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Bibliography on Electron Transfer Processes in Ion-Ion/Atom/Molecule Collisions

– UPDATED 1993 –

Hiro Tawara

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RESEARCH REPORT
NIFS-DATA Series

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BIBLIOGRAPHY ON ELECTRON TRANSFER PROCESSES IN ION-ION/ATOM/MOLECULE COLLISIONS

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National Institute for Fusion Science

Nagoya 464-01, Japan

Abstract

Following our previous compilations [IPPJ-AM-45 (1986), NIFS-DATA-7 (1990)], bibliographic information on experimental and theoretical studies on electron transfer processes in ion-ion/atom/molecule collisions is up-dated. The references published through 1980-1992 are included. For easy finding references for particular combination of collision partners, a simple list is also provided.

[keywords : bibliography, atomic ions, molecular ions, electron transfer, charge changing]

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$\to Ne^{(q-1)+}$, $Ar^{(q-1)+}$, $Kr^{(q-1)+}$

TOF
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(0.25-0.66)xq/M (keV/amu)
recoil ion source; total cross section

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H^- + H, H_2 -> H(2s,Ly-α,3s,B-α)
photon spectroscopy
3 - 25 keV/amu

11
81E10 Hall, J. Richard, P. Gray, T.J. Lin, C.D.
Phys. Rev. A 24 (1981) 2416 - 2419
Double K-shell-to-K-shell electron transfer in ion-atom collisions.
A^{Z+} + Ti -> $A^{(Z-1)+}(1s)$, $A^{(Z-2)+}(1s^2)$ + $Ti(1s^{-1})$, $Ti^{2+}(1s^{-2})$
(A = N,F,Mg,Al,Si,S)
x-ray yields
1500 - 6500 keV/amu (Si); 5000 keV/amu (others)

12
81E11 Hird, B. Ali, S.P.
J. PHys. B 14 (1981) 267 - 280
Electron transfer to Ar^{2+} from rare gas atoms.
Ar^{2+} + He,Xe -> Ar^+
1.5 - 5 keV

13
81E22 Holzscheiter, H.M. Church, D.A.
J. Appl. Phys. 74 (1981) 2313-2318
Near thermal charge transfer between Ar^{2+} and N_2.
Ar^{2+} + N_2 -> Ar^+
trapping technique
- 10^{-3} keV/amu
rate coefficient

14
81E23 Holzscheiter, H.M. Church, D.A.
Phys. Letters 86A (1981) 25-28
Charge transfer reaction of multi-charged ions with O_2.
O^{q+} + O_2 -> $O^{(q-1)+}$ (q = 2,3)
trapped ion source
- $2x10^{-3}$ keV/amu
rate coefficient

15
81E24 Howald, A.M. Anderson, L.W. Lin, C.C.

Phys. Rev. A 24 (1981) 44-47
Charge-changing cross sections for H^- ions incident on a Na vapor target.
H^- + Na -> H, H^+
growth
1 - 25 keV/amu

16
81E12 Hvelplund, P. Hangen, H.K. Knudsen, H. Andersen, L. Damsgaard, H. Fukusawa, F.
Phys. Scripta 24 (1981) 40 - 42
Electron capture into highly-lying Rydberg states in collisions between multiply charged ions and H_2.
$Au^{13+,15+}$ + H_2 -> $Au^{12+,14+}$
optical measurement
100 keV/amu
$\Delta n=1$; dominant transitions; no cross section given

17
81E13 Justiniano, E. Cocke, C.L. Gray, T.J. DuBois, R.D. Can, C.
Phys. Rev. A 24 (1981) 2953 - 2962
Charge transfer and ionization in low energy Ar^{q+} + Ne collisions.
Ar^{q+}(q=2-9) + Ne -> $Ar^{(q-1)+}$, $Ar^{(q-2)+}$, $Ar^{(q-3)+}$ + Ne^{i+} (i = 1 - 3)
coincidence technique
(0.1-1.1)xq/M (keV/amu)
recoil ion source; total cross section

18
81E14 Knudsen, H. Haugen, H.K. Hvelplund, P.
Phys. Rev. A 23 (1981) 597 - 610
Single-electron capture cross sections for medium- and high-charged ions colliding with atoms.
Au^{q+}(q=2-24), O^{q+}(q=1-8) + He -> $Au^{(q-1)+}$, $O^{(q-1)+}$
growth
16.8 - 102 keV/amu (Au); 125 - 1000 keV/amu (O)
scaling law

19
81E15 Mann, R. Folkmann, F. Beyer, H.F.
J. Phys. B 14 (1981) 1161 - 1181
Selective electron capture into highly stripped Ne and N target atoms after heavy ion impact.
A^{q+} + B -> $A^{(q-1)+}(n)$ + B^+ (A = Ne^{8+},Ne^{10+},N^{5+}; B = He,Ne,Ar,H_2,CH_4,NH_3)
x-ray spectroscopy
10^{-4} keV/amu
recoil ions; no cross section

20
81E16 Nagata, T. Okamura, Y. Katoh, E. Mukoyama, Y.
Phys. Letters 81A (1981) 265 - 267
Single-electron capture cross sections for 0.4-5.0 keV He^+ ions incident on alkali-vapor targets.
He^+ + B -> He^0(B = Cs,Rb,K,Na)
growth
0.1 - 1.25 keV/amu

21
81E17 Seim, W. Muller, A. Salzborn, E.
Z. Phys. A 301 (1981) 11 - 16
On the population of metastable ionic states in electron-capture collisions.
A^{1+},A^{2+} + O_2 -> A^{2+},A^{3+}
growth
0.25 - 1.7 keV/amu
metastable state effect

22
81E18 Tanis, J.A. Shafroth, S.M. Willis, J.E. Clark, M. Swenson, J.

Strait, E.N. Mowat, J.R.
Phys. Rev. Letters 47 (1981) 828 - 831
Simultaneous electron capture and excitation in S + Ar collisions.
S^{q+} + Ar -> $S^{(q-1)+}$,$S^{(q-2)+}$ (q = 13 - 16)
coincidence with K x-rays
2180 keV/amu

23
81E19 Tanis, J.A. Shafroth, S.M. Willis, J.E. Mowat, J.R.
Phys. Rev. A 23 (1981) 366 - 370
Radiative electron capture by Cl ions incident on C and Cu foils.
Cl^{Z+} + C,Cu -> $Cu^{(Z-1)+}$ + $h\nu$ + C^{+},Cu^{+}
x-ray spectroscopy
1142 - 2285 keV/amu

24
81E25 Tsurubuchi, S. Iwai, T.
J. Phys. B 14 (1981) 243 - 259
Excitation of Li(2p) and He(2p) in collisions of Li^{+} with He at energies below 4.2 keV.
Li^{+} + He -> Li($2P_{0}$, $2P_{\pm 1/2}$)
photon spectroscopy technique
6.4×10^{-2} - 6.0×10^{-1} keV/amu
transitions(2p ->2s ; 4d -> 2p ; 3d -> 2p) of Li;
also He^{*} transition(2p -> 1s)

25
81E20 Vane, C.R. Prior, M.H. Marrus, R.
Phys. Rev. Letters 46 (1981) 107 - 110
Electron capture by Ne^{10+} trapped at very low energies.
Ne^{10+} + Ne -> Ne^{9+}
trapped ion
3.5×10^{-4} - 2.25×10^{-3} keV/amu
recoil ion + trapping; total cross sections

1
82E 1 Beyer,H.F. Mann,R. Folkmann,F.
J. Phys. B 15 (1982) 1083-1088
Electron capture by slow Ne^{8+} recoil ions
Ne^{8+} + He, Ne, Ar, CH_4, Xe -> Ne^{7+}
K-α x-ray observation
recoil ion source; recoil energy

2
82E 2 Bissinger,G. Joyce,J.M. Lapicki,G. Laubert,R. Varghese,S.L.
Phys. Rev. Letters 49 (1982) 318-322
Failure of cross section additivity for electron capture from hydrogen gases to bound states of hydrogen ions
H^+ + B -> H^0 (B = CH_4, C_2H_2, C_3H_6, C_4H_8)
growth
800 - 3000 keV/amu

3
82E 3 Bloemen,E. Dijkkamp,D. de Heer,F.J.
J. Phys. B 15 (1982) 1391-1413
Production of excited projectile states in collisions of 25-800 keV Ne^{z+} (z=1,2,3,4) with He, Ne and Ar
Ne^{z+}(z=1,2,3,4) + He, Ne, Ar -> $Ne^{(z-1)+}$ + He^+, Ne^+, Ar^+
photon emission spectroscopy
1.24 - 39.6 keV/amu

4
82E 4 Brazuk,A. Winter,H.
J. Phys. B 15 (1982) 2233-2244
Excitation by electron capture in collisions of ground state and metastable Ne^{2+} with Xe at 40 keV
Ne^{2+} + Xe -> Ne^+(nl) + Xe^+
photon emission spectroscopy
2.0 keV/amu

5
82E 5 Bruch,R. Dube,L.J. Trabert,E. Heckmann,P.H. Raith,B. Brand,K.
J. Phys. B 15 (1982) L857-862
Electron capture to Rydberg states; C^{4+} in collisions with H_2
C^{4+} + H_2, He -> C^{3+}(nl) + H_2^+, He^+
E. EUV; T. TA, CDW, first and second Born
166 - 416 keV/amu

6
82E 6 Church,D.A. Holzscheiter,H.M.
Phys. Rev. Letters 49 (1982) 643-646
Charge transfer from atomic hydrogen to O^{2+} and O^{3+} ions with electron-volt energy
O^{2+}, O^{3+} + H -> O^+, O^{2+}
trapping technique
10^4 K
rate constant

7
82E 7 Dmitriev,I.S. Vorobiev,N.F. Zaikov,V.P. Konovalova,Zh.M. Nikolaev,V.S. Teplova,Ya.A. Fainberg,Yu.A.
J. Phys. B 15 (1982) L351-355
Oscillations of the charge exchange cross sections and the average equilibrium charge of helium ions
He^{2+}; He^+ + He, N_2, Ne, Ar -> He^+, He^0; He^0
growth
331 - 2070 keV/amu

8
82E37 Dowek, D. Dhuicq, D. Sidis, V. Barat, M.
Phys. Rev. A 26 (1982) 746-761
Collision spectroscopy of the He, He^{+} - $H_2(D_2)$ systems. A triatomic extension of the molecular-orbital-promotion model.
$He, He^{+} + H_2 ->$
translational energy spectroscopy
0.05 - 0.75 keV/amu
angular distribution. no absolute cross sections

9
82E 8 El-Sherbini,T.M. de Heer,F.J.
J. Phys. B 15 (1982) 423-438
Projectile excitation in the collisions of Ar^{q+}(q=1,2 and 3) with He and Ne
Ar^{q+} + He, Ne -> Ar^{+}, Ar^{2} (q=1-3)
photon emission spectroscopy
0.375 - 10 keV/amu

10
82E 9 Groh,W. Schlachter,A.S. Muller,A. Salzborn,E.
J. Phys. B 15 (1982) L207-212
Transfer ionization in slow collisions of He^{2+} ions in rare gases
He^{2+} + A -> He^{+} + A^{i+} + (i-1)e
coincidence
1.88 - 8 keV/amu
charge fraction

11
82E10 Havener,C.C. Westerveld,W.B. Risley,J.S. Tolk,N.H. Tully,J.C.
Phys. Rev. Letters 48 (1982) 296-929
Observation of a large electric dipole moment produced in electron transfer collisions of H^{+} on He
H^{+} + He -> H^{0}(n=3) + H^{+}
Balmer-alpha line observation
40 - 80 keV/amu
polarization as a function of electric field

12
82E11 Hegerberg,R. Elford,M.T. Skullerud,H.R.
J. Phys. B 15 (1982) 797-811
The cross section for symmetric charge exchange of Ne^{+} in Ne at low energies
A^{+} + A -> A + A^{+} (A = Ne, Ar)
drift tube method
$1x10^{-4}$ - $1.25x10^{-3}$ keV/amu

13
82E12 Iwai,T. Kaneko,Y. Kimura,M. Kobayashi,N. Ohtani,S. Okuno,K. Takagi,S. Tawara,H. Tsurubuchi,S.
Phys. Rev. A 26 (1982) 105-115
Cross sections for one-electron capture by highly stripped ions of B, C, N, O, F, Ne and S from He below 1 keV/amu
A^{q+} + He -> $A^{(q-1)+}$ + He^{+} (A = B, C, N, O, F, Ne, S; q = 1-9)
growth
0.44 - 1.11 keV/amu
total cross section

14
82E13 Kadota,K. Dijkkamp,D. van der Woude,R.L. de Boer,A. Yan,P.G. de Heer,F.J.
J. Phys. B 15 (1982) 3275-3296
One-electron capture into excited states for He^{2+} - Li collisions in the energy range of 15 - 150 keV
He^{2+} + Li -> He^{+}(nl) + Li^{+}
photon emission spectroscopy
4 - 40 keV/amu

15
82E14 Kadota,K. Dijkkamp,D. van der Woude,R. Yan,P.G. de Heer,F.J.
Phys. Letters 88A (1982) 135-139
Absolute cross sections for one-electron capture into the excited projectile states in collisions between He^{2+}(15-150 keV) and Li atoms
He^{2+} + Li -> He^{+}(nl)
optical spectroscopy
3.75 - 37.5 keV/amu

16
82E15 Kambara,T. Awaya,Y. Hitachi,A. Kase,M. Kohno,I. Tonuma,T.
J. Phys. B 15 (1982) 3759-3767
X-ray from radiative electron capture induced by 110 MeV Ne ions
Ne^{10+} + H_2, He, CH_4, N_2, O_2, Ne -> Ne^{9+} + $h\nu$
x-ray spectroscopy
5500 keV/amu

17
82E16 Kamber,Y. Mathur,D. Hasted,J.B.
J. Phys. B 15 (1982) 2051-2059
Energy loss spectra of single electron capture products from Ar^{2+} collisions with Ar, Kr, and Xe
Ar^{2+} + B -> Ar^{+}(nl) (B = Ar, Kr, Xe)
energy loss spectroscopy
0.013 keV/amu
no cross sections

18
82E17 Katayama,I. Berg,G.P.A. Hurlimann,W. Martin,S.A. Meissburger,J.
Oelert,W. Rogge,M. Romer,J.G.M. Tain,J. Styzen,B.
Phys. Letters 92A (1982) 385-388
Charge transfer reactions of ^3He in carbon at 68, 99 and 130 MeV
$^3He^{2+}$ + C -> He^{+}
foil thickness dependence
22000 - 43000 keV/amu

19
82E18 Kimura,M. Iwai,T. Kaneko,Y. Kobayashi,N. Matsumoto,A. Ohtani,S.
Okuno,K. Takagi,S. Tawara,H. Tsurubuchi,S.
J. Phys. B 15 (1982) L851-856
The (n,l) distributions in electron capture reactions for C^{3+}, N^{4+} and O^{5+} ions colliding with He
A^{q+} + He -> $A^{(q-1)+}$ + He^{+} (A^{q+}=C^{3+}, N^{4+}, O^{5+})
energy-loss/-gain spectroscopy
2.5×10^{-1} (C^{3+}), 2.85×10^{-1} (N^{4+}), 3.12×10^{-1} (O^{5+}) keV/amu

20
82E19 Kusakabe,T. Hanaki,H. Nagai,N. Kuroda,K. Maeda,N. Sakisaka,M.
Nucl. Instr. Meth. 198 (1982) 577-581
Ion-impact ion source applied to low energy charge-transfer collisions
He^{2+} + Ne -> He^{+}, He^{0}
growth
0.2 - 0.75 keV/amu

21
82E41 Mahan, B.H. Martner, C. Okeefe, A.
J.Chem.Phys. 76 (1982) 4433 - 4438
Laser-induced fluorescence studies of the charge transfer reactions of N_2^+ with Ar and N_2.
N_2^+ + Ar,N_2 -> N_2
trapped ion technique
10^{-5} keV/amu
strong vibrational state dependence in N_2 targets but not in Ar targets

22
82E20 Mann,R. Cocke,C.L. Schlachter,A.S. Prior,M. Marrus,R.
Phys. Rev. Letters 49 (1982) 1329-1332
Selective final-state population in electron capture by low-energy highly charged projectiles studied by energy-gain spectrocopy
Ne^{9+}, Ne^{10+} + He, Ne, Ar, Xe -> $Ne^{8+}(n)$, $Ne^{9+}(n)$
energy-gain spectroscopy
0.025- keV/amu
crossing radius; n-distribution only

23
82E38 Marrus, R. Prior, M. Vane, C.R.
Nucl. Instr. Meth. 202 (1982) 171-175
Electron capture by trapped, low-energy, multiply charged neon ions.
Ne^{q+}(q = 3 - 10) + Ne -> $Ne^{(q-1)+}$ + Ne^{+}
trapped ion
thermal

24
82E21 Matsumoto,A. Ohtani,S. Iwai,T.
J. Phys. B 15 (1982) 1871-1881
Experimental study of one-electron capture by ground and metastable Ar^{2+} ions from Na at 1.5 keV
$Ar^{2+}(^1D, ^3P)$ + Na -> Ar^{+} + Na^{+}
optical attenuation method
3.75×10^{-2} keV/amu

25
82E22 McCullough,R.W. Goffe,T.V. Shaha,M.B. Lennon,M.O. Gilbody,H.B.
J. Phys. B 15 (1982) 111-117
Electron capture by He^{2+} and He^{+} ions in lithium vapor
He^{2+}, He^{+} + Li -> He^{+}, He^{0}
growth
1.7 - 200 keV/amu
total cross section

26
82E23 Miethe,K. Dreiseidler,T. Salzborn,E.
J. Phys. B 15 (1982) 3069-3084
Charge transfer of hydrogen atoms in N_2 and in caesium vapor
H + N_2, Cs -> H^{+}, H^{0-}
growth
0.1 - 5 keV/amu
scattering effect in cross sections (θ = 0.8, 2.6)

27
82E24 Murray,G.A. Stone,J. Mayo,M. Morgan,T.J.
Phys. Rev. A 25 (1982) 1805-1807
Single and double electron transfer in He^{2+} + Li collisions
He^{2+} + Li -> He^{+}, He^{0}
total cross section

28
82E25 Nagata,T.
Mass spectroscopy in Japan 30 (1982) 153-161
Attenuation cross sections for single electron capture of proton in collision with alkali-atom targets
H^{+} + Cs, Rb, K, Na -> H
attenuation method
0.3 - 5 keV/amu

29
82E39 Niki, H. Izawa, Y. Otani, H. Yamanaka, C.
Trans.Inst.Elec.Eng. 102C (1982) 45 - 51
Charge exchange effect on laser isotope separation of atomic uranium (in Japanese).
$U^+ + U \to U + U^+$
4×10^{-4} keV/amu

30
82E26 Ohtani,S. Kaneko,Y. Kimura,M. Kobayashi,N. Iwai,T. Matsumoto,A. Okuno,K. Takagi,S. Tawara,H. Tsurubuchi,S.
J. Phys. B 15 (1982) L533-535
Observation of electron capture into selective state by fully stripped ions from He atom
C^{6+}, O^{8+} + He -> C^{5+}(nl), O^{7+}(nl) + He^+
Energy-loss/gain spectroscopy
0.45 keV/amu

31
82E27 Panev,G.S.
Phys. Letters 91A (1982) 348-350
Charge transfer in collisions of Mg^+ ions with Ca atoms
Mg^+ + Ca -> Mg + Ca^+
crossed beam
0.006 - 0.08 keV/amu
total cross section

32
82E28 Pedersen,E.H. Folkmann,F. Pedersen,N.H.
J. Phys. B 15 (1982) 739-762
Differential cross sections for K-shell ionization and capture by H^+n C(CH_4) and Ne
H^+ + B -> H + $B^+(1s^{-1})$ (B = C, Ne)
Auger electron coincidence
200 - 600 keV/amu (C), 500 - 1500 keV/amu (Ne)
impact parameter dependence

33
82E29 Pedersen,E.H. Pedersen,N.H.
J. Phys. B 15 (1982) 2205-2220
Differential cross sections for K-shell ionization and capture in asymmetric collisions; scaling properties
A^{z+} + B -> $A^{(z-1)+}$ + $B^+(1s)$ (A = H, He, Li; B = C, Ne, Ar)
Auger electron coincidence
200 keV/amu (C), 500 keV/amu(Ne), 1700 keV/mu (Ar)
probability as a function of impact parameter

34
82E30 Pedersen,E.P. Loftager,P. Rasmussen,J.L.
J. Phys. B 15 (1982) 4423-4436
Electron capture in close collisions between protons and carbon (CH_4)
H^+ + C -> H + $C^+(1s^{-1})$
Auger electron coincidence
200 - 2000 keV/amu
Impact parameter dependence

35
82E42 Piotrovskii, Yo.A. Tolmachev, Yu.A. Kasyanenko, S.U.
Opt.Spectrosc.(USSR) 52 (1982) 452 - 453
Investigation of the non-resonant charge-exchange process in helium-mercury systems.
He^+ + Hg -> He + $Hg^{+*}(7\ ^2P_{3/2})$
after-glow method
rate coefficient at thermal energies

36
82E31 Richard,P. Pepmiller,P.L. Kawatsura,K.
Phys. Rev. A 25 (1982) 1937-1942
Electron excitation and capture in F^{8+} plus Ne collisions
$F^{8+}(1s)$ + Ne -> F^{7+}
x-ray spectroscopy
526 - 2100 keV/amu

37
82E32 Rille,E. Olson,R.E. Peacher,J.L. Blankenship,D.M. Kvale,T.J. Redd,E. Park,J.T.
Phys. Rev. Letters 49 (1982) 1819-1821
Isotope effect in electron-capture differential cross sections at intermediate energies
H^+, D^+ + H, D -> H^0, D^0
E. growth with high temperature oven; T. CTMC
40 keV/amu
projectile dependence at small angles; no target isotope dependence; scaling law

38
82E33 Rille,E. Winter,H.
J. Phys. B 15 (1982) 3489-3507
State-selective and total one-electron capture in Ne^{q+} - Li collisions (q = 1,2; E $\leq$ 30q keV)
Ne^{q+} + Li -> $Ne^{(q-1)+}(3l, 4l)$ (q=1,2)
photon spectroscopy
0.25 - 1.5 keV/amu (Ne^+; 1 - 3 keV/amu (Ne^{2+})
total and partial cross sections

39
82E40 Shah, M.B. Gilbody, H.B.
J.Phys.B 15 (1982) 3441 - 3453
Ionization of H_2 by fast protons and multiply charged ions of He,Li,C,N and O.
H^+,He^{2+},C^{2+},C^{3+},C^{4+} + H_2 -> H,He^+,C^+,C^{2+},C^{3+} + H^+ + H^+ + e
projectile-recoil ion coincidence
16 - 160 keV/amu
dissociative and non-dissociative ionization cross sections for H^+,He^{2+},Li^+,Li^{2+},Li^{3+},C^{q+}(q = 2,3,4) ,N^{q+}(q = 2,3,4,5),O^{q+}(q = 2,3,4,5)

40
82E34 Tanis,J.A. Bernstein,E.M. Graham,W.G. Clark,M. Shafroth,S.M. Johnson,B.M. Jones,K.W. Meron,M.
Phys. Rev. Letters 49 (1982) 1325-1328
Resonant behavior in the projectile x-ray yield associated with electron capture in S + Ar collisions
S^{13+} + Ar -> S^{12+}
coincidence with x-ray
2180 - 5000 keV/amu

41
82E35 Tawara,H. Richard,P. Kawatsura,K.
Phys. Rev. A 26 (1982) 154-161
Radiative electron-capture processes in zero-and one-electron heavy ion collisions with He
F^{8+}, F^{9+} + He -> F^{7+}, F^{8+} + He^+ + $h\nu$
x-ray spectroscopy
789 - 2100 keV/amu

82E36 Tsurubuchi,S. Iwai,T. Kaneko,Y. Kimura,M. Kobayashi,N. Matsumoto,A. Ohtani,S. Okuno,K. Takagi,S. Tawara,H.
J. Phys. B 15 (1982) L733-737
Two-electron capture into autoionising states of $N^{5+}(3l3l')$ and $O^{5+}(1s3l3l')$ in collisions of N^{7+} and O^{7+} with He
N^{7+}, O^{7+} + He -> $N^{5+}(3l, 3l')$, $O^{5+}(1s3l3l')$ + He^{2+}
Energy-loss/gain spectroscopy
0.5 keV/amu (N^{7+}). 0.44 keV/amu (O^{7+})

1
83E 1 Afrosimov,V.V. Basalaev,A.A. Donets,E.D. Zinovev,A.N. Lozhkin,K.O. Panov,M.N.
JETP Letters 37 (1983) 24-27
Electron capture cross sections of nuclei and mutiply charged ions at hydrogen atoms
A^{z+}, $A^{(z-1)+}$, $A^{(z-2)+}$ + H -> $A^{(z-1)+}$, $A^{(Z-2)+}$, $A^{(z-3)+}$ (A = C, N, O, Ne)
growth
0.47 - 5.2 keV/amu

2
83E 2 Afrosimov,V.V. Donets,E.D. Zinovev,A.N. Ovchinnikov,S.Y. Panov,M.N.
JETP Letters 38 (1983) 80-83
Cross sections for characteristic x-ray emission in collisions of C^{6+}, N^{6+}, N^{7+}, and O^{8+} ions with hydrogen
C^{6+}, N^{6+}, N^{7+}, O^{8+} + H -> C^{5+}, N^{5+}, N^{6+}, O^{7+} (2p-1s; Σ(np-1s))
x-ray observation
0.47 - 7.5 keV/amu
oven (dissociation 85%)

3
83E 3 Baptist,R. Bliman,S. Bonnet,J.J. Chauvet,G. Dousson,S. Hitz,D. Jacquot,B. Knystautas,E.J.
Phys. Lett. 93A (1983) 185-188
Radiative decay of lithium-like ions following charge exchange collisions of 60 keV O^{6+} ions with H_2
O^{6+} + H_2 -> O^{5+}(nl) + H_2^+
photon emission spectroscopy
3.75 keV/amu
no cross sections given

4
83E 4 Bliman,S. Bonnefoy,M. Bonnet,J.J. Dousson,S. Fleury,A. Hitz,D. Jacquot,B.
Phys. Scripta T3 (1983) 63-67
Charge exchange collision experiments with highly charged ions-status report
A^{z+} + He -> $A^{(z-1)+}$ (A = C, O, Ne); Ar^{q+}(q=3-16) + D_2 -> $Ar^{(q-1)+}$
growth
2 - 5 keV/amu
ECR source; total cross section and x-ray production cross section

5
83E 5 Bliman,S. Bonnet,J.J. Chauvet,G. Dousson,S. Hitz,D. Jacquot,B. Knystautas,E.J.
J. Phys. B 16 (1983) L243-245
Radiative decay of lithium-like ions following charge exchange collisions of 3 keV amu^{-1} C^{4+} ions with H_2
C^{4+} + H_2 -> C^{3+}(nl) + H_2^+
photon emission spectroscopy
3.3 keV/amu

6
83E 6 Bliman,S. Hitz,D. Jacquot,B. Harel,C. Salin,A.
J. Phys. B 16 (1983) 2849-2860
Charge exchange in the O^{8+} - He collisions at keV amu^{-1} energies
O^{8+} + He -> O^{7+}(n) + He^+, O^{6+}(n,n') + He^{2+}
E. TOF; T. OEDM
0.9 - 5.3 keV/amu

7
83E 7 Chetioui,A. Wohrer,K. Rozet,J.P. Jolly,A. Stephan,C. Belkic,Dz. Gayet,A. Salin,A.
J. Phys. B 16 (1983) 3993-4003
State-to-state charge exchange cross sections in high-velocity asymmetric and near-symmetric collisions of 400 MeV Fe^{26+} ions
$Fe^{26+} + B \rightarrow Fe^{25+}(nl) + B^{+}(1s^{-1})$ (B = He, N, Ar)
E. x-ray spectroscopy
T. continuum-distorted wave, strong-potential Born, impulse
7000 keV/amu
x-ray (1s->np, nd)

8
83E 8 Church,D.A. Kenefick,R.A. Burns,W.S. Holmes,C.S.O.R. Huldt,S. Berry,S. Breinig,M. Elston,S. Rozet,J.P. Sellin,I.A. Taylor,D. Thomas,B.
Phys. Rev. Letters 51 (1983) 1636-1639
Charge transfer to multicharged recoil ions in a Penning trap
$Ne^{q+} + Ne \rightarrow Ne^{(q-1)+}$ (q=2-6)
trapping method
q x 10^{-4} keV/amu
rate coefficients

9
83E 9 Cocke,C.L. Gray,T.J. Justiniano,E. Can,C. Waggoner,B. Varghese,S.L. Mann,R.
Phys. Scripta T3 (1983) 75-78
Electron capture collisions involving low-energy highly stripped projectiles
$Ar^{q+} + He \rightarrow Ar^{(q-1)+}$(q=3-6); Ne^{q+}(q=2-8) + He -> $Ne^{(q-1)+}$, $Ne^{(q-2)+}$;
Ar^{q+}(q=2-10) + Li -> $Ar^{(q-1)+}$
growth, energy gain spectroscopy
0.006 - 0.075 keV/amu
recoil ion; total cross section; n-distribution for Ne^{10+} + Xe

10
83E10 Damsgaard,H. Hangen,H.K. Hvelplund,P. Knudsen,H.
Phys. Rev. A 27 (1983) 112-116
Coincidence measurements of electron capture and target ionization in multiply charged Au^{q+} + (He, Ne) collisions
Au^{q+} (q=5-21) + He, Ne -> $Au^{(q-1)+}$, $Au^{(q-2)+}$ + He^{r+}(r=1,2), Ne^{r+}(r=1-6)
coincidence
100 keV/amu

11
83E11 Dijkkamp,D. Brazuk,A. Drentje,A.G. de Heer,F.J. Winter,H.
J. Phys. B 16 (1983) L343-346
State-selective single-electron capture by 80 keV C^{4+} ions from He, H_2 and Li
C^{4+} + He, H_2, Li -> C^{3+}(nl) + He^{+}, H_2^{+}, Li^{+}
photon emission spectroscopy
6.66 keV/amu

12
83E12 Gordeev,Yu.S. Dijkkamp,D. Drentje,A.G. de Heer,F.J.
Phys. Rev. Letters 50 (1983) 1842-1845
Electron capture into different (n,l) states in slow collisions of C^{6+}, N^{6+}, O^{6+} and Ne^{6+} projectiles on He and H_2 targets
C^{6+}, N^{6+}, O^{6+}, Ne^{6+} + He -> C^{5+}(nl), N^{5+}(nl), O^{5+}(nl), Ne^{5+}(nl) + He^{+}
N^{6+}, O^{6+} + H_2 -> N^{5+}(nl), O^{5+}(nl) + H_2^{+}
photon emission spectroscopy
0.56 - 6.25 keV/amu

13
83E13 Groh,W. Muller,A. Schlachter,A.S. Salzborn,E.
J. Phys. B 16 (1983) 1997-2015
Transfer ionization in slow collisions of multiply charged ions with atoms
$A^{q+} + B \rightarrow A^{(q-k)+} + B^{i+} + (i-k)e$
{A=Ne (q=1-7); Ar(q=1-9); Kr(q=1-12); Xe(q=1-15)}
coincidence
(3-5)xq/M (keV/amu)
contribution of transfer ionization; charge fraction

14
83E14 Hall,J. Richard,P. Gray,T.J. Newcomb,J. Pemiller,P. Lin,C.D. Jones,K. Johnson,B. Gregory,D.
Phys. Rev. A 28 (1983) 99-110
Systematics of single and double K-shell vacancy production in titanium bombarded by heavy ions
$A^{z+} + Ti \rightarrow A^{(z-1)+}(1s) + Ti^{+}(1s^{-1})$; $A^{(z-2)+}(1s^2) + Ti^{2+}(1s^{-2})$
(A = C, N, O, F, Mg, Si, S, Cl)
x-ray measurements
500 - 6500 keV/amu

15
83E15 Hanaki,H. Kusakabe,T. Nagai,N. Sakisaka,M.
J. Phys. Soc. Japan 52 (1983) 424-430
Electron capture of He^{2+} from gas target atoms at round a few keV
$He^{2+} + A \rightarrow He^{+}, He^{0}$ (A = Ne, Ar, Kr, Xe, N_2)
growth method
0.175 - 1.125 keV/amu
recoil ion source

16
83E17 Huber,B.A.
Phys. Scripta T3 (1983) 96-100
Energy gain and loss spectroscopy of charged changing collisions between multiply charged ions and neutrals
$A^{q+} + B \rightarrow A^{(q-1)+}$ (A = Ne, Ar, Kr, Xe; B = H_2, He, Ar, Xe; q=2-6)
growth, energy gain spectroscopy
0.25 keV/amu
cross section vs. crossing radius

17
83E16 Huber,B.A. Kahlert,H.J.
J. Phys. B 16 (1983) 4655-4669
State-selective electron capture by $Ar^{2+}(^3P, ^1D, ^1S)$ ions in He, Ne and Kr
Ar^{2+} + He, Ne, Ar -> Ar^{+}
translational energy spectroscopy
0.015 keV/amu
metastable beam fraction determined through beam attenuation

18
83E54 Hug, M.S. Doverspike, L.D. Champion, R.L.
Phys. Rev. A 27 (1983) 2831-2839
Electron detachment for collisions of H^- and D^- with hydrogen molecules
$H^-, D^- + H_2 \rightarrow H, D$
parallel plate technique
threshold - 0.2 keV/amu

19
83E18 Hvelplund,P. Samsoe,E. Andersen,L.H. Haugen,H.G. Knudsen,H.
Physica Scripta T3 (1983) 176-181
Population of n,l states in electron-capture collisions between highly charged, medium-velocity ions and H_2
$Au^{q+} + H_2 \rightarrow Au^{(q-1)+}(n) + H_2^{+}$ ($12 \le q \le 18$)
photon emission spectroscopy
100 keV/amu

20
83E19 Johnsen,R.
Phys. Rev. A 28 (1983) 1460-1468
Spectroscopic observations of the radiative charge transfer and association of helium ions with neon atoms at thermal energy
$He^+ + Ne \rightarrow He + Ne^+ + h\nu$.
selected ion drift tube technique
3×10^{-5} keV/amu
rate coefficient

21
83E20 Kahlert,H.J. Huber,B.A. Wiesemann,K.
J. Phys. B 16 (1983) 449-459
Charge exchange and transfer ionisation in low-energy Ne^{2+} - Xe collisions
$Ne^{2+} + Xe \rightarrow Ne^+ + Xe^+; Ne^+ + Xe^{2+} + e^-$
energy-loss/-gain spectroscopy
10^{-2} keV/amu

22
83E21 Kamber,E.Y. Hasted,J.B.
J. Phys. B 16 (1983) 3025-3035
Single electron capture by Ar^{2+} and Ar^{3+} ions impacting helium
$Ar^{2+}, Ar^{3+} + He \rightarrow Ar^+, Ar^{2+}(nl) + He^+ + \Delta E$
energy loss spectroscopy
0.0135, 0.03 keV/amu
energy loss spectra

23
83E22 Knudsen,H. Hvelplund,P. Andersen,L.H. Bjornelund,S.
Phys. Scripta T3 (1983) 101-109
Experimental investigation of electron capture by highly charged ions of medium velocities
general analysis

24
83E23 Kuen,I. Stori,H. Howorka,F.
Phys. Rev. A 28 (1983) 119-126
Measurement of direct and charge exchange excitation cross sections in collisions of 1 - 800 eV (laboratory frame) He^+, Ne^+, Ar^+, Kr^+ and B^+ ions and of 1 - 3600 eV He^{2+}, Ne^{2+}, and Ar^{2+} ions with O_2(wavelength region 2000 - 8000 A)
$A^+ + O_2 \rightarrow A^0$ (A = He, Ne, Ar, Kr, B); $A^{2+} + O_2 \rightarrow A^+$ (A = He, Ne, Ar)
photon-spectroscopy
1.2×10^{-5} - 0.45 keV/amu (A^+); 1.2×10^{-5} - 0.9 keV/amu (A^{2+})
emission cross sections

25
83E26 Kusakabe,T. Hanaki,H. Nagai,N. Horiuchi,T. Sakisaka,M.
Phys. Scripta T3 (1983) 191-193
q-dependence of electron capture cross sections for slow Kr^{q+} and Xe^{q+} ions on H_2 and He
$Kr^{q+}(q=2\text{-}9), Xe^{q+}(q=2\text{-}10) + H_2, He \rightarrow Kr^{(q-k)+}, Xe^{(q-k)+}$ (k=1-2)
growth
0.29 keV/amu
total cross section

26
83E24 Kusakabe,T. Hanaki,H. Nagai,N. Horiuchi,T. Konomi,I. Sakisaka,M.
Mem. Fac. Eng. Kyoto Univ. 45 (1983) 35-49
Charge transfer cross sections for multiply charged slow Ne, Ar, Kr and Xe ions on various gas targets I. rare gas targets
Kr and Xe ions on various gas targets I.
rare gas targetsA^{q+} + B -> $A^{(q-k)+}$ + B^{k+}
(A = Ne, Ar, Kr, Xe; q=2-11; B = He, Ne, Ar, Kr, Xe; k=1-5)
growth
0.15 - 3 keV/amu

27
83E25 Kusakabe,T. Nagai,N. Hanaki,H. Horiuchi,T. Sakisaka,M.
J. Phys. Soc. Japan 52 (1983) 4122-4128
Charge transfer cross sections for slow Ne^{2-5+} ions on He and H_2
Ne^{q+} + B -> $Ne^{(q-k)+}$ + B^{k+} (q=2-5; B = He, H_2; k=1-2)
growth
0.15 - 3 keV/amu

28
83E27 Lennon,M. McCullough,R.W. Gilbody,H.B.
J. Phys. B 16 (1983) 2191-2204
State-selective electron capture by C^{2+}, C^{3+}, N^{2+} and Ar^{2+} ions in rare gases
C^{2+} + He, Ne, Ar -> C^{+}; N^{2+} + He, Ne -> N^{+}; Ar^{2+} + He, Ne -> Ar^{+};
C^{3+} + He -> C^{2+}
energy-loss/-gain spectroscopy
0.13 - 5 (C^{2+}); 5.7×10^{-2} - 0.57 (N^{2+}); 3.5×10^{-3} - 0.125 (Ar^{2+});
0.25 - 1.5 (C^{3+}) keV/amu

29
83E28 Lindinger,W.
Phys. Scripta T3 (1983) 115-119
Reactions of doubly charged ions at near thermal energies
A^{2+} + B -> A^{+} (A = He, C, O, Ne, Mg, Ar, Ca, Kr;
B = He, Ne, Ar, Kr, Xe, Hg, H_2, N_2, O_2, NO, CO_2, SO_2, NO_2, NH_3, CH_4,C_2H_2)
swarm method
thermal energy
rate coefficient - crossing radius

30
83E30 Matsumoto,A. Iwai,T. Kaneko,Y. Kimura,M. Kobayashi,N. Ohtani,S. Okuni,K. Takagi,S. Tawara,H. Tsurubuchi,S.
J. Phys. Soc. Japan 52 (1983) 3291-3293
Measurement of relative population between B^{2+}(2s) and B^{2+}(2p) in electron capture collision of B^{3+} with He
B^{3+} + He -> B^{2+}(2s, 2p)
energy-gain spectroscopy
0.09 - 0.3 keV/amu
relative value

31
83E29 Matsumoto,A. Sano,T. Twai,T.
J. Phys. Soc. Japan 52 (1983) 1173-1177
Observation of N_2^{+} 3914 A band emission in collisions of singly-and doubly-charged Ar, Kr and Xe ions with N_2 at keV energies
A^{q+} + N_2 -> $A^{(q-1)+}$ + N_2^{+} ($B^2\Sigma u^+$) (A = Ar, Kr, Xe; q = 1,2)
optical spectroscopy
0.03 - 0.2 keV/amu
relative emission cross section

32
83E31 Mayo,M. Stone,J.A. Morgan,T.J.
Phys. Rev. A 28 (1983) 1315-1321
Charge changing cross sections for 1 - 70 keV H^+ and H^0 in collisions with calcium and strontium metal vapors
$H^+(H^0)$ + Ca, Sr -> H^0, H^- (H^+, H^-)
growth
1 - 70 keV/amu

33
83E32 McCullough,R.W. Lennon,M. Wilkie,F.G. Gilbody,H.B.
J. Phys. B 16 (1983) L173-176
State-selective electron capture by N^{2+} ions in atomic hydrogen using collision spectroscopy
N^{2+} + H -> $N^+(2s2p^3)$ $^3P^0$, $^3D^0$ + H^+
energy-loss/-gain
0.57 keV/amu

34
83E33 Mikoushkin,V.M. Ogurtsov,G.N. Flaks,I.P.
J. Phys. B 16 (1983) L405-408
Autoionisation in quasimolecular system formed in multiply charged ion-atoms collisions
He^+, He^{2+}, Ne^{n+}, Ar^{n+} + Xe -> He, He^+, $Ne^{(n-1)+}$, $Ar^{(n-1)+}$ + Xe^{2+} + e (n=1,2,3)
electron emission spectroscopy
1.25 - 7.5 (He^+, He^{2+}), 0.25 - 1.5 (Ne^{n+}), 0.125 - 0.75 (Ar^{n+}) keV/amu

35
83E34 Muller,A. Groh,W. Salzborn,E.
Phys. Rev. Letters 51 (1983) 107-109
Statistical interpretation of transfer ionization in slow collisions of multiply charged ions with atoms
Xe^{q+} + Xe -> $Xe^{(q-i)+}$ + Xe^{k+} + (k-i)e (q=3-15)
statistical model for transfer ionization and multiple-ionization

36
83E35 Neil,P.A. Angel,G.C. Dunn,K.F. Gilbody,H.B.
J. Phys. B 16 (1983) 2185-2190
Charge transfer and ionization in H^+ - C^+ and H^+ - N^+ collisions
H^+ + C^+, N^+ -> H^0 + C^{2+}, N^{2+}
crossed beam technique
65 - 470 keV/amu

37
83E36 Ohtani,S.
Phys. Scripta T3 (1983) 110-114
Recent activities at NICE Nagoya
A^{q+} + He -> $A^{(q-1)+}(n)$ + He^+ (A=C, N, O; q=3-8)
energy gain spectroscopy
1xq/M (keV/amu)
total cross section vs. crossing radius

38
83E37 Okuno,K. Tawara,H. Iwai,T. Kaneko,Y. Kimura,M. Kobayashi,N. Matsumoto,A. Ohtani,S. Takagi,S. Tsurubuchi,S.
Phys. Rev. A 28 (1983) 127-134
Energy-spectroscopic studies of electron-capture processes by low-energy, highly stripped C, N, and O ions from He
C^{4+}, C^{5+}, N^{5+}, N^{6+}, O^{6+} + He -> (single and double) electron transfer
energy-loss/-gain spectroscopy
0.33, 0.66 (C^{4+}); 0.41, 0.82 (C^{5+}); 0.36, 0.72 (N^{5+}); 0.43, 0.86 (N^{6+}); 0.37, 0.74 (O^{6+}) keV/amu
n-distribution; no cross sections

39
83E38 Panov,M.N. Basalaev,A.A. Lozhkin,K.O.
Phys. Scripta T3 (1983) 124-130
Interaction of fully stripped, hydrogenlike and heliumlike C, N, O, Ne and Ar ion with H and He atoms and H_2 molecules
$Ar^{q+}(q=3-7) + He \rightarrow Ar^{(q-1)+}(nl) + He^{+}$
photon emission spectroscopy
0.6 - 8 keV/amu

40
83E39 Peart,B. Rinn,K. Dolder,K.
J. Phys. B 16 (1983) 2831-2835
Measurements of cross sections for inelastic collisions between $^{4}He^{+}$ ions
$He^{+} + He^{+} \rightarrow He^{0} + He^{2+}$; $He^{+} + He^{2+} + e$
crossed beam
7 - 29 keV/amu

41
83E41 Pedersen,E.H. Cocke,C.L. Rasmussen,J.L. Varghese,S.L. Waggoner,W.
J. Phys. B 16 (1983) 1799-1804
Capture of Ar K-shell electrons by protons
$H^{+} + Ar \rightarrow H + Ar^{+}(1s^{-1})$
x-ray coincidence
1500 - 10000 keV/amu
impact parameter dependence

42
83E40 Pedersen,E.H. Cocke,C.L. Stockli,M.
Phys. Rev. Letters 50 (1983) 1910-1913
Experimental observation of the Thomas peak in high velocity electron capture by protons from He
$H^{+} + He \rightarrow H^{0}$
2820 - 7400 keV/amu
angular distributions in Thomas peak

43
83E42 Phaneuf,R.A.
Phys. Rev. A 28 (1983) 1310-1314
Electron capture by slow Fe^{q+} ions from hydrogen atoms and molecules
$Fe^{q+}(q=3-14) + H, H_2 \rightarrow Fe^{(q-1)+}$
growth
0.01 - 0.095 keV/amu
total cross sections

44
83E43 Prior,M.H. Marrus,R. Vane,C.R.
Phys. Rev. A 26 (1983) 141-150
Electron capture by trapped Ne^{q+} ions at very low energies
$Ne^{q+}(q=1-10) + Ne, Xe \rightarrow Ne^{(q-1)+}$
trapping beam technique
$5x10^{-5}$ - $3.5x10^{-3}$ keV/amu
trapped recoil ion

45
83E44 Rudd,M.E. DuBois,R.D. Toburen,L.H. Ratcliffe,C.A. Goffe,T.V.
Phys. Rev. A 28 (1983) 3244-3257
Cross sections for ionization of gases by 5 - 4000 keV protons and for electron capture by 5 - 150 keV protons
$H^{+} + B \rightarrow H^{0}$ (B = He, Ne, Ar, Kr, H_2, N_2, CO, O_2, CH_4, CO_2)
condenser plate method
5 - 150 keV/amu

46
83E45 Sakisaka,M. Hanaki,H. Nagai,N. Horiuchi,T. Konomi,I. Kusakabe,T.
J. Phys. Soc. Japan 52 (1983) 716-717
A statistical model for collisions of multiple electron transfer
$Kr^{q+}(q=2-9) + Kr \rightarrow Kr^{(q-2)+} + Kr^{i+}$ (i=1-5)
0.29 keV/amu
multiple electron transfer

47
83E48 Schlachter,A. Stearns,J.W. Graham,W.G. Berkner,K.H. Pyle,R.V. Tanis,J.A.
Phys. Rev. A 27 (1983) 3372-3374
Electron capture for fast highly charged ions in gas targets;
an empirical scaling rule
300 - 8500 keV/amu
total cross section; scaling law

48
83E46 Schuessler,H.A. Holder,C.H. Sing,O.
Phys. Rev. A 28 (1983) 1817-1820
Orbiting charge transfer cross sections between He^{+} ions and cesium atoms at near-thermal ion-atom energies
$He^{+} + Cs \rightarrow He(1s^2, 1s2s, 1s2p)$
trapped technique
3.9×10^{-5} - 2.4×10^{-4} keV/amu

49
83E55 Shah, M.B. Gilbody, H.B.
J.Phys.B 16 (1983) 4395 - 4403
Crossed-beam coincidence studies of ionization and electron capture in collisions of multiply charged ions with hydrogen atoms.
$Ar^{q+} + H \rightarrow Ar^{(q-1)+} + H^{+}$ (q = 3,4,5,6)
projectile-recoil ion coincidence
3.5 - 100 keV/amu
ionization cross sections also given for C^{q+} (q = 2,3,4,5,6),
O^{q+} (q = 2,3,4,5,6),Ar^{q+} (q = 3,4,5,6,7,8,9) + H
(E = 10 - 400 keV/amu)

50
83E47 Shields,G.C. Moran,T.F.
J. Phys. B 16 (1983) 3591-3601
Single-and double-electron transfer reactions of ground and metastable state Ar^{2+} ions
$Ar^{2+} + B \rightarrow Ar^{+}, Ar^{0}$ (B = O_2, N_2, CO, CO_2, CH_4, C_2H_6)
TOF
0.1 - 0.175 keV/amu
total cross section

51
83E49 Stevens,J. Petersen,R.S. Pollack,E.
Phys. Rev. A 27 (1983) 2396-2402
Electron capture in small-angle Ar^{2+} + Ar collisions
$Ar^{2+} + Ar \rightarrow Ar^{+} (^2P) + Ar^{+}(3s^2 3p^4 nl)$
energy loss/gain spectroscopy
0.0725 keV/amu
scattering angle 0-1; relative cross section

52
83E50 Terasawa,M. Gray,T.J. Hagmann,S. Hall,J. Newcomb,J. Pepmiller,P. Richard,P.
Phys. Rev. A 27 (1983) 2868-2875
Electron capture by and electron excitation of two-electron fluorine ions incident on helium
$F^{7+}(1s2s\ ^3S) + He \rightarrow F^{6+}(1s2s2p\ ^4P)$
x-ray spectroscopy
315 - 2100 keV/amu
total cross section

53
83E51 Winter,H.
J. Phys. B 16 (1983) L521-523
Comments on "radiative decay of lithium-like ions fullowing exchange collisions of 3 keV/amu C^{4+} with H_2"
$C^{4+} + H_2 \rightarrow C^{3+}(nl)$
VUV photon spectroscopy
3 keV/amu

54
83E52 Winter,H.
Phys. Scripta T3 (1983) 159-162
Empirical state-selection rules for electron capture in low energy-ion-atom collisions
Ne^{+}, Ne^{2+}, O^{+} + Li -> Ne(nl), Ne^{+}(nl), O(nl) + Li^{+}
energy-loss/gain spectroscopy
7 - 25 keV/amu

55
83E53 Yan,P.G. van der Woude,R. Dijkkamp,D. de Heer,F.J.
Phys. Scripta T3 (1983) 120-123
Electron capture into excited states in collisions between multiply charged ions and atoms
He^{2+}, C^{q+}, O^{q+}(q=1,2,3) + Li -> He^{+}, $C^{(q-1)+}$, $O^{(q-1)+}$(nl)
C^{q+}, O^{q+} + H_2 -> $C^{(q-1)+}$, $O^{(q-1)+}$(nl)
photon emission spectroscopy
1 - 37.5 keV/amu

1
84E50 de Bruijn,D.P. Neuteboom,J. Sidis,V. Los,J.
Chem. Phys. 85 (1984) 215-231
A detailed experimental study of the dissociative charge exchange of H_2^+ with Ar, Mg, Na and Cs targets at keV energies
$H_2^+ + B \rightarrow H_2^*$ (B = Ar, Mg, Na, Cs)
growth
0.75 - 3.75 keV/amu

2
84E52 Andersen, N. Andersen, T. Jepsen, L. Macek, J.
J. Phys. B 17 (1984) 2281-2294
Electron detachment processes in keV H^-, Li^-, Na^-, K^- - rare gas collisions.
$A^- + He, Ne, Ar \rightarrow A, A^*$ (A = H, Li, Na, K)
growth
0.36 - 100 keV/amu
total detachment cross section

3
84E 1 Andersen,L.H. Frost,M. Hvelplund,P. Knudsen,H. Datz,S.
Phys. Rev. Letters 52 (1984) 518-521
Correlated two-electron effects in highly charged ion-atom collisions; transfer ionization and transfer excitation in 20-MeV Au^{15+} + He collisions
$Au^{15+} + He \rightarrow Au^{14+} + He^+$; $Au^{13+} + He^{2+}$
Electron emission spectroscopy coincidence with final projectile charge state
3939.0 keV/amu

4
84E 2 Anholt,R. Andriamonje,S.A. Morenzoni,E. Stoller,Ch. Molitoris,J.D. Meyerhof,W.E. Borman,H. Xu,J.S. Xu,Z.Z. Rasmussen,J.O. Hoffmann,D.H.
Phys. Rev. Letters 53 (1984) 234-237
Observation of radiative capture in relativistic heavy ion-atom collisions
$A^{q+} + B \rightarrow A^{(q-1)+} + h\nu + B^+$ (q = z, z-1; A = Xe, La, U; B = Be-Ta)
x-ray spectroscopy
10^5 keV/amu
REC cross sections; angular districution

5
84E 3 Astner,G. Barany,A. Cederquist,H. Danared,H. Huldt,S. Hvelplund,P. Johnson,A. Knudsen,H. Liljeby,L. Renfelt,K.G.
J. Phys. B 17 (1984) L877-883
Absolute cross sections for multielectron processes in low-energy Ar^{q+} - Ar collisions as measured with a new technique
$Ar^{q+} + Ar \rightarrow Ar^{r+} + Ar^{2+} + (r+s-q)e$
TOF
0.45xq keV/amu
recoil ions

6
84E 4 Aumayr,F. Fehringer,M. Winter,H.
J. Phys. B 17 (1984) 4201-4211
Inelastic H^+ - Li(2s) collisions (2-20 keV); II. electron capture into H(2p) and H(3l) subshells
H^+ + Li(2s) -> H(2p), H(3s, 3p, 3d)
photon spectroscopy
2 - 20 keV/amu

7
84E 6 Bahring,A. Hertel,I.V. Meyer,E. Schmidt,H.
Phys. Rev. Letters 53 (1984) 1433-1436
Polarization dependence of resonant charge transfer in low energy collisions of Na^+ with laser-excited $Na^*(3p)$
$Na^+ + Na^*(3s, 3p) \rightarrow Na(3s, 3p) + Na^+$
E. photon spectroscopy; T. MO model calculation
0.045 - 0.075 keV/amu
polarization measured

8
84E 5 Baptist,R. Bonnet,J.J. Chauvet,G. Desclaux,J.P. Dousson,S. Hitz,D.
J. Phys. B 17 (1984) L417-421
Polarisation of light emitted after charge transfer from H_2 to C^{4+} ions
$C^{4+} + H_2 \rightarrow C^{3+}(3lm_l) + H_2^+$
photon emission spectroscopy
0.3 - 3 keV/amu

9
84E 7 Berkowitz,K. Zorn,J.C.
Phys. Rev. A 29 (1984) 611-616
Charge transfer into the metastable 2s level of hydrogen by protons colliding with K and Na
$H^+ + K, Na \rightarrow H(2s)$
growth
0.5 - 2.5 keV/amu

10
84E 8 Boellaard,A.
FOM Institute for Atomic and Molecular Physics Report No.58.245
......
Electron capture into He^{2+} - Li collisions at 0.55 - 10.0 keV
$He^{2+} - Li \rightarrow He^+(nl)$
photon spectroscopy
0.138 - 2.5 keV/amu

11
84E 9 Bordenave-Montesquieu,A. Benoit-Cattin,P. Gleizes,A. Marrakchi,A.I. Dousson,S. Hitz,D.
J. Phys. B 17 (1984) L127-131
Autoionisation of $N^{5+}(nln'l')$ with n=2,3,4 and n'>=n measured by electron spectrometry in collisions of N^{7+} with He and H_2, at 4.9 keV amu^{-1}
$N^{7+} + He, H_2 \rightarrow N^{5+}(nln'l') + He^{2+}, H_2^{2+}$ (n=2,3,4; n'>=n)
electron emission spectroscopy
4.9 keV/amu

12
84E10 Bordenave-Montesquieu,A. Benoit-Cattin,P. Gleizes,A. Marrakchi,A.I. Dousoon,S. Hitz,D.
J. Phys. B 17 (1984) L223-227
Two-electron capture into autoionising configurations $N^{4+}(1snln'l')$ with n=2,3,4 and $n' \geq n$, observed by electron spectrometory in collisions of $N^{6+}(1s)$ with He and H_2, at 4.2 $keVamu^{-1}$
$N^{6+} + He, H_2 \rightarrow N^{4+}(1snln'l') + He^{2+}, H_2^{2+}$ (n=2,3,4; n'>=n)
electron emission spectrosocpy
4.2 keV/amu

13
84E12 Brazuk,A. Dijkkamp,D. Drentje,A.G. de Heer,F.J. Winter,H.
J. Phys. B 17 (1984) 2489-2505
Measurement of metastable fractions in multiply charged ion beams by ion excitation in core-conserving electron capture
$C^{2+}, N^{3+}, O^{4+}, N^{2+} + Li \rightarrow C^+, N^{2+}, O^{3+}, N^+ + Li^+$
photon emission spectroscopy
1.665 (C^{2+}), 1.43 (N^{3+}), 1.25 (O^{4+}), 1.43 (N^{2+}) keV/amu

14
84E11 Brazuk,A. Winter,H. Dijkkamp,D. Boellaard,A. de Heer,F.J. Drentje,A.G.
Phys. Lett. 101A (1984) 139-141
Absolute emission cross sections for detection of plasma impurity ions with active neutral lithium beam diagnostics
C^{q+}, O^{q+} + Li -> $C^{(q-1)+}$, $O^{(q'-1)+}$ + Li^{+} (q = 3,4,5,6 ; q'= 4,5,6,7)
photon emission spectroscopy
1.66,2.5 (C^{q+} + Li); 1.25,1.88 (O^{q+} + Li) keV/amu

15
84E13 Dijkkamp,D. Brazuk,A. Drentje,A.G. de Heer,F.J. Winter,H.
J. Phys. B 17 (1984) 4371-4385
Single-electron capture into C^{3+}(n,l) subshells in C^{4+} - Li collisions (20-80 keV)
C^{4+} + Li -> C^{3+}(nl) + Li^{+} (n<=7)
photon emission spectroscopy
0.8 - 6.7 keV/amu

16
84E14 Dmitriev,I.S. Vorobev,N.F. Konovalova,Zh.M. Nikolaev,V.S. Novozhilova,V.N. Teplova,Ya.A. Fainberg,Yu.A.
Sov. Phys. -JETP 57 (1984) 1157-1164
Loss and capture of electrons by fast ions and atoms of helium in various media
He^{2+}; He^{+} + B -> He^{+}, He^{0}; He^{0} (B = He, Ne, N_2, Sr)
E. growth; T. modified OBK
331 - 2070 keV/amu

17
84E15 DuBois,R.D
Phys. Rev. Letters 52 (1984) 2348-2351
Electron production in collisions between light ions and rare gases; The importance of the charge transfer and direct ionization channels
H^{+}, He^{+} + B -> H^{0}, He^{0} + B^{i+} (B = Ne, Ar, Kr)
coincidence between H^{0}, He^{0} and B^{i+} ions
15 - 100 (H); 4 - 25 (He) keV/amu

18
84E16 DuBois,R.D. Giese,J.P. Cocke,C.L.
Phys. Rev. A 29 (1984) 1079-1082
Contribution of electron capture to 2p-vacancy production in p-Mg collisions
H^{+} + Mg(2p) -> H^{0} + Mg($2p^{-1}$); H + Mg($2p^{-1}$)
growth
25 - 80 keV/amu

19
84E53 Friedrich, B. Herman, Z.
Chem. Phys. Letters 107 (1984) 375-380
Dynamics of low energy charge transfer processes :
Ar^{2+} + He -> Ar^{+} + He^{+} at eV collision energies.
Ar^{2+}(^{3}P,^{1}D) + He -> Ar^{+}
crossed beam technique
1.25×10^{-5} - 4×10^{-5} keV/amu
relative cross sections only. different angular distributions for ^{3}P and ^{1}D states

20
84E17 Gould,H. Greiner,D. Lindstrom,P. Symons,T.J.M. Crawford,H.
Phys. Rev. Letters 52 (1984) 180-183
Electron capture by U^{91+} and U^{92+} and ionization of U^{90+} and U^{91+}
U^{91+}, U^{92+} + B -> U^{90+}, U^{91+} (B = C, Cu, Ta)
growth method
4×10^{5} - 9.6×10^{5} keV/amu

21
84E18 Graham,W.G. Berkner,K.H. Pyle,R.V. Schlachter,A.S. Stearns,J.W. Tanis,J.A.
Phys. Rev. A 30 (1984) 722-728
Charge transfer cross sections for multiply charge ions colliding with gaseous targets at energies from 310 keV/amu to 8.5 MeV/amu
$A^{q+} + B \rightarrow A^{(q-1)+}, A^{(q-2)+}, A^{(q+1)+}$ (A = C, Ar, Fe, Nb, Pb; q = 6-59; B = H_2, He, N_2, Ne, Ar, Xe)
growth
310- 8500 keV/amu
total cross section

22
84E30 Hanaki,H. Kusakabe,T. Horiuchi,T. Konomi,I. Nagai,N. Yamaguchi,T. Sakisaka,M.
Mem. Fac. Eng. Kyoto Univ. 46 (1984) 1-17
Charge transfer cross sections for multiply charged slow Ne, Ar, Kr and Xe ions on various gas targets II. molecular gas targets
$A^{q+} + B \rightarrow A^{(q-k)+} + B^{k+}$ (A = Ne, Ar, Kr, Xe; q = 2-11; B = H_2, N_2, CO_2, CH_4, C_2H_6, C_3H_8; k = 1-5)
growth
0.15 - 3 keV/amu

23
84E54 Havener, C.C. Rouze, N. Westerveld, W.B. Risley, J.S.
Phys. Rev. Letters 53 (1984) 1049-1052
Experimental determination of the current density of the H(n=3) state produced in electron-transfer collisions of H^+ on He.
H^+ - He -> H(n=3)
Balmer-alpha line as a function of transverse electric field
40 - 80 keV/amu
current distribution of H(n=3)

24
84E19 Heckman,V. Martin,S.J. Jakacky,J. Pollack,E.
Phys. Rev. A 30 (1984) 2261-2263
Electron capture in $H^+ + H_2$
$H^+ + H_2 \rightarrow H(1s) + H_2^+(^2\Sigma g^+)$
TOF method
1 - 3 keV/amu
probability as a function of scattered angle

25
84E20 Howald,A.M. Miers,R.E. Allen,J.S. Anderson,L.W. Lin,C.C.
Phys. Rev. A 29 (1984) 1083-1087
Charge-changing cross sections for 1 - 25 keV H(1s) incident on a Na-vapor target
H(1s) + Na -> H^+, H^-
growth
1 - 25 keV/amu
total cross section

26
84E21 Huber,B.A. Kahlert,H.J.
J. Phys. B 17 (1984) L69-74
On the importance of metastable $Ne^{2+}(^1D_2)$ ions in charge-changing Ne^{2+} - Xe collisions
$Ne^{2+} + Xe \rightarrow Ne^+ + Xe^+;\ Ne^+ + Xe^{2+} + e^-$
energy-loss/-gain spectroscopy
2×10^{-2}, 5×10^{-2} keV/amu

27
84E22 Huber,B.A. Kahlert,H.J. Wiesemann,K.
J. Phys. B 17 (1984) 2883-2895
Study of electron capture reactions by means of double translational spectroscopy
Ar^{3+}, Ar^{3+*} + Ar -> Ar^{2+*} + Ar^{+}
double translational spectroscopy
0.015 keV/amu

28
84E23 Iwai,T. Kaneko,Y. Kimura,M. Kobayashi,N. Matsumoto,A. Ohtani,S. Okuno,K. Takagi,S. Tawara,H. Tsurubuchi,S.
J. Phys. B 17 (1984) L95-99
The dependence on Rc of cross sections for one-electron capture by S^{11+}, S^{13+} and Kr^{q+}(q=7-25) ions from He
S^{11+}, S^{13+}, Kr^{q+}(q=7-25) + He -> S^{10+}, S^{12+}, $Kr^{(q-1)+}$ + He^{+} + ΔE
translational energy spectroscopy
1xq/M keV/amu
total cross sections vs. crossing radius

29
84E24 Jolly,A. Wohrer,K. Chetioui,A. Rozet,J.P. Stephan,C. Dube,L.J.
J. Phys. B 17 (1984) 235-242
Total charge transfer cross sections for 400 MeV bare Fe^{26+} ions colliding with He, N_2, Ne and Ar targets
Fe^{26+} + He, N_2, Ne, Ar -> Fe^{25+}
Lyman x-rays
7140 keV/amu
total cross section

30
84E25 Justiniano,E. Cocke,C.L. Gray,T.J. DuBois,R. Can,C. Waggoner,W. Schuch,R. Schmidt-Bocking,H. Ingwersen,H.
Phys. Rev. A 29 (1984) 1088-1095
Total cross sections for electron capture and tranfer ionization by highly stripped, slow Ne, Ar, Kr and Xe projectiles on helium
Ne^{q+}, Ar^{q+}, Kr^{q+}, Xe^{q+} + He -> $Ne^{(q-i)+}$, $Ar^{(q-i)+}$, $Kr^{(q-i)+}$, $Xe^{(q-i)+}$ (i= 1-2)
(0.25 - 1.0)xq/M keV/amu
recoil ion sources; total cross sections

31
84E26 Kamber,E.Y. Brenton,A.G. Beynon,J.H.
J. Phys. B 17 (1984) 4919-4933
Single electron capture collisions of ground and metastable N^{2+*} ions with atomic and molecular gases
N^{2+}, N^{2+*} + He, Ne, Ar, Kr, Xe, H_2, N_2 -> Ne^{+}
translational energy spectroscopy
0.43 keV/amu
no cross sections given

32
84E27 Kamber,E.Y. Hasted,J.B.
Vacuum 34 (1984) 63-65
Energy loss spectra for single electron capture in Ar^{3+} - He collisions
Ar^{3+} - He -> Ar^{2+} + H^{+} + ΔE
energy loss spectroscopy
0.03 keV/amu
no cross section

33
84E28 Kase,M. Kikuchi,A. Yagishita,A. Nakai,Y.
J. Phys. B 17 (1984) 671-677
Single-and double-electron capture cross sections for Ne^{+} in He, Ne and Ar
Ne^{2+} + He, Ne, Ar -> Ne^{+}, Ne^{0}
growth
25 - 150 keV/amu
total cross section

34
84E29 Katayama,I. Berg,G.P.A. Hulimann,W. Martin,S.A. Meissburger,I.
Aelert,W. Rogge,M. Romer,J.G.M. Rain,J.L. Zemlo,L. Gaul,G.
J. Phys. B 17 (1984) L23-28
High energy electron capture and stripping in gas targets
$^{3}He^{2+}$ + N_2, Ne, Ar -> He
attenuation method
$2x10^{4}$ - $4x10^{4}$ keV/amu

35
84E49 Kheyrandish,H. Armour,D.G. Jones,E.J.
Vacuum 34 (1984) 269-273
The measurement of charge transfer cross sections for a variety of ions on air and argon
A^{+} + B -> A (A = Sb, As, In, P, N_2, O_2, N, O, Ge, Cr, Fe; B = air, Ar)
growth
0.08 - 2.9 keV/amu

36
84E31 McCullough,R.W. Wilkie,F.G. Gilbody,H.B.
J. Phys. B 17 (1984) 1373-1382
State-selective electron capture by slow C^{2+} and C^{3+} ions in atomic hydrogen
C^{2+} + H -> C^{+} + H^{+}
C^{3+} + H -> $C^{2+}((2s3s)^{3}S$, $(2s3p)^{3}P^{0}$, $(2p)^{2}\,^{1}S$, $(2p)^{2}\,^{1}D)$ + H^{+}
energy-loss/gain spectroscopy
$5x10^{-2}$ - 1.5 keV/amu

37
84E32 Newcomb,J. Dillingham,T.R. Hall,J. Varghese,S.L. Pepmiller,P.L. Richard,P.
Phys. Rev. A 29 (1984) 82-91
Electron capture by metastable projectiles on He and Ne
$F^{7+}(1s2s\ ^{3}S)$ + He, Ne -> F^{6+}
Auger electron
315 - 789 keV/amu

38
84E33 Nielsen,E.H. Andersen,L.H. Barany,A. Cederquist,H. Hvelplund,P.
Knudsen,H. MacAdam,K.B. Sorensen,J.
J. Phys. B 17 (1984) L139-144
Energy-gain spectroscopy measurements of single-electron capture by Ar^{6+} in Ne and Ar
Ar^{6+} + Ne, Ar -> $Ar^{5+}(nl)$
energy-gain spectroscopy
0.0025 - 0.025 keV/amu
total and partial cross section

39
84E34 Nikulin,V.K. Dijkkamp,D. Gordeev,Yu.S. Samoylov,A.V. de Heer,F.J.
J. Phys. B 17 (1984) L721-725
Electron capture into excited projectile states in 6 - 100 keV Ne^{4+} - Ne collisions
Ne^{4+} + Ne -> $Ne^{3+}(2p^{2}$, nl); $Ne^{2+}(2p^{2}$, $nl^{2})$
0.25 - 6.25 keV/amu

40
84E35 Ohtani,S.
Electronic and Atomic Collisions (eds. Eichler.J. Hertel,I.V. Stolterfoht,N. (North-Holland, Amsterdam)) ...... (1984) ......
One-electron capture by highly stripped ions from helium atoms
C^{q+}, N^{q+}, O^{q+} + He -> $C^{(q-1)+}$, $N^{(q-1)+}$, $O^{(q-1)+}$ + He^{+}
energy-loss/-gain

41
84E36 Peterson,J.R. Bae,Y.K.
Phys. Rev. A 30 (1984) 2807-2810
Product states of H_3^+, H_2^+ and O_2^+ electron capture in Cs
D_2^+; D_3^+; O_2^+ + Cs -> dissociative charge transfer
energy analysis
0.3 keV/amu

42
84E37 Roncin,P. Barat,M. Laurent,H. Pommier,J. Dousson,S. Hitz,D.
J. Phys. B 17 (1984) L521-525
Transfer ionization and two-electron capture processes in N^{6+} - He collisions at 3 - 34 keV energies
Ne^{6+} + He -> Ne^{5+} (n=3,4)
energy-gain spectroscopy
0.1 keV/amu
angular dependence of energy-gain spectra; contribution of two-electron capture and transfer ionization

43
84E38 Schmeissner,C. Cocke,C.L. Mann,R. Meyerhof,W.
Phys. Rev. A 30 (1984) 1661-1671
Energy-gain spectroscopy studies of electron capture from helium by slow multiply charged neon ions
Ne^{q+} + He -> $Ne^{(q-1)+}$ (q= 3-8)
energy-loss/-gain
$3.5x10^{-3}$ - $2.6x10^{-2}$ keV/amu

44
84E39 Sorensen,J. Andersen,L.H. Hvelplund,P. Knudsen,H. Liljeby,L. Nielsen,E.H.
J. Phys. B 17 (1984) 4743-4756
Cross sections σ(nl) for electron capture collisions between medium velocity, highly charged ions and molecular hydrogen
Au^{q+} + H_2 -> $Au^{(q-1)+}$(nl) + H_2^+ (q= 12-18)
photon emission spectroscopy
100 keV/amu

45
84E40 Szucs,S. Karemera,M. Terao,M. Brouillard,F.
J. Phys. B 17 (1984) 1613-1622
Experimental study of the mutual neutralization of H^+ and H^- between 5 and 2000 eV
H^+ + H^- -> H + H
merging beam technique
$5x10^{-3}$ - 2 keV/amu

46
84E41 Tanis,J.A. Bernstein,E.M. Graham,W.G. Stockli,M.D. Clark,M. McFarland,R.H. Morgan,T.J. Berkner,K.H. Schlachter,A.S. Stearns,J.W.
Phys. Rev. Letters 53 (1984) 2551-2554
Resonant electron transfer and excitation in two- three- and four electron Ca^{q+} and V^{q+} ions colliding with helium
Ca^{q+}(q= 16-18), V^{q+}(q= 19-21) + He -> $Ca^{(q-1)+}$, $C^{(q-1)+}$
RTE
2500 - 9000 (Ca), 3530 - 9000 (V) keV/amu

47

84E51 Tanis,J.A. Bernstein,E.M. Stockli,M.P. Graham,W.G. Berkner,K.H. Markevich,D.J. McFarland,R.H. Pyle,R.V. Stearns,J.W. Willis,J.E.
Phys. Rev. A 29 (1984) 2232
Correlations between charge-changing interactions and projectile Kα-x-ray emission in Ar + Xe collisions
Ar^{q+} + Xe -> $Ar^{(q-1)+}$ (q=15, 16, 17)
coincidence between x-rays and projectiles
4000 - 4500 keV/amu

48

84E42 Tawara,H. Iwai,T. Kaneko,Y. Kimura,M. Kobayashi,N. Matsumoto,A. Ohtani,K. Takagi,S. Tsurubuchi,S.
Phys. Rev. A 29 (1984) 1529-1532
Energy-spectroscopy studies of electron-capture processes of low-energy, highly stripped F and Ne ions in collisions
F^{q+} + He -> $F^{(q-1)+}$ + He^{+}(q=6,7;8); Ne^{q+} + He -> $Ne^{(q-1)+}$ + He^{+} (q=7,8,9)
energy-loss/gain spectroscopy
1xq/M keV/amu

49

84E43 Varghese,S.L. Waggoner,W. Cocke,C.L.
Phys. Rev. A 29 (1984) 2453-2456
Electron capture from lithium by protons and helium ions
H^{+}, He^{+}, He^{2+} + Li -> H^{0}, He^{0}, He^{+}
growth
0.257 - 3.85 (H), 0.06 - 2 (He) keV/amu

50

84E44 Waggoner,W. Cocke,C.L. Varghese,S.L. Stockli,M.
Phys. Rev. A 29 (1984) 2457-2462
Experimental cross sections for electron capture from lithium by slow, highly charged, rare-gas projectiles
Ne^{q+}, Ar^{q+}, Kr^{q+}, Xe^{q+} + Li -> $Ne^{(q-1)+}$, $Ar^{(q-1)+}$, $Kr^{(q-1)+}$, $Xe^{(q-1)+}$ (q= 2-10)
Li-oven
(0.1 - 1.0)xq/M keV/amu

51

84E45 Watts,M.F. Angel,G.C. Dunn,K.F. Gilbody,H.B.
J. Phys. B 17 (1984) 1631-1635
Charge transfer and ionization in collisions between Li^{+} ions
Li^{+} + Li^{+} -> Li^{+} + Li^{2+} + e; Li^{0} + Li^{2+}
crossed beam technique
0.053 - 0.24 keV/amu

52

84E46 Williams,I.D. Geddes,J. Gilbody,H.B.
J. Phys. B 17 (1984) 1547-1558
Electron capture, loss and excitation in collisions of H^{+}, H(1s), H(2s) and H^{-} in atomic oxygen
H^{+} + B -> H^{0} (total, 2s); H(1s) + B -> H^{+}, H^{0}(2s), H^{-};
H(2s) + B -> H^{+}, H^{-} (B = O, O_2)
growth
2.5 - 25 keV/amu
Ir tube furnace

53

84E47 Wohrer,K. Chetioui,A. Rozet,J.P. Jolly,A. Stephan,C.
J. Phys. B 17 (1984) 1575-1587
K-K transfer cross sections in near-symmetric Fe^{26+} ion-atom collisions at intermediate velocity
Fe^{26+} + B -> Fe^{25+}(1s) + B($1s^{-1}$) (B = Ar, Kr, Zr, Ag, Sn)
x-ray spectroscopy
7142 keV/amu

54

84E48 Woods,C.J. Sofield,C.J. Cowern,N.E.B. Murrell,M. Draper,J.

J. Phys. B 17 (1984) 867-878

Comparison of charge-changing cross sections in gaseous and solid targets

C^{q+} + B -> $C^{(q\pm i)+}$ (q= 4-6; i= 1,2; B= carbon foil, CH_4, C_2H_6, C_2H_4, C_2H_2)

growth

3000 keV/amu

1
85E67 van Wijngaarden,A. Patel,J. Becker,K. Drake,G.W.F.
Phys. Rev. A 32 (1985) 2150-2157
Charge-exchange processes of hydrogen ions with Hg atoms at keV energies
$H^+ + Hg \rightarrow H^0$; $H^- + Hg \rightarrow H^0$
growth
23.8 - 134.2 keV/amu

2
85E 6 Alvarez,I. Cisneros,C. Morales,A. Morgan,T.J.
Phys. Letters 109A (1985) 268-270
H^- formation in H^0 + Mg collisions
$H^0 + Mg \rightarrow H^-$
growth
1.0 - 5.0 keV/amu

3
85E 1 Andrews,M.C. McDaniel,F.D. Duggan,J.L. Miller,P.D. Pepmiller,P.L.
Krause,H.F. Rosseel,T.M. Rayburn,L.A. Mehta,R. Lapicki,G.
Nucl. Instr. Meth. in Phys. Res. B 10/11 (1985) 186-189
M-shell electron capture and direct ionization of gold by 25 MeV carbon and 32 MeV oxygen ions
$C^{6+}, O^{8+} + Au \rightarrow C^{5+}, O^{7+} + Au^+ (3l^{-1})$
x-ray coincidence
2000 keV/amu

4
85E 2 Andriamonje,S. Chemin,J.F. Rofurier,J. Saboya,B. Schenrer,J.N.
Belkic,Dz. Gayet,R. Solin,A. Laurent,H. Schapira,J.P.
J. Physique 46 (1985) 349-353
Electron capture from the krypton M-shell by MeV protons
$H^+ + Kr \rightarrow H^0(1s) + Kr^+(3l^{-1})$
E. x-ray coincidence; T. CDW
2000 - 3000 keV/amu

5
85E 4 Aumayr,F. Lakits,G. Husinsky,W. Winter,H.
J. Phys. B 18 (1985) 2493-2501
Inelastic H^+ - Li(2s) collisions (2-20 keV); III. electron capture into the H(2s) subshell
$H^+ + Li(2s) \rightarrow H(2s)$
photon spectroscopy
2 - 20 keV/amu

6
85E 3 Aumayr,F. Winter,H.
Phys. Rev. A 31 (1985) 67-71
Total single-electron capture cross sections for impact of H^+, H_2^+, He^+, and Ne^+ (2-20 keV) on Li
$A^+ + Li(2s) \rightarrow A^0$ (A = H, H_2, He, Ne)
growth
2 - 20 (H) keV/amu; 0.1 - 1 keV/amu
total cross section

7
85E 5 Aumayr,F. Winter,H.
J. Phys. B 18 (1985) L741-746
Excitation by impact of He^+ (2-20 keV) on Li(2s)
$He^+ + Li(2s) \rightarrow$ He(total, 2p, 3p)
photon spectroscopy
0.5 - 5 keV/amu

8
85E 7 Bae,Y.K. Coggiola,M.J. Peterson,J.R.
Phys. Rev. A 31 (1985) 3627-3632
Charge transfer of 50 eV - 4 keV H^+, H_2^+, H_3^+, N^+ and N_2^+ in Cs; absolute cross sections
$A^+ + Cs \rightarrow A^0$ (A = H, H_2, H_3, N, N_2)
attenuation method
0.05 - 4 keV/amu (H); 0.025 - 0.28 keV/amu
attenuation cross sections dominated by single electron capture

9
85E 9 Baltayan, P. Pebay-Peyroula, J.C. Sadeghi, N.
J.Phys.B 18 (1985) 3615 - 3628
Determination of the rate constants for population of the individual Cd^{+*} levels in thermal Penning and charge transfer reactions of $He^*(2^3S_1)$ and He^+ with cadmium.
$He^+ + Cd \rightarrow He + Cd^{+*}(j)$
flowing-afterglow method
cross sections and rate coefficients at thermal energies

10
85E 8 Barany,A. Astner,G. Cederquist,H. Danard,H. Huldt,S. Hvelplund,P. Johnson,A. Knudsen,H. Liljeby,L. Rensfelt,K.G.
Nucl. Instr. Meth. in Phys. Res. B 9 (1985) 397-399
Absolute cross sections for multi-electron processes in low energy Ar^{q+} - Ar collisions; comparison with theory
$Ar^{q+} + Ar \rightarrow Ar^{(q-k)+} + Ar^{(k+n)+}$ (q= 4-8; k= 1-5; n= 0-3)
coincidence technique
0.045xq keV/amu

11
85E10 Bliman,S. Bonnet,J.J. Bordenave-Montesquieu,A. Dousson,S. Druetta,M. Hitz,D. Mayo,M.
Nucl. Instr. Meth. in Phys. Res. B 9 (1985) 371-376
Radiative decay following low energy charge exchange collisions at the AGRIPPA facility
Ne^{8+}, O^{8+}, Al^{8+} + H_2, -> $Ne^{7+}(nl)$, $O^{7+}(nl)$, $Al^{7+}(nl)$
x-ray, VUV photon spectroscopy
1.56 - 3.84 keV/amu
grazing incidence spectrometer; cystal spectrometer

12
85E11 Bonnet,J.J. Fleury,A.F. Bonnefoy,M. Politis,M.F. Chassevent,M. Bliman,S. Dousson,S. Hitz,D.
J. Phys. B 18 (1985) L23-27
Electron capture into different (nl) states in slow collisions of Ne^{8+} projectiles on He and H_2 targets
Ne^{8+} + He, H_2 -> $Ne^{7+}(nl)$ + He^+, H_2^+
photon emission spectroscopy
1 - 4 keV/amu

13
85E13 Bordenave-Montesquieu,A. Benoit-Cattin,P. Gleizes,A. Marrakchi,A.I. Dousson,S. Hitz,D.
Nucl. Instr. Meth. in Phys. Res. B 9 (1985) 389-391
Experimental cross sections for two-electron capture into nitrogen autoionising states in N^{q+}(q=6,7) on He and H_2 collisions at 10.5 q keV
$N^{6+,7+}$ + H_2, He -> $N^{4+,5+}$ (nl, n'l'), n=2,3,4
electron spectroscopy
0.75xq keV/amu

14
85E12 Bordenave-Montesquieu,A. Boenoit-Cattin,P. Gleizes,A. Dousson,S. Hitz,D.
J. Phys. B 18 (1985) L195-199
One-electron capture into Li-like autoionizing N^{4+}(1s2ln'l')
configurations by metastable N^{5+}(1s2s ^3S) multicharged ions in collisions
with He and H_2, observed by electron spectroscopy at 3.4 keV/amu
N^{5+} + He, H_2 -> N^{4+} (1s2ln'l')
electron spectroscopy
3.42 keV/amu

15
85E14 Brazuk,A. Winter,H. Dijkkamp,D. de Heer,F.J. Drentje,A.G.
Nucl. Instr. Meth. in Phys. Res. B 9 (1985) 442-447
Subshell-selective electron capture from lithium by slow multiply
charged ions
C^{4+} + Li(2s) -> C^{4+} (n,l)
1.67 - 6.67 keV/amu

16
85E15 Can,C. Gray,T.J. Varghese,S.L. Hall,J.M. Tunnel,L.N.
Phys. Rev. A 31 (1985) 72-83
Electron-capture cross sections for low-energy highly charged neon and
argon ions from molecular and atomic hydrogen
Ne^{q+}(q=2-7), Ar^{q+}(q=2-10) + H, H_2 -> $Ne^{(q-1)+}$, $Ar^{(q-1)+}$
H-oven
(0.4 - 1.25)xq/M keV/amu

17
85E16 Cederquist,H. Andersen,L.H. Barany,A. Hvelplund,P. Knudsen,H.
Nielsen,E.H. Pedersen,J.O.K. Sorensen,J.
J. Phys. B 18 (1985) 3951-3969
State-selective single- and double-electron capture processes in slow
C^{4+} + He, Ne, Ar and Xe collisions
C^{4+} + Ne, Ar, Xe -> C^{3+} + Ne^+, Ar^+, Xe^+
C^{4+} + He, Ne -> C^{2+} + He^{2+}, Ne^{2+}
energy-loss/-gain
0.0416 keV/amu

18
85E17 Chetioui,A. Rozet,J.P. Vernhet,D. Wohrer,K. Bouisset,P. Tonati,A. Stephan,C.
Nucl. Instr. Meth. in Phys. Res. A 240 (1985) 488-491
Charge exchange process with low energy multicharged ions;
n,l populations
Al^{12+} + He, H_2 -> Al^{11+} (n,l)
photon spectroscopy
10xq/27 (keV/amu)
Lyman spectra obsrved; Si(Li) used; relative intensities

19
85E18 Chetioui,A. Wohrer,K. Rozet,J.P. Vernhet,D. Stephan,C.
Nucl. Instr. Meth. in Phys. Res. B 10/11 (1985) 134-137
High velocity capture process in excited states of multicharged ions
Ar^{18+} + N_2 -> Ar^{17+}(np); Fe^{26+} + He, N_2 -> Fe^{25+} (np)
6250 keV/amu (Ar); 7140 keV/amu (Fe)
n-distribution

20
85E20 Ciric,D. Brazuk,A. Dijkkamp,D. de Heer,F.J. Winter,H.
J. Phys. B 18 (1985) 3629-3639
State-selective electron capture in C^{3+} - H, H_2 collisions
(0.7 - 4.6 keVamu^{-1}) studied by photon spectroscopy
C^{3+} + H, H_2 -> C^{2+} + H^+, H_2^+
photon emission spectroscopy
0.7 - 4.6 keV/amu

21
85E19 Ciric,D. Dijkkamp,D. Vlieg,E. de Heer,F.J.
J. Phys. B 18 (1985) L17-22
Subshell-selective electron capture cross sections in collisions of
He^{2+} and C^{4+} with atomic hydrogen
C^{4+} + H -> C^{3+}(nl) + H^{+} (n=3,4); He^{2+} + H -> He^{+}(2p) + H^{+}
photon emission spectroscopy
1 - 7 (C^{4+}-H), 1 - 10 (He^{2+}-H) keV/amu

22
85E21 Ciric,D. Dijkkamp,D. Vlieg,E. de Heer,F.J.
J. Phys. B 18 (1985) 4745-4762
Selective electron capture into He II (n,l) subshells in collisions of
He^{2+} with atomic and molecular hydrogen
He^{2+} + H, H_2 -> H^{+} (n,l)
photon spectroscopy
1.25 - 10 keV/amu

23
85E22 Clark,M. Brandt,D. Swenson,J.K. Shafroth,S.M.
Phys. Rev. Letters 54 (1985) 544-546
Non-resonant electron transfer and projectile K-electron excitation in
ion-atom collisions
Si^{11+} + He -> Si^{10+}
growth
469 - 2940 keV/amu

24
85E71 Clark,M. Shafroth,S.M.
Nucl Instr. Meth. in Phys. Res. B 10/11 (1985) 124-127
Resonant transfer and excitation(RTE) and non-resonant transfer and
excitation(NTE) in Si^{11+} on He collisions
Si^{11+} + He -> Si^{10+}
coincidence with x-ray and charge changed projectile
535 - 3571 keV/amu

25
85E23 Coggiola,M.J. Bae,Y.K. Peterson,J.R.
Phys. Rev. A 32 (1985) 784-788
Single-electron-capture cross sections for 1-10 keV Li^{+} ions in
alkaline-earth vapors
Li^{+} + Mg, Ca, Sr, Ba -> Li^{0}
attenuation method
0.14 - 1.4 keV/amu
total cross section

26
85E24 Cotte,P.H. Druetta,M. Martin,S. Denis,A. Desesquelles,J. Hitz,D. Dousson,S.
Nucl. Instr. Meth. in Phys. Res. B 9 (1985) 743-46
UV spectroscopy of charge exchange collisions between N^{5+} ions and H_2, He
N^{5+} + H^{2}, He -> N^{4+} ($1s^{2}$nl)
UV spectroscopy
0.8 - 3.57 keV/amu

27
85E28 Dijkkamp,D. Boellaard,A. de Heer,F.J.
Nucl. Instr. Meth. in Phys. Res. B 9 (1985) 377-381
Single electron capture in slow He^{2+} - Li collisions
He^{2+} - Li -> He^{+} (n,l)
VUV spectroscopy
0.55 - 10 keV/amu

28
85E25 Dijkkamp,D. Ciric,D. de Heer,F.J.
Phys. Rev. Letters 54 (1985) 1004-1007
Total capture and line-emission cross sections for C^{6+}, N^{7+}, O^{8+} - H collisions in the energy range
C^{6+}, N^{7+}, O^{8+} - H -> C^{5+}(nl), N^{6+}(nl), O^{7+}(nl)
VUV spectroscopy
3 - 7.5 keV/amu

29
85E29 Dijkkamp,D. Ciric,D. de Heer,F.J. Vlieg,E.
Nucl. Instr. Meth. in Phys. Res. B 9 (1985) 403-407
(n,l)-subshell electron capture cross sections in collisions of C^{4+}, N^{5+} and O^{6+} with atomic hydrogen
C^{4+}, N^{5+}, O^{6+} + H -> C^{3+}(n,l), N^{4+}(n,l), O^{5+}(n,l)
VUV spectroscopy
1 - 7 keV/amu

30
85E27 Dijkkamp,D. Ciric,D. Vlieg,E. de Boer,A. de Heer,F.J.
J. Phys. B 18 (1985) 4763-4793
Subshell-selective electron capture in collisions of C^{4+}, N^{5+}, O^{6+} with H, H_2 and He
C^{4+}, N^{5+}, O^{6+} + B -> C^{3+}, N^{4+}, O^{5+} (nl)
photon spectroscopy
0.5 - 12 keV/amu

31
85E26 Dijkkamp,D. Gordeev,Yu.S. Brazuk,A. Drentje,A.G. de Heer,F.J.
J. Phys. B 18 (1985) 737-756
Selective single-electron capture into (n,l) subshells in slow collisions of C^{6+}, N^{6+}, O^{6+} and Ne^{6+} with He, H_2, and Ar
C^{6+}, N^{6+}, O^{6+}, Ne^{6+} + He -> C^{5+}(nl), N^{5+}(nl), O^{6+}(nl), Ne^{5+}(nl) + He^{+}
C^{6+}, N^{6+}, O^{6+} + H_2 -> C^{5+}(nl), N^{5+}(nl), O^{5+}(nl) + H_2^{+}
O^{6+} + Ar -> O^{5+}(nl) + Ar^{+}
photon emission spectoscopy
0.56 - 6.25 keV/amu

32
85E31 Druetta,M. Mayo,M. Bliman,S. Martin,S. Hitz,D. Dousson,S. Deresquelles,J.
J. de Phys. Letters 46 (1985) L869-873
Etude spectroscopique de la collision d'echange de charge entre Ne^{8+} et He
Ne^{8+} + He -> Ne^{7+}, Ne^{6+}
VUV spectrometer
2.4 - 4 keV/amu
emission cross section

33
85E30 Druetta,M. Mayo,M. Cotte,P.H. Martin,S. Dousson,S. Hitz,D. Tran Cong,K.
Phys. Letters 108A (1985) 338-339
Asolute cross sections for electron capture into (n,l) subshells of N VI by VUV spectroscopic study of the N^{6+} - He collision
N^{6+} + He -> N^{5+} (n,l)
VUV spectrometer
4.2 keV/amu

34
85E33 DuBois,R.D.
Phys. Rev. A 32 (1985) 3319-3323
Charge transfer and ionization of lithium by protons and helium ions
H^{+}, He^{2+}, He^{+} + Li -> H^{0}, He^{+}, He^{0}
growth
15 - 200 keV/amu
differentials in Li charge states

35
85E32 DuBois,R.D. Toburen,L.H.
Phys. Rev. A 31 (1985) 3603-3611
Electron capture by protons and helium ions from lithium, sodium and magnesium
H^+, He^+ + B -> H^0, He^0; He^{2+} + B -> He^+, He^0 (B = Li, Na, Mg)
growth
2 - 100 keV/amu (H); 1.3 - 66.7 keV/amu (He)

36
85E34 Graham,W.G. Berkner,K.H. Bernstein,E.M. Clark,M. McFarland,R.H. Morgan,T.J. Schlachter,A.S. Stearns,J.W. Stockli,M.P. Tanis,J.A.
J. Phys. B 18 (1985) 2503-2508
Charge state dependence of single electron capture and loss cross sections for highly stripped V ions in He at 8.55 MeV/amu
V^{q+}(q=18-23) + He -> $V^{(q-1)+}$
growth
8550 keV/amu
total cross sections

37
85E35 Hall,J. Richard,P. Pepmiller,P.L. Gregory,D.C. Miller,P.D. Moak,C.D. Jones,C.M. Alton,G.D. Bridwell,L.B. Sofield,C.J.
Phys. Rev. A 33 (1985) 914-920
Energy systematics of single-and double- K-shell vacancy production in titanium bombarded by chlorine ions
Cl^{q+} + Ti -> $Cl^{(q-1)+}$, $Cl^{(q-2)+}$ + $Ti^+(1s^{-1})$, $Ti^{2+}(1s^{-2})$
x-ray spectroscopy
7 - 15 $\times 10^3$ keV/amu

38
85E36 Hippler,R. Faust,M. Wolf,R. Kleinpoppen,H. Lutz,H.O.
Phys. Rev. A 31 (1985) 1399-1404
Polarization studies of H(2p) charge-exchange excitation; H^+ + Ar collisions
H^+ + Ar -> H(2p) + Ar^+
linear and circular polarizar
1.5 - 3 keV
polarization at scattering angle of 0.5 - 3.5

39
85E37 Huber,B.A. Kahlert,H.J.
J. Phys. B 18 (1985) 491-498
Vibrational excitation of H_2^+ in electron capture collsions of Xe^{2+} and Ar^{3+} with H_2
Xe^{2+} + H_2 -> Xe^+ + $H_2^+(\nu)$; Ar^{3+} + H_2 -> Ar^{2+}(nl) + $H_2^+(\nu)$
energy-gain/-loss
4.6×10^{-5}, 2.3×10^{-4} (Xe^{2+}); 1.5×10^{-1}, 0.75 (Ar^{3+}) keV/amu

40
85E38 Hvelplund,P. Andersen,L.H. Barany,A. Cederquist,H. Heinemeier,J. Knudsen,H. Macadam,K.B. Nielsen,E.H. Sorensen,J.
Nucl. Instr. Meth. in Phys. Res. B 9 (1985) 421-425
Energy-gain spectroscopy studies of state-selective electron capture for multiply charged Ar recoil ions; comparison with the extended classical barrier model
Ar^{q+} (q=6-10) + Ne, Ar, Xe -> $Ar^{(q-1)+}$(nl)
energy gain spectroscopy-energy defect
0.025 keV/amu

41
85E39 Jellen-Wutte,U. Schweinzer,J. Vanek,W. Winter,H.
J. Phys. B 18 (1985) L779-785
Scattering-angle-dependent translational energy spectroscopy for electron capture by double charged ions
Ar^{2+}, Kr^{2+}, Xe^{2+} + He, Ne, Ar -> Ar^{+}, Kr^{+}, Xe^{+}
translational energy spectroscopy
identification of various reaction channel

42
85E40 Jones,M.L. Doughty,B.M. Dillingham,T.R. Jones,T.A.
Nucl. Instr. Meth. in Phys. Res. B 10/11 (1985) 142-145
Electron capture by 20 - 150 keV protons on hydrogen gases
H^{+} + CO, CH_4, C_2H_6, C_3H_8 -> H^{0}
growth
20 - 150 keV/amu

43
85E42 Kamber,E.Y. Brenton,A.G. Beynon,J.H. Hasted,J.B.
J. Phys. B 18 (1985) 933-941
Single-electron capture spectra for collisions of O^{2+} on He, N_2 and H_2
O^{2+} + He, N_2, H_2 -> O^{+*}(nl)
translational spectroscopy
0.125 - 0.38 keV/amu

44
85E41 Kamber,E.Y. Hormis,W.G. Brenton,A.G. Hasted,J.B. Baynon,J.H.
J. Phys. B 18 (1985) 117-124
Double electron capture by Ar^{3+} from rare-gas atoms
Ar^{3+} + He, Ne, Ar, Kr -> Ar^{+} + He^{2+}, Ne^{2+}, Ar^{2+}, Kr^{2+}
enegy-loss/-gain
0.2 keV/amu

45
85E75 Kelbch, S. Ullrich, J. Mann, R. Richard, P. Schmidt-Bocking, H.
J.Phys.B 20 (1985) 323 - 336
Cross sections for the production of highly charged argon and xenon recoil ions in collisions with high velocity uranium projectiles.
U^{q+} (q = 65 - 75) + Ar,Xe -> $U^{(q-r)+}$ (r= 1-4) +
Ar^{i+} (i= 1-18),Xe^{i+} (i= 1-33)
scattered projectile-recoil ion coincidence technique
3600 - 15500 keV/amu
partial(r,i) cross sections given

46
85E43 Lee,A.R. Williams,D.G. Butcher,E.C.
Phys. Letters 107A (1985) 218-220
Isotope effect in electron capture by protons into the 2s-state of hydrogen
H^{+} + H_2, D_2 -> H(2s)
photon measurement
8 - 16 keV/amu
no isotope effect found

47
85E44 Lembo,L.J. Danzmann,K. Stoller,Ch. Meyerhof,W.E. Hansch,T.W.
Phys. Rev. Letters 55 (1985) 1874-1876
Observation of polarized optical radiation following electron capture into slow, highly ionized neon
4 keV Ne^{8+} + Na -> Ne^{7+}(nl)
0.2 keV/amu

48
85E46 Maro,M. Hitz,D. Druetta,M. Dousson,S. Desclaux,J.P. Blimann,S.
Phys. Rev. Letters 54 (1985) 317-319
Spectroscopy of Al VIII produced by low energy charge changing collisions
$Al^{8+} + H_2 \rightarrow Al^{7+}$
optical spectroscopy
3 keV/amu

49
85E45 Mathur,D. Badrinathan,C. Rajgara,F.A. Rafeja,U.T.
J. Phys. B 18 (1985) 4795-4804
Electron capture collisions of $Kr^{2+}(^3P)$ in H_2
$Kr^{2+}(^3P) + H_2 \rightarrow Kr^{+}$
growth + energy loss sectroscopy
0.012 - 0.06 keV/amu

50
85E47 McAfee,K.B. Hozack,R.S.
Phys. Rev. A 32 (1985) 810-814
Charge and energy transfer in symmetric doubly charged Ar^{2+} + Ar collisions
$Ar^{2+}(^1S) + Ar \rightarrow Ar + Ar^{2+}(^3P)$
translational energy spectroscopy
0.006 keV/amu
energy spectra only

51
85E48 McDaniel,F.D. Toten,A. Bhalla,R.P. Lapicki,G.
Nucl. Instr. Meth. A24 (1985) 492-497
Carbon K-shell vacancy production and K-K electron capture cross sections for 0.4 - 1.5 MeV H^+ ions incident on CH_4 targets
$H^+ + C \rightarrow H(1s) + C^+(1s^{-1})$
Auger electron coincidence
400 - 1500 keV/amu

52
85E49 Meyer,F.W. Howald,A.M. Havener,C.C. Phaneuf,R.A.
Phys. Rev. Letters 54 (1985) 2663-2666
Observation of low-energy Z oscillations in total electron capture cross sections for bare projectiles colliding with H and H_2
$A^{z+} + H, H_2 \rightarrow A^{(z-1)+}$ (A = C, N, O, F, Ne)
growth
0.3 - 3.0 keV/amu
total cross section

53
85E50 Meyer,F.W. Howald,A.M. Havener,C.C. Phaneuf,R.A.
Phys. Rev. A 32 (1985) 3310-3318
Low-energy total electron capture cross sections for fully stripped and H-like projectiles incident on H and H_2
$A^{Z+,(Z-1)+} + H, H_2 \rightarrow A^{(Z-1)+,(Z-2)+}$ (A = C, N, O, F, Ne)
H-oven
0.18 - 8.5 keV/amu

54
85E51 Meyerhof,W.E. Anholt,R. Eichler,J. Gould,H. Munger,Ch. Alonso,J. Thieberger,P. Wegner,H.E.
Phys. Rev. A 32 (1985) 3291-3301
Atomic collisions with relativisic heavy ions. III. electron capture
$Xe^{q+} + B \rightarrow Xe^{(q-i)+}$ (q=52-54 ; B=Be-Au ; i=1-3)
solid target
82000 - 200000 keV/amu

55
85E52 Nakamura,T. Kobayashi,N. Kaneko,Y.
J. Phys. Soc. Japan 54 (1985) 1743-1749
Ion-energy-loss spectroscopy of Kr^{2+}-He and -Ne collisions II.
one-electron capture processes
$Kr^{2+}(^3P, ^1D_2, ^1S_0)$ + He, Ne -> Kr^+
energy-loss spectroscopy
0.006 - 0.018 keV/amu

56
85E53 Nielsen,E.H. Andersen,L.H. Barany,A. Cederquist,H. Heinemeier,J.
Hvelplund,P. Knudsen,H. MacAdam,K.B. Sorensen,J.
J. Phys. B 18 (1985) 1789-1808
Energy-gain spectroscopy of state-selective electron capture for
multiply charged Ar recoil ions
Ar^{q+} + Ne, Ar, Xe -> $Ar^{(q-1)+}$ (q=6-10)
energy-gain/-loss spectroscopy
$1x10^{-2}$ - $5x10^{-2}$ keV/amu

57
85E54 Peart,B. Bennett,M.A. Dolder,K.
J. Phys. B 18 (1985) L439-444
New measurements of the mutual neutralization of H^+/H^- and He^+/H^- ions
$H^+ + H^-$ -> H + H; $He^+ + H^-$ -> He + H
crossed beam technique
0.03 - 2 keV/amu (H^+); 0.1 - 3 keV/amu (He^+)

58
85E73 Pepmiller, P.L. Richard, P. Newcomb, J. Hall, J. Dillingham,T.R.
Phys. Rev. A 31 (1985) 734-743
Formation of doubly excited two-electron ions during F^{8+} + He ,
F^{8+} + Ne and F^{8+} + Ar collisions.
$F^{8+}(1s)$ + He, Ne, Ar -> $F^{7+}(2p^2,2s2p)$
photon spectroscopy
684 - 1630 keV/amu

59
85E55 Phaneuf,R.A. Kimura,M. Sato,H. Olson,R.E.
Phys. Rev. A 31 (1985) 2914-2917
Electron capture by slow Al^{q+} ions colliding with hydrogen
Al^{q+}(q=2-10) + H, H_2 -> $Al^{(q-1)+}$
E. growth; T. MO expansion
0.02 - 0.12 keV/amu
total cross section; laser source

60
85E56 Puerta,J. Huber,B.A.
J. Phys. B 18 (1985) 4445-4453
Single electron capture by state-prepared Ar^{2+} projectiles in Ar
Ar^{2+} + Ar -> Ar^+
translational energy spectroscopy
0.01 keV/amu
metastable fraction

61
85E57 Puerta,J. Kahlert,H.J. Koslowski,H.R. Huber,B.A.
Nucl. Instr. Meth. in Phys. Res. B 9 (1985) 415-420
Single electron capture by state-selected multiply charged Ar^{q+} ions (q=3,4)
$Ar^{3+,4+}$ + He, Ne, Ar, Kr -> Ar^{2+}, Ar^{3+}
translational energy spectroscopy
0.02 keV/amu
forward angle (θ - 0 ± 0.7)

62
85E58 Rinn,K. Melchert,F. Salzborn,E.
J. Phys. B 18 (1985) 3783-3795
Measurements of charge transfer in H^+ - He^+ collisions
$H^+ + He^+ \rightarrow H^0 + He^{2+}$
crossed beam technique
8 - 100 keV/amu

63
85E59 Rozet,J.P. Chevallier,P. Legagneux-Piquema,P. Chetioui,A. Stephan,C.
J. Phys. B 18 (1985) 943-948
Capture cross sections in highly excited P sates of Ar^{17+} in high velocity collisions of 250 MeV Ar^{18+} on N
$Ar^{18+} + N_2 \rightarrow Ar^{17+}$ (np, $n \leq 10$)
x-ray spectroscopy
6250 keV/amu
$1/n^3$ distribution

64
85E60 Rudd,M.E. Goffe,T.V. Itoh,A.
Phys. Rev. A 32 (1985) 2128-2133
Ionization cross sections for 10 - 300 keV/U and electron capture cross sections for 5 - 150 keV/U $^3He^{2+}$ ions in gases
$He^{2+} + B \rightarrow He^+, He^0$ (B = He, Ne, Ar, Kr, H_2, N_2, CO, O_2, CH_4, CO_2, H_2O)
condenser plate
1.67 - 50 keV/amu
total cross section

65
85E61 Rudd,M.E. Itoh,A. Goffe,T.V.
Phys. Rev. A 32 (1985) 2499-2500
Cross sections for ionization, capture and loss for 5 - 450 keV He^+ on water vapor
$He^+ + H_2O \rightarrow He^0$; He^{2+}
condenser plate
1.25 - 112.5 keV/amu

66
85E62 Scheurer,J.N. Baker,O.K. Meyerhof,W.E.
J. Phys. B 18 (1985) L85-89
Large angle scattering and nuclear resonance effect in electron capture in H^+ + C and H^+ + N collisions
$H^+ + C, N \rightarrow H^0$
350 - 1000 keV/amu (C), 1050 - 1065 keV/amu (N)
θ = 30, 150

67
85E74 Serenkov, I.T. Illin, R.N. Sakharov, V.I.
Sov. Phys.-JETP 61 (1985) 243-248
Detachment of an electron from hydrogen, chlorine, or titanium ions colliding with argon, sodium or magnesium.
$H^- + B \rightarrow H$ (B = Na, H_2) ; $Cl^- + B \rightarrow Cl$ (B = Ar, Na, Mg) ;
$Ti^- + B \rightarrow Ti$ (B = Ar, Na, Mg)
growth
0.2 - 5 keV/amu

68
85E63 Shafroth,S.M. Awaya,Y. Kase,M. Kambara,T. Kumagai,H. Nishida,M. Shibata,H. Tawara,H.
Nucl. Instr. Meth. in Phys. Res. A 240 (1985) 546-548
Angular distribution of REC for Ar^{4+} on C at 1 MeV/amu
$Ar^{q+} + C \rightarrow Ar^{(q-1)+}(1s) + h\nu + C^+$
x-ray spectroscopy
1000 keV/amu
angular distribution

69
85E64 Shah,M.B. Elliott,D.S. Gilbody,H.B.
J. Phys. B 18 (1985) 4245-4258
Ionization and charge transfer in collisions of H^+ and He^{2+} with lithium
H^+, He^{2+} + Li -> H^0, He^+
growth method
22 - 2100 keV/amu
Li-oven

70
85E72 Tanis,J.A. Bernstein,E.M. Oglesby,C.S. Graham,W.G. Clark,M. McFarland,R.H. Morgan,T.J. Stockli,M.P. Berkner,K.H. Schlachter,A.S. Sterns,J.W. Johnson,B.M. Jones,K.W. Meron,M.
Nucl. Instr. Meth. in Phys. Res. B 10/11 (1985) 128-233
Resonant-transfer and excitation for highly charged ions ($16 \leq z \leq 23$) in collisions with helium
S^{13+}, $Ca^{16+ - 18+}$, $V^{19+ - 21+}$ + He -> S^{12+}, $Ca^{15+ - 17+}$, $V^{18+ - 20+}$ + He^+
coincidence
469 - 6250 (S); 2500 - 9000 (Ca); 3529 - 9020 (V) keV/amu

71
85E65 Tawara,H. Iwai,T. Kaneko,Y. Kimura,M. Kobayashi,N. Matsumoto,A. Ohtani,K. Takagi,S. Tsurubuchi,S.
Nucl. Instr. in Phys. Res. B 9 (1985) 432-434
Electron capture in I^{q+}(q=10-41) + He collisions at low energies
I^{q+}(q=10-41) + He -> $I^{(q-1)+}$
energy gain spectroscopy
0.08 - 0.3 keV/amu
cross sections vs. q and crossing radius

72
85E66 Tawara,H. Iwai,T. Kaneko,Y. Kimura,M. Kobayashi,N. Matsumoto,A. Ohtani,S. Okuno,K. Takagi,S. Tsurubuchi,S.
J. Phys. B 18 (1985) 337-350
Electron capture processes of I^{q+} ions with very high charge state ($41 \geq q \geq 10$) in collisions with He atoms
I^{q+} + He -> $I^{(q-1)+}$ + He^+ (q=10-41)
energy-loss/gain
6×10^{-2} - 0.73 keV/amu

73
85E68 Varghese,S.L. Bissinger,G. Joyce,J.M. Laubert,R.
Phys. Rev. A 31 (1985) 2202-2209
Atomic total electron-capture cross sections from C^-, O^-, F^- and S^- bearing molecular gases for ~MeV/u H^+ and He^+ projectiles
H^+, He^+ + B = H^0, He^0 (B = C^-, O^-, F^-, S^- compound gas)
growth
800 - 3000 keV/amu (H); 800 keV/amu (He)

74
85E69 Vernhet,D. Chetioui,A. Wohrer,K. Rozet,J.P. Piquemal,P. Hitz,P. Dousson,S. Salin,A. Stephan,C.
Phys. Rev. A 32 (1985) 1256-1259
Alignment of Ne^{8+} n^1P states produced by collisions of Ne^{9+} with H_2 at 4 keV/amu
Ne^{9+} + H_2 -> Ne^{8+} (1snl)
4 keV/amu

75
85E70 Wilkie,F.G. Yousif,F.B. McCullough,R.W. Geddes,J. Gilbody,H.B.
J. Phys. B 18 (1985) 479-489
Total and state-selective capture by slow N^{2+} ions in atomic and molecular hydrogen
N^{2+} + H -> $N^+(2p^2)$ + H^+; N^{2+} + H, H_2 -> N^+ + H^+, H_2^+
energy-gain/-loss
4.28×10^{-2} - 14.3 keV/amu

1
86E69 Afrosimov, V.V. Basalaev, A.A. Panov, M.N. Samoilov, A.V.
Sov.Phys.-JETP 64 (1986) 273 - 279
Electron capture from helium atoms into various electronic states by multiply charged argon ions.
Ar^{q+}(q = 3-8) + He -> $Ar^{(q-1)+}$(nl), $Ar^{(q-2)+}$(nl,n'l'); $Ar^{(q-1)+}$ + He^{2+}
translational energy spectroscopy + ion coincidence technique
0.12 - 0.47 keV/amu

2
86E70 Andersen, L.H. Jensen, K.E. Knudsen, H.
J.Phys.B 19 (1986) L161 - 166
High velocity behaviour (V>> $e^2/\hbar$) of electron capture to the continuum in H^+,He^{2+} + He collisions.
H^+,He^{2+} + He -> H^+,He^{2+} + e + He^+
electron spectroscopy
10^3 - 2.6x10^3 keV/amu(H); 0.4 - 2x10^3 keV/amu(He)

3
86E71 Anholt, R. Meyerhof, W.E.
Phys.Rev.A 33 (1986) 1556 - 1568
Atomic collisions with relativistic heavy ions VI : the state of ions in matters.
Xe^{52+},Xe^{54+} + Be,U -> Xe^{51+},Xe^{53+}
photon spectroscopy
8.2x10^4 - 1.97x10^5 keV/amu
also K X-ray production , K-REC cross sections given

4
86E72 Anholt, R. Stoller, Ch. Molitioris, J.D. Spooner, D.W. Morenzoni, E. Andriamonje, S.A. Meyerhof, W.E.
Phys.Rev.A 33 (1986) 2270 - 2280
Atomic collisions with relativistic heavy ions VI : radiative process.
Xe^{54+} + Be,Ni,Ta -> Xe^{53+} + REC; La^{57+} -> La^{56+}; U^{92+} + Be,Ni,U -> U^{91+}
photon spectroscopy
8x10^4 - 1.8x10^5 keV/amu(Xe); 1.7x10^5 keV/amu(La); 4x10^5 keV/amu(U)
primary bremsstrahlung

5
86E 1 Aumayr,F. Lakits,G. Winter,H.
Phys. Rev. A 33 (1986) 846-850
Electron capture from Li(2s) by doubly charged ions (5-40 keV)
A^{2+} + Li(2s) -> A^+ + Li^+ (A = N, Ne, Ar, Kr, Xe)
growth
0.04 - 2.9 keV/amu

6
86E12 Bendali,N. Duong,H.T. Juncar,P. Saint Jalm,J.M. Vialle,J.L.
J. Phys. B 19 (1986) 233-238
Na^+ - Na charge exchange processes studied by collinear laser spectroscopy
Na^+ + Na(3s) -> Na(3s,3p) + Na^+
collinear laser spectroscopy
0.2 keV/amu
no cross sections given. density-dependence

7
86E 4 Bischof,G. Linder,F.
Z. Phys. D 1 (1986) 303-320
Crossed beam study of He^+ - O_2 charge transfer reactions in the collision energy range 0.5 - 200 eV
He^+ + O_2 -> He + O + O^+
crossed beam technique
1.25x10^{-4} - 0.05 keV/amu

8
86E73 Bliman, S. Bonnet, J.J. Bonnefoy, M. Dousson, S. Fleury, A. Hitz, D. LuDac, T. Mayo, M.
J.de Phys.(colloq.) 47(C-6) (1986) 41 - 46
X-UV spectroscopy of low energy charge exchange collisions.
Ne^{8+} + He -> $Ne^{7+}(1s^2nl)$ (nl = 3s,3p,4s,4p,4d,3d+4f)
photon spectroscopy
1.56 - 4 keV/amu

9
86E15 Bruijn,D.P.de
Electronic and Atomic Collisions (1986) 697-704
Dissociation of H_2 products of electron capture
H_2^+ + B -> H_2^* (B = Ar, Mg, Na, Cs)
translational spectroscopy
0.75 - 3.3 keV/amu
dissociation mechanisms studied

10
86E16 Bruijn,D.P.de Neuteboom,J. Govers,T.R. Los,J.
Phys. Rev. A 34 (1986) 3847-3854
Dissociative decay of n=3 levels in H_2. I. populated in charge exchange of H_2^+ with Cs
H_2^+ + Cs -> H_2(n=3) -> H(1s) + H(2l)
position-/time-sensitive detector
1.25 - 5 keV/amu
no cross sections given

11
86E13 Claeys,W. Cornet,A. Lorent,V. Jureta,J. Fussen,D.
J. Phys. B 19 (1986) 2955-2958
Electron capture by 1.6 - 5 keV metastable hydrogen atoms in the inert gases and H_2
H(2s) + B -> H^- + B^+ ; H(1s) + B -> H^- + B^+ (B = H_2, He, Ne, Ar, Kr, Xe)
growth method
1.6 - 5 keV
Cs-neutralized H beam

12
86E 2 Clark,M.W. Bernstein,E.M. Tanis,J.A. Graham,W.G. McFarland,R.H. Morgan,T.J. Johnson,B.M. Jones,K.W. Meron,M.
Phys. Rev. A 33 (1986) 762-764
Electron capture and loss for 2.5 - 200 MeV S^{13+} + He collisions
S^{13+} + He -> S^{12+}, S^{14+}
growth
78 - 6250 keV/amu

13
86E14 Cornille,M. Dubau,J. Bely-Dubau,F. Bliman,S. Hitz,D. Mayo,M. Bonnett,J.J. Bonnefoy,M.
J. Phys. B 19 (1986) L393-397
Spectroscopy of doubly excited Ne VII produced in low energy charge exchange collisions
Ne^{8+} + He -> Ne^{6+} (n = 2, 3, 4)
photon spectroscopy
2.4 - 4 keV/amu
no cross section given

14
86E74 Courbin, C. Sidis, V. Wahnon, P.
Ann.de Phys.(France) 11(coll.NO.3) (1986) 113 - 124
Theoretical study of the alignment and orientation of n=2 levels in the Li^+ + He collision.
$Li^+ + He \rightarrow Li^*(2^2P) + He^+$
photon spectroscopy
0.07 - 3 keV/amu
also $Li^+ + He^*(2^1P)$ excitation.

15
86E17 Druetta,M. Bouchama,T. Martin,S.
J. Phys. B 19 (1986) L723-726
Single electron capture into $Ne^{6+}(n,l)$ sushells in $Ne^{7+} + H_2$ collisions
$Ne^{7+} + H_2 \rightarrow Ne^{6+}(n,l)$
VUV spectroscopy
3.5 keV/amu
emission cross sections given

16
86E18 Dubois,R.D.
Phys. Rev. A 34 (1986) 2738-2745
Charge transfer leading to multiple ionization of neon, sodium and magnesium
$H^+, He^+, He^{2+} + B \rightarrow H, He, He^+ + B^+$; $H, He, He^+ + B^{i+} + (i-1)e$;
$H^+, He^+, He^{2+} + B^{i+} + ie$
$He^{2+} + B \rightarrow He + B^{2+}$; $He + B^{i+} + (i-2)e$ (i=1-4, B = Ne, Na, Mg)
coincidence
2 - 50 keV/amu
total cross sections

17
86E 7 DuBois,R.D.
Phys. Rev. A 33 (1986) 1595-1601
Ionization and charge transfer in He^{2+} - rare gas collisions
$He^{2+} + B \rightarrow He^+, He^0 + B^{i+}$ (B = He, Ne, Ar, Kr)
coincidence technique
3.75 - 50 keV/amu

18
86E19 Elliott,D.S. Shah,M.B. Gilbody,H.B.
J. Phys. B 19 (1986) 3277-3286
Ionization and charge transfer in collisions of H^+ and He^{2+} with potassium
$H^+ + K \rightarrow H + K^{i+} + (i-1)e$ (i=1-4)
$He^{2+} + K \rightarrow HE^+ + K^{i+} + (i-1)e$; $He + K^{i+} + (i-2)e$ (i=1-4)
coincidence
38 - 2070 keV/amu
total cross sections

19
86E20 Fournier,P.G. Aouchiche,H. Lorent,V. Baudon,J.
Phys. Rev. A 34 (1986) 3743-3748
Energy distribution of H^- ions produced by double capture in proton - H_2 collisions
$H^+ + H_2, D_2 \rightarrow H^- + H_2^{2+}, D_2^{2+}$
translational energy spectroscopy
3 - 9 keV/amu
no cross section given

20
86E21 Giese.J.P. Cocke,C.L. Waggoner,W. Tunnel,L.N. Varghese,S.L.
Phys. Rev. A 34 (1986) 3770-3781
Energy-gain spectroscopy of electron-capture collisions between low-energy Ar and Ne projectiles and atomic and molecular targets
$Ar^{q+}(q=4-8)$, $Ne^{q+}(q=4-7) + D, D_2 \rightarrow Ar^{(q-1)+}, Ne^{(q-1)+}(n,l)$
translational-energy spectroscopy
- 0.05 keV/amu

21
86E10 Graham,W.G. Bernstein,E.M. Clark,M.W. Tanis,J.A. Berkner,K.H. Gohil,P. McDonald,R.J. Schlachter,A.S. Stearns,J.W. McFarland,R.H. Morgan,T.J. Muller,A.
Phys. Rev. A 33 (1986) 3591-3594
Structure in the energy dependence of high energy electron capture cross sections
$Ca^{q+} + H_2 \rightarrow Ca^{(q-1)+}$ (q=16-19)
growth method
2425 - 9200 keV/amu
two bumps near 200 - 300 MeV

22
86E75 Guyon, P.M. Goves, T.R. Baer, T.
Z.Phys.D 4 (1986) 89 - 101
State selected ion-molecule reactions; a summary of experimental and theoretical analysis on the system $N_2^+(v) + Ar^+ \rightarrow N_2(v') + Ar^+$.
$N_2^+(v) + Ar \rightarrow N_2(v') + Ar^+$; $Ar^+(^2P_J) + N_2 \rightarrow Ar + N_2^+(v)$
photoionization + TOF
5×10^{-4} - 1.4×10^{-2} keV/amu

23
86E22 Hagmann,S. Kelbch,S. Cocke,C.L. Richard,P. Skutlartz,A. Schmidt-Bocking,H. Schuch,R. Johnson,B. Meron,M. Jones,K.
Phys. Rev. A 34 (1986) 2897-2910
Recoil charge state - target K-Auger electron coincidences : a technique to study excitation patterns in K-K charge transfer
F^{8+}, F^{9+} + Ne -> F^{7+}, F^{8+} + $Ne^+(K^{-1})$
Auger-electron / recoil ion coincidence
230 - 530 keV/amu
no cross sections

24
86E76 Hall, J. Richard, P. Pepmiller, P.L. Gregory, D.C. Miller, P.D. Moak, C.D. Jones, C.M. Alton, G.D. Bridwell, L.B. Sofield, C.J.
Phys.Rev.A 4 (1986) 914 - 920
Energy systematics of single and double K-shell vacancy production in titanium bombarded by chlorine ions.
Cl^{17+} + Ti -> Cl^{16+} , Cl^{15+} + Ti^+(K^{-1},K^{-2})
photon spectroscopy
5×10^2 - 1.5×10^3 keV/amu
Single and double K-shell ionization cross sections;
K-K and KK-KK transfer cross sections

25
86E23 Havener,C.C. Rouze,N. Westervelt,W.B. Risley,J.S.
Phys. Rev. A 33 (1986) 276-293
Experimental determination of the density matrix describing collisionally produced H(n=3) atoms
H^+ + He -> H(n=3)
Balmer-alpha intensity as a function of axial and transverse electric field
40 - 80 keV/amu
density matrix

26
86E24 Hippler,R. Harbich,W. Faust,M. Lutz,H.O. Dube,L.J.
J. Phys. B 19 (1986) 1507-1514
Alignment of H(2p) following H^+ - He, Ar charge-changing collisions
H^+ + He, Ar -> H(2p) + He^+, Ar^+
Lyman α measurement
0.5 - 5 ; 35 - 300 keV/amu
integral alignment factor A_{20}

27
86E25 Hird,B. Abbas,I.A. Bruyere,M.
Phys. Rev. A 33 (1986) 2315-2319
Single- and double-electron detachment cross sections for O^- collisions with rare gas atoms
O^- + B -> O, O^+ (B = He, Ne, Ar, Kr, Xe)
growth method
0.6 - 7 keV/amu

28
86E26 Hormis,W.G. Hasted,J.B. Kamber,E.Y. Brenton,A.G. Beynon,J.H.
Int. J. Mass Spec. Ion Phys. 70 (1986) 153-162
Single electron capture by Ar^{3+} from rare gas atoms
translational energy spectroscopy
0.23 keV/amu
no cross sections given. only spectra with state identifications

29
86E 8 Hormis,W.G. Kamber,E.Y. Hasted,J.B.
Int. J. Mass Spectr. Ion Processes 69 (1986) 211-216
Differential N^{2+} - He collisions with capture
N^{2+} + He -> N^+
translational energy spectroscopy
0.07 keV/amu
no cross section

30
86E27 Horsdal,E. Jensen,B. Nielsen,K.O.
Phys. Rev. Letters 57 (1986) 675-678
Experimental study of charge transfer near a nuclear scattering
Ne(H^+, H^0) nuclear reaction
1955 keV/amu

31
86E28 Horsdal,E. Jensen,B. Nielsen,K.O.
Phys. Rev. Letters 57 (1986) 1414-1416
Critical angle in electron capture
H^+ + He -> H + He^+ ; H + He^{2+} + e
coincidence
200 - 500 keV/amu
angle-differential cross sections

32
86E29 Kimura,M.
Electronic and Atomic Collisions ...... (1986) 471-478
Electron capture by slow and highly stripped iodine ions from helium atoms
I^{q+} + He -> $I^{(q-1)+}$ (q=10-40)
short review

33
86E30 Knudsen,H. Andersen,L.H. Jensen,K.E.
J. Phys. B 19 (1986) 3341-3352
The double-differential cross sections for electron capture to the continuum in the strong interaction region : fast, highly charged ions on helium atoms
C^{6+}, O^{8+}, Cl^{11+}, Au^{11+} + He -> ECC
electron spectroscopy
100 - 2000 keV/amu
ECC

34
86E31 Kusakabe,T. Horiuchi,T. Nagai,N. Hanaki,H. Konomi,I. Sakisaka,M.
J. Phys. B 19 (1986) 2165-2174
Charge transfer of multiply charged slow argon, krypton and xenon ions on atomic and molecular targets. single-charge transfer cross sections
Ar^{q+}(q=2-7) + He, H_2 -> $Ar^{(q-1)+}$
Kr^{q+}(q=2-9), Xe^{q+}(q=2-11) + B -> $Kr^{(q-1)+}$, $Xe^{(q-1)+}$
(B = He, Ne, Ar, Kr, Xe, H_2, N_2, CO_2, CH_4, C_2H_6, C_3H_8)
growth
- 0.3 keV/amu
scaling law proposed. recoil ions used. total cross sections given.

35
86E32 Larsen,P.H. Elford,M.T.
J. Phys. B 19 (1986) 449-461
The mobilities of Xe ions in Xe and the derived charge transfer cross section for $Xe^+(^2P_{3/2})$ ions in Xe
$Xe^+(^2P_{3/2})$ + Xe -> Xe + Xe^+
drift tube technique
$2x10^{-6}$ - $3x10^{-5}$ keV/amu

36
86E62 Leeuw,P.E. van der Tip,A. Kouot,W. Kleyn,A.W. Los,J.
Chem. Phys. 101 (1986) 183-199
Differential cross sections for collisional neutralization of H^- by rare gases
He^- + He, Ar, Xe -> He^0
position sensitive detection (E), impulse approximation (T)
0.12 - 0.5 keV/amu
relative angle-differential cross sections

37
86E33 Liao,C.L. Ng,C.Y.
J. Chem. Phys. 84 (1986) 197-200
Vibrational state distributions of $H_2^+(v")$ resulting from the electron transfer reactions $H_2^+(v=0,1)$ + $H_2(v=0)$ -> $H_2(v')$ + $H_2^+(v")$
in the energy range of 2 - 16 eV
10^{-3} - 10^{-2} keV/amu

38
86E35 Liao,C.L. Shao,J.D. Xu,R. Flesch,G.D. Li,Y.G. Ng,C.Y.
J. Chem. Phys. 85 (1986) 3874-3890
A state-to-state study of the electron transfer reactions
$Ar^+(^2P_{3/2,1/2})$ + $N_2(X,v=0)$ -> $Ar(^1S_0)$ + $N_2^+(X,v')$
$Ar^+(^2P_{3/2,1/2})$ + $N_2(v=0)$ -> $Ar(^1S_0)$ + $N_2^+(v')$
crossed-beam / photo ionization
$6x10^{-6}$ - $1x10^{-3}$ keV/amu

39
86E36 Liao,C.L. Xu,R. Ng,C.Y.
J. Chem. Phys. 85 (1986) 7136-7145
A state-to-state study of the electron transfer reactions
$N_2^+(\overline{X},v'=0-2)$ + $Ar(^1S_0)$ -> $N_2(X,v)$ + $Ar^+(^2P_{3/2,1/2})$
$N_2^+(\overline{X},v'=0-2)$ + $Ar(^1S_0)$ -> $N_2(X,v)$ + $Ar^+(^2P_{3/2,1/2})$
crossed beam / photo ionization
$1x10^{-4}$ -0.02 keV/amu

40
86E34 Liao,C.L. Xu,R. Ng,C.Y.
J. Chem. Phys. 84 (1986) 1948-1950
Fine structure effect on the charge transfer reaction
$Ar^+(^2P_{3/2,1/2})$ + $N_2(\overline{X}^1\Sigma_g^+,v=0)$
$Ar^+(^2P_{3/2,1/2})$ + $N_2(\overline{X}^1\Sigma_g^+,v=0)$ -> $Ar(^1S_0)$ + $N_2^+(\overline{X}^2\Sigma_g^+,v')$
$2.5x10^{-4}$ - $1x10^{-2}$ keV/amu

41
86E 9 Liljeby,L. Astner,G. Barany,A. Cederquist,H. Danared,H. Huldt,S.
Hvelplund,P. Johnson,A. Knudsen,H. Rensfelt,K.G.
Phys. Scripta 33 (1986) 310-320
Absolute cross sections for multielectron processes in slow
Ar^{q+} + Ne, Ar, Kr collisions
Ar^{q+} + B -> Ar^{r+} + B^{s+} (q=1-8 ; r=0-8 ; s=1-6 ; B=Ne, Ar, Kr)
TOF + coincidence
0.045xq keV/amu

42
86E37 MacAdam,K.B.
Phys. Rev. A 34 (1986) 2767-2770
Failure of classical scaling in low-velocity charge transfer from
Rydberg atoms
scaling to H^+ + H(1s) -> H(all) + H^+

43
86E38 Mann,R.
Z. Phys. D 3 (1986) 85-90
Total one-electron capture cross sections for Ar^{q+} and I^{q+} ions in
slow collisions on H_2 and He
Ar^{q+}(q=4-15), I^{q+}(q=5-27) + B -> $Ar^{(q-1)+}$, $I^{(q-1)+}$ (B = H_2, He)
growth
0.02 - 0.07 keV/amu (Ar) : 0.008 - 0.04 keV/amu (I)
recoil ions by 2GeV U^{75+} (I^{40+} observed). total cross sections given

44
86E40 Mathur,D. Badorinathan,C. Rajgara,F.A. Raheja,U.T.
Chem. Phys. 103 (1986) 447-459
Translational energy loss spectroscopy of molecular dications from methane
CH_n^+(n=1-5) + B -> CH_n^{2+} (B = Kr, CH_4, N_2, air)
translational spectroscopy
0.03 - 0.4 keV/amu
no cross section given

45
86E39 Mathur,D. Kingston,R.G. Harris,F.M. Beynon,J.H.
J. Phys. B 19 (1986) L575-580
State-diagnosed electron capture collisions of Cs_2^{q+}(q=2,3) with
atomic and molecular targets
Cs_2^{q+}(q=2,3) + B -> $Cs_2^{(q-1)+}$
translational energy spectroscopy
0.02 - 0.03 keV/amu
no cross sections given. reaction window

46
86E41 Matsuo,T. Kobayashi,N. Kaneko,Y.
J. Phys. Soc. Japan 55 (1986) 3045-3053
Study of low energy charge transfer reactions of Ar^+ + N_2 and Ar^+ + O_2
by Time-of-Flight technique
Ar^+ + B -> Ar + B^+ (B = N_2, O_2)
TOF technique
2.5×10^{-7} - 2×10^{-5} keV/amu
angular distribution (0 - 2^0)

47
86E59 McFarland,J.A. Bernstein,E.M. Clark,M.W. Graham,W.G. Mueller,D.W.
Muller,A. Stockli,M.P. Berkner,K.H. Gohil,P. McDonald,R.J.
Schlachter,A.S. Stearns,J.W.
Phys. Rev. A 34 (1986) 2543-2546
Resonant transfer and excitation : dependence on projectile charge
state and target-electron momentum distribution
Ca^{q+} + H_2, He -> $Ca^{(q-1)+}$ (q=10-19)
X-ray / scattered particle coincidence
2500 - 9250 keV/amu

48

86E42 Morenzoni,E. Anholt,R. Meyerhof,W.E.

Z. Phys. D 4 (1986) 133-140

Separated projectile and target K X-ray production in symmetric heavy ion collisions as a function of the target thickness

$A^{q+} + A \rightarrow A^{(q-1)+}(1s) + A^{+}(K^{-1})$ (A = Ni, Cu, Nb, Ag)

X-ray yield over thickness dependence

1000 - 1500 keV/amu

49

86E11 Muller,A. Schuch,B. Groh,W. Salzborn,E. Beyer,H.F. Mokler,P.H. Olson,R.E.

Phys. Rev. A 33 (1986) 3010-3017

Multiple electron capture and ionization in collisions of highly stripped ions with Ar atoms

Fe^{q+}(q=5,10,12,15,20,25), U^{q+}(q=44) + Ar -> $Fe^{(q-i)+}$, $U^{(q-1)+}$(i=0-5) + Ar^{r+}(r=1-14)

E. recoil ion-projectile ion coincidence ; T. CTMC

1400 keV/amu

50

86E43 Nagata,T. Kuribara,M.

J. Phys. Soc. Japan 55 (1986) 500-506

Cross sections for formation of H(2p) and H(2s) atoms on H^{+}-alkali atom charge transfer collisions

H^{+} + B -> H(2p,2s) (B = Na, K, Rb, Cs)

growth

0.006 - 5 keV/amu

51

86E78 Noll, M. Toennies, J.P.

J.Chem.Phys. 85 (1986) 3313 - 3325

Vibrational state resolved measurements of differential cross sections for H^{+} + O_2 charge transfer collisions.

$H^{+} + O_2(v=0) \rightarrow H + O_2^{+}(v' = 0 - 5)$

TOF method

scattering angle = 0 - 11

52

86E44 Okuno,K.

J. Phys. Soc. Japan 55 (1986) 1504-1515

Charge transfer of Ar^{2+} and Kr^{2+} in their own gases studied by the beam guide technique

$A^{2+} + A \rightarrow A^{+}, A^{0}$ (A = Ar, Kr)

octopole ion-beam guide technique

10^{-5} - 0.01 keV/amu (Ar) ; 3×10^{-6} - 0.01 keV/amu (Kr)

total cross sections

53

86E45 Panev,G.S.

Phys. Letters 115A (1986) 338-339

Total charge transfer cross sections in collisions of Ca^{+} ions with Mg and Sr atoms

Ca^{+} + Mg, Sr -> Ca

cross beam technique

0.002 - 0.025 keV/amu

total cross sections

54

86E46 Peart,B. Bennett,M.A.

J. Phys. B 19 (1986) L321-324

Measurement of one-electron transfer between $^{3}He^{2+}$ and H^{-} ions

$^{3}He^{2+} + H^{-} \rightarrow He^{+} + H$

crossed beam technique

0.03 - 2.6 keV/amu

55
86E47 Peart,B. Wilkins,P.M.
J. Phys. B 19 (1986) L515-517
Measurement of charge transfer between B^{2+} - H^- and C^{3+} - H^-
$B^{2+} + H^- \rightarrow B^+ + H$; $C^{3+} + H^- \rightarrow C^{2+} + H$
crossed beam technique
0.4 - 2.4 keV/amu

56
86E 3 Rice,J.E. Marmar,E.S. Terry,J.L. Kallne,E. Kallne,J.
Phys. Rev. Letters 56 (1986) 50-53
Observation of charge-transfer population of high n-levels in Ar^{16+}
from neutral hydrogen in the ground and excited states in a Tokamak plasma
Ar^{17+} + H, H(n) -> Ar^{16+}
photon spectroscopy
4×10^{-2} keV/amu (maxellian)

57
86E49 Roncin,P. Barat,M. Laurent,H.
Europhys. Letters 2 (1986) 371-377
Differential cross sections for one- and two-electron capture by highly
charged ions (N^{7+}, O^{7+}, Ne^{7+}, Ne^{8+}) at low keV energies
A^{8+} + He -> $A^{7+,6+}$; A^{7+} + He -> $A^{5+,6+}$ (A = N, O, Ne)
translational energy spectroscopy
- 0.5 keV/amu
relative differential cross sections

58
86E48 Roncin,P. Gaboriaud,M.N. Laurent,H. Barat,M.
J. Phys. B 19 (1986) L691-695
Transfer excitation in low-energy(keV/amu) multiply charged ion-atom collisions
Ne^{7+} + He -> Ne^{6+}
translation spectroscopy / position-sensitive detector
0.5 keV/amu
relative differential cross sections (angle)

59
86E50 Rozet,J.P. Chetioui,C. Bouisset,P. Vernhet,D. Wohrer,K. Touati,A.
Stephan,C. Gradin,J.P.
Phys. Rev. Letters 58 (1986) 337-340
Anomalous population of deep capture states of fast ions emerging from
solid foils
Kr^{36+} + B -> Kr^{35+} (B=C, Ne, Al, Si, Ar, Cr, Cu, Zr, Sb)
thickness-dependence
3.3×10^4 keV/amu
K-,L-shell capture cross sections

60
86E51 Sasao,M. Sato,K. Matsumoto,A. Nishizawa,A. Takagi,S. Amemiya,S.
Masuda,T. Tsurita,T. Fukuzawa,F. Haruyama,S. Kanamori,Y.
J. Phys. Soc. Japan 55 (1986) 102-105
Electron capture cross sections in high energy He^{2+} + Li collisions
He^{2+} + Li -> He^+, He
growth technique
200 - 500 keV/amu

61
86E52 Schoenfeldt,W.A. Mokler,P.H. Hoffmann,D.H.H. Warczak,A.
Z. Phys. D 4 (1986) 161-176
Resonant electron transfer and L-shell excitation at 3.6 MeV/u
Sm^{q+} -> Xe collisions at q=34-52
Sm^{q+} + Xe -> $Sm^{(q-1)+}$ (q=34-52)
X-ray / scattered particle coincidence
3600 keV/amu

62
86E54 Scott,D. Champion,R.L. Doverspike,L.D. Hug,M.S.
J. Phys. B 19 (1986) 3991-4006
Collisions of Cs^- with atoms and molecules
$Cs^- + B \rightarrow Cs + B + e$; $Cs + B^-$
(B = He, Ne, Ar, Kr, Xe, D_2, N_2, O_2, CO, CO_2, SO_2, N_2O, CH_4, SF_6)
parallel-plate technique
7×10^{-4} keV/amu

63
86E53 Scott,D. Hug,M.S. Champion,R.L. Doverspike,L.D.
Phys. Rev. A 33 (1986) 170-177
Alkali-negative ion-molecule collisions
$A^- + B \rightarrow A + B^-$, $A + B + e$
(A = Na, K ; B = H_2, D_2, N_2, O_2, CO, CO_2, CH_4)
parallel-plate technique
threshold - 7×10^{-3} keV/amu

64
86E79 Sharma, S. Hasted, J.B. Mathur, D.
Ind.J.Phys.B 60(B) (1986) 508 - 516
Energy loss spectra of N^{2+} ions with Kr and Xe gases.
N^{2+} + Kr , Xe -> N^+(nl)
translational energy spectroscopy
0.5 keV/amu
Peak assignment; no cross sections given

65
86E55 Stolterfoht,N. Havener,C.C. Phaneuf,R.A. Swenson,J.K. Shafroth,S.M. Meyer,F.W.
Phys. Rev. Letters 57 (1986) 74-77
Evidence for correlated double-electron capture in low energy collisions of O^{6+} with He
O^{6+}, C^{4+} + He -> O^{4+}, C^{2+}
Auger electron spectroscopy at zero degree
3.75/3.33 keV/amu
no cross sections given

66
86E77 Suzuki, Y. Kaneko, T. Sakisaka, M.
Nucl.Instr.Meth. in Phys.Res.B 16 (1986) 397 - 402
An apparatus for measuring collisional dissociation and electron capture of molecular ions.
CO^+ + Ar -> C^+ + O + Ar; O^+ + C + Ar; C^+ + O^+ + Ar + e; C + O + Ar^+; CO + Ar^+; CO^+ + Ar^+ + e
H_2^+ + Ar -> H^+ + H + Ar; H^+ + H^+ + Ar + e; H + H + Ar^+; H_2 + Ar^+; H_2^+ + Ar^+ + e
position-sensitive ion-atom coincidence method
0.29 - 0.43 keV/amu(CO^+); 4 - 6 keV/amu(H_2^+)

67
86E56 Suzuki,Y. Kaneko,T. Tomita,M. Sakisaka,M.
J. Phys. Soc. Japan 55 (1986) 3037-3044
Dissociation and electron capture of H_2 ions in collisions with He, Ne and Ar atoms
H_2^+ + B -> H^+ + H + B ; H^+ + H^+ + B ; H + H + B^+ ; H_2 + B^{2+} ; H_2^+ + Y^+
(B = He, Ne, Ar)
scattered ion / recoil ion coincidence
2 - 8 keV/amu

68
86E57 Swenson,J.K. Yamazaki,Y. Miller,P.D. Krause,H.F. Dittner,P.F. Pepmiller,P.L. Datz,S. Stolterfoht,N.
Phys. Rev. Letters 57 (1986) 3042-3045
Observation of resonant transfer and excitation to specific LS-coupled states in O^{5+} + He collisions by high resolution, 0^0 Auger-electron spectroscopy
O^{5+} + He -> O^{4+}
Auger spectroscopy
312 - 1562 keV/amu

69
86E58 Tang,S.Y. Wang,D.P. Neynaber,R.H.
J. Phys. B 19 (1986) L831-836
Ion pair production in Li - Cs collisions
Li + Cs -> Li^- + Cs^+
Merging beam technique
0.14 - 0.8 keV/amu

70
86E80 Tanis, J.A. Bernstein, E.M. Clark, M.W. Graham, W.G. McFarland, R.H. Morgan, T.J. Mowat,J.R. Mueller, D.W. Müller, A. Stockli, M.P.
Phys.Rev.A 34 (1986) 2543 - 2546
Resonant transfer and excitation; dependence on projectile charge state and target-electron momentum distribution.
Ca^{q+}(q = 10 - 19) + H_2 , He -> $Ca^{(q-1)+*}$
photon spectroscopy

71
86E60 Terao,M. Szucs,S. Cherkani,M. Brouillard,F. Allan,R.J.
Europhys. Letters 1 (1986) 123-128
Experimental and theoretical study of electron transfer in the He^{2+} + H^- collision
$^3He^{2+}$ + H^- -> $^3He^+$ + H
merged beam + coincident product (E), OEDM + translation factor (T)
$5x10^{-2}$ -2.25 keV/amu

72
86E61 Tobita,K. Takeuchi,H.
J. Phys. Soc. Japan 55 (1986) 4231-4233
One-electron loss cross section of helium in hydrogen gas
He + H_2 -> He^+
growth
0.5 - 4 keV/amu

73
86E 6 Ullrich,J. Bethge,K. Kelbch,S. Schadt,W. Schmidt-Bocking,H. Stiebing,K.E.
J. Phys. B 19 (1986) 437-448
Absolute cross sections for projectile-charge-state-correlated multiple ionisation processes in Ne - Ne collisions
Ne^{q+} + Ne -> Ne^{r+} + Ne^{s+} (q=2, 3 ; r=1-6)
coincidence technique
75 - 360 keV/amu

74
86E81 Van Zyl, B. Gealy, M.W. Neumann, H.
Phys.Rev.A 33 (1986) 2333 - 2338
Balmer-line emission from low-energy H^+ impact on rare atoms.
H^+ + He , Ne , Kr , Xe -> $H^*(n)$ + hv(n = 3,4 -> n = 2)
photon spectroscopy
1.25 - 2 keV/amu(He); 0.5 - 2 keV/amu(Ne); 0.04 - 2 keV/amu(Kr,Xe)
Balmer-alpha and -beta line emission cross section; also polarization

75
86E63 Vogt,H. Schuch,R. Justiniano,E. Schulz,M. Schwab,W.
Phys. Rev. Letters 57 (1986) 2256-2259
Experimental test of higher-order electron capture processes in collisions of fast protons with atomic hydrogen
$H^+ + H(1s) \rightarrow H + H^+$
atomic hydrogen
2800 - 5000 keV/amu
angle-differential cross section (θ = 0.005 - 0.8 mrad)

76
86E64 Wang,H.Y. Church,D.A.
J. Phys. B 19 (1986) L799-801
Electron transfer from H_2 to N^{3+} near 0.1eV/amu
$N^{3+} + H_2 \rightarrow N^{2+}$
trapped ion
10^{-4} keV/amu

77
86E65 Warzcak,A. Liesen,D. Liu,B.
J. Phys. B 19 (1986) 3975-3990
Strong influence of electron capture on the characteristic X-ray emission following close heavy-ion-atom collisions
U + Sn ; Pb + Ag
impact parameter / X-ray coincidence
1400 keV/amu

78
86E66 Watts,M.F. Dunn,K.F. Gilbody,H.B.
J. Phys. B 19 (1986) L355-359
Redetermination of cross sections for charge transfer and ionization in H^+ - He^+ collisions
$He^+ + He^+ \rightarrow H + He^{2+}$
crossed beam technique
0.05 - 0.14 keV/amu

79
86E67 Watts,M.F. Hopkins,C.J. Angel,G.C. Dunn,K.F. Gilbody,H.B.
J. Phys. B 19 (1986) 3739-3747
Charge transfer and ionization in collisions of protons with Al^+, Ga^+, In^+ and Tl^+ ions
$H^+ + B^+ \rightarrow H + B^{2+}$ (B = Al, Ga, In, Tl)
Crossed beam
50 - 600 keV/amu
Ionization + charge transfer cross sections given

80
86E 5 Wilkie,F.G. McCullough,R.W. Gilbody,H.B.
J. Phys. B 19 (1986) 239-251
State-selective electron capture by slow C^{3+} and N^{3+} ions in H and H_2
$C^{3+} + H \rightarrow C^{2+}(2s3d\ ^1D,^3D;\ 2s3p\ ^1P,^3P;\ 2s3s\ ^3S;\ 2p^2\ ^1S,^1D) + H^+$
translational energy spectroscopy + H-oven
0.125 - 1 keV/amu
only energy gain spectra for $C^{3+} + H_2$; N^{3+} + H, H_2 collisions

81
86E68 Williams,D.G. Lee,A.R. Butcher,E.C.
J. Phys. B 19 (1986) 4007-4016
Differential cross sections for transfer into the 2s state of hydrogen : $H^+ + H_2$, $H^+ + D_2$
$H^+ + H_2, D_2 \rightarrow H(2s)$
3.3 - 24 keV/amu
angle-differential cross sections

1
87E 1 Afrosimov, V.V. Basalaev, A.A. Lozhkin, K.O. Panov, M.N.
JETP Letters 48 (1987) 107 - 110
Filling of various electronic states in collisions of multiply charged argon ions with hydrogen atoms and molecules
Ar^{6+} + H, H_2 -> Ar^{5+}(4s,4p,4d,4f,5s,5p)
Ar^{4+} + H -> Ar^{3+}($3s^23p^24s,3s^23p^23d,3s3p^4,3s^23p^24p$)
translational energy spectroscopy
$5x10^{-2}$ - 2 keV/amu

2
87E 2 Almeida, D.P. Castro Faria, N.V. de Freire, F.L. Montenegro, E.C. de Pinho, A.G.
Phys. Rev. A 36 (1987) 16 - 25
Collisional formation and destruction of fast negative hydrogen ions in He, Ne and Ar targets
H^- + B -> H, H^+ ; H + B -> H^+ ; H^+ + B -> H^- (B = He, Ne, Ar)
growth method
300 - 2000 keV/amu

3
87E 3 Andriamonje, S. Chevallier, M. Cohen, C. Dural, J. Gaillard, M.J. Genre, R. Hage-Ali, M. Kirsch, R. Mazuy, B. Mory, J. Moulin, J. Poizat, J.C. Remillieux, J. Schmaus, D. Toulemonde, M.
Phys. Rev. Letters 59 (1987) 2271 - 2274
Observation of radiative electron capture into K, L, M shells of 25 MeV/u Xe^{53+} ions channeled in silicone
Xe^{53+} + Si -> Xe^{52+} + hv
X-ray spectroscopy
$2.5x10^4$ keV/amu
no cross sections, only estimation for REC

4
87E 4 Anholt, R. Meyerhof, W.E. Xu, X.Y. Gould, H. Feinberg, B. McDonald, R.J. Wegner, H.E. Thieberger, P.
Phys. Rev. A 36 (1987) 1586 - 1600
Atomic collisions with relativistic heavy ions VIII. charge state studies of relativistic uranium ions
U^{q+}(q=83-91), Xe^{q+}(q=52-54) + B -> $U^{(q-k)+}$(k=1-4), $Xe^{(q-k)+}$(k=1-3)
(B = Al, Cu, Ag, Au)
10^5 - 10^6 keV/amu
ionization cross sections scaled with $1/Z_1^2$

5
87E 6 Aumayr, F. Lakits, G. Winter, H.
J. Phys. B 20 (1987) 2025 - 2030
Charge transfer and target excitation in H^+ - Na(3s) collisions (2 - 20 keV)
H^+ + Na(3s) -> H^0 + Na^+ ; H^+ + Na(3p)
photon spectroscopy technique
2 - 20 keV/amu

6
87E18 Aumayr, F. Lokits, G. Winter, H.
Z. Phys. D 6 (1987) 145 - 153
Electron capture and target excitation in slow ion-alkali atom collisions : a systematic study.
A^+ + B -> A^0 + B^+ (A = He,Ne,Ar,C,N,0 ; B = Li(2s),Na(3s))
growth
0.25 - 5 keV/amu
also excitation cross section to Li(2p) and Na(3p) with interference filter.

7
87E 5 Aumayr, F. Winter, H.
J. Phys. B 20 (1987) L803 - 807
Ly-alpha emission in H^+ - Na collisions (1 - 20 keV)

H^+ + Na(3s), Na^*(3p) -> H^*(2p)
photon spectroscopy
1 - 20 keV/amu

8
87E11 Baer, M. Dueren, R. Friedrich, B. Niedner, G. Noll, M. Toennies, J.P.
Phys. Rev. A 36 (1987) 1063 - 1072
Dynamics of H^+ + Kr and H^+ + Xe elastic and charge transfer collisions : state-selected differential cross sections at low collision energies
H^+ + $Kr(^1S_0)$ -> H(n=1) + $Kr^+(^2P_{3/2},^2P_{1/2})$
H^+ + $Xe(^1S_o)$ -> H(n=1,2) + $Xe^+(^2P_{3/2},^2P_{1/2})$
TOF
0.03 - 0.05 keV/amu (c.m.)
angular distribution

9
87E 7 Baptist, R. Bonnet, J.J. Bonnefoy, M. Boursey, E. Brenac, A. Chassevent, M. Chauret, G. Dousson, S. Duff, Y. Le Fleury, A. Gargaud, M. Hitz, D.
Nucl. Instr. Meth. in Phys. Res. B23 (1987) 123 - 127
Subshell-selective electron capture in collisions of C^{4+} (0.05a.u. < v < 0.40a.u.) with H and H_2
C^{4+} + H, H_2 -> C^{3+}(3s,3p,3d)
VUV photon spectroscopy
0.05 - 3.3 keV/amu
ratios of subshell cross sections

10
87E 8 Barat, M. Gaboriaud, M.N. Guillemot, L. Roncin, P. Laurent, H. Andriamonje, S.
J. Phys. B 20 (1987) 5771 - 5783
Coincident energy gain spectroscopy of electron capture in multiply charged ions colliding with He, H_2 and heavy rare gas targets
C^{6+}, N^{7+}, O^{8+} + He, H_2 -> C^{5+}, N^{6+}, O^{7+}
C^{6+}, N^{7+} + Ar, Xe -> C^{5+}, N^{6+}
N^{6+}, O^{7+}, Ne^{9+} + He -> N^{5+}, O^{6+}, Ne^{8+}
N^{6+} + Ar -> N^{5+} ; O^{7+} + H_2 -> O^{6+}
Ne^{8+} + He,Ar -> Ne^{7+} ; O^{6+} + He, Ne, H_2, Ar, Kr,Xe
energy gain spectroscopy
0.5 keV/amu
no cross sections. only n-distribution

11
87E 9 Bernstein, E.M. Clark, M.W. Tanis, J.A. Berkner, K.H. McDonald, R.J. Schlachter, A.S. Stearns, J.W. Graham, W.G. McFarland, R.H. Morgan, T.J. Mowat, J.R. Mueller, D.W. Stockli, M.P.
J. Phys. B 20 (1987) L505 - 510
Resonant electron transfer and L-shell excitation for Nb^{31+} and La^{40+} ions
$A^{(z-3)+}$ + H_2 -> $A^{(z-2)+*}$ + H_2 (A = Nb, La)
coincidence between X-rays and scattered particles
3240 - 5040 keV/amu (La) ; 2370 - 6450 keV/amu (Nb)

12
87E81 Binder, J. Huber, B.A. Koslowski, H.R. Wiesemann, K.
J. Phys. B 20 (1987) 2713 - 2721
Near-threshold translational energy spectroscopy (NTTES).
Ar^{3+}(nl) + Ar -> Ar^{2+}(n'l') + Ar^+(n''l'')
translational energy spectroscopy
variable electron energy for ionization in order to identify electronic states of ions

13
87E12 Bordenave-Montesquieu, A. Benoit-Cattin, P. Boudjema, M. Gleizes, A. Bachau, H.
J. Phys. B 20 (1987) L695 - 703
Angular momenta determination of N^{5+}(3l3l') capture states in N^{7+} - He collisions

N^{7+} + He -> $N^{5+}(3l3l')^1L$ + He^{2+}
electron-spectroscopy

14
87E10 Bouchama, T. Desesquelles, J. Druetta, M. Farison, M. Martin, S.
J. Phys. B 20 (1987) L457 - 461
Radiative two-electron capture and doubly excited state excitation in N^{5+} + He low energy collisions
$N^{5+}(1s^2)$ + He -> $N^{3+}(1s^2nln'l')$
0.357 - 4.28 keV/amu
emission cross sections for $2s^2\ ^1S$ - $2s2p\ ^1P$ transition

15
87E82 Burnside, R.G. Tepley, C.A. Wickwar, V.B.
Annales Geophysicae 5(A) (1987) 343 - 350
The O^+-O collision cross sections : can it be inferred from aeronomical measurements
O^+ + O -> O + O^+
the previous values should increase by a factor of 1.7(+0.7; -0.3)

16
87E13 Church, D.A. Kravis, S.D. Sellin, I.A. Levin, C.S.O.J.C. Short, R.T.
Meron, M. Johnson, B.M. Jones, K.W.
Phys. Rev. A 36 (1987) 2487 - 2490
Confined thermal multicharged ions produced by synchrotron radiation
Ar^{q+}(q=2-5) + Ar -> $Ar^{(q-1)+}$ + Ar^+
trapped ion
10^{-5} keV/amu
rate coefficients at 300K

17
87E14 Coggiola, M.J. Peterson, J.R. Huestis, D.L.
Phys. Rev. A 36 (1987) 2008 - 2023
Angular scattering effects in D^- producton by double electron capture of D^+ in Cs
D^+ + Cs -> D^0, D^+ : D^0 + Cs -> D^0, D^- : D^- + Cs -> D^0
0.125 - 1 keV/amu
angular differential cross sections

18
87E16 Danared, H. Andersen, H. Astner, G. Defrance, P. Rachafi, S.
Phys. Scripta 36 (1987) 756 - 764
Absolute differential cross sections for high-charge low-energy Ar colliding with Ar
Ar^{q+} + Ar -> Ar^{r+} + Ar^{s+} (q = 6-13)
recoil-scattered ion coincidence
0.27(q=6) - 0.59(q=13) keV/amu
total cross sections for q=6-13. differential cross sections for q=6-9,10

19
87E15 Danared, H. Andersson, H. Astner, G. Barany, A. Defrance, P. Rachafi, S.
J. Phys. B 20 (1987) L165 - 170
Angular differential cross sections for high charge low energy Ar colliding with Ar
Ar^{q+}(q=8,9,11) + Ar -> Ar^{r+} + Ar^{s+} (r = q-1, q-2, q-3)
translational energy spectroscopy
0.045 x q keV/amu
relative cross sections

20
87E17 Dev, B. Boers, A.L.
J. Phys. B 20 (1987) 3463 - 3473
Collision cross sections and the efficiency of a Bendix multiplier for 2-5 keV He, Ar and H_2 ions and neutrals
A^+ + A -> A + A^+ (A = He, Ar, H_2)
growth
2 - 5 keV (for all ions)

21
87E80 Druetta, M. Martin, S. Bouchama, T. Harel, C. Jouin, H.
Phys. Rev. A 36 (1987) 3071 - 3076
Spectroscopic study of the charge exchange collision between Ar^{8+} and He or H_2 at beam energies of 80, 40 and 8 keV
$Ar^{8+} + B \to Ar^{7+}(4l,5l) + B^{+}$ (B = He, H_2)
X-ray spectroscopy (E), PSS (T)
0.5 - 2 keV/amu
emission cross sections, cross sections for (n,l) states

22
87E19 DuBois, R.D.
Phys. Rev. A 36 (1987) 2583 - 2593
Ionization and charge transfer in He^{2+} - rare gas collisions II.
$He^{2+} + B \to He^{+} + B^{k+} + (k-1)e$; $He^{0} + B^{k+} + (k-2)e$
(B = He,Ne,Ar,Kr)
projectile-recoil ion coincidence
50 - 500 keV/amu

23
87E20 Ebel, F. Salzborn, E.
J. Phys. B 20 (1987) 4531 - 4542
Charge transfer of 0.2 -5 keV protons and hydrogen atoms in sodium,potassium and rubidium vapor targets.
$H^{+} + B \to H + B^{+}$; $H^{-} + B^{2+}$: $H + B \to H^{+} + B + e$
$H^{-} + B^{+}$ (B = Na,K,Rb)
growth method
0.5 - 5 keV/amu
also secondary electron emission coefficients for SS,Cu

24
87E21 Elbel, M. Weitzel, R.
Z. Phys. D 7 (1987) 171 - 176
Luminescence of Ar^{+} ion emitted after electron capture of Ar^{2+} ions from K-atoms.
$Ar^{2+}(3p^4\ {}^3P,{}^1D) + K \to Ar^{+} + K^{+}$
optical attenuation method
0.1 keV/amu

25
87E83 Friedrich, B. Niedner, G. Noll, M. Toennies, J.P.
Z. Phys. D 6 (1987) 49 - 53
H^{+} + Xe low energy collisions : opposite phase oscillations of the elastic and charge transfer differential cross sections.
$H^{+} + Xe \to H^{+} + Xe$; $H + Xe^{+}$
TOF technique
4 - 6.6 keV/amu
angular distribution

26
87E84 Friedrich, B. Vancura, J. Herman, Z.
Int. J. Mass Spectro. Ion Phys 80 (1987) 177 - 185
Crossed-beam investigation of the single-electron charge transfer process $Kr^{2+} + He \to Kr^{+} + He^{+}$ at sub-eV collision energies.
$Kr^{2+}({}^1D_2,{}^1S_0) + He \to Kr^{+}({}^2P_{3/2},{}^2P_{1/2}) + He^{+}$
crossed-beam technique
3.8×10^{-6} - 6.2×10^{-6} keV/amu
total cross section ratios only

27
87E22 Friedrich, B. Niedner, G. Noll, M. Toennies, J.P.
J. Chem. Phys. 87 (1987) 5256 - 5265
Vibrationally resolved inelastic and charge transfer scattering of H^{+} by H_2O.
$H^{+} + H_2O \to H^{0}$
TOF
0.03 - 0.05 keV/amu

probabilities given as a function of scattering angle.

28
87E85 Futrell, J.M.
Int. J. Quan. Chem. 31 (1987) 133 - 159
Crossed-molecular beam studies of the state-to-state reaction dynamics of charge transfer at low and intermediate energy.
crossed-beam technique
review

29
87E23 Gealy, M.W. Van Zyl, B.
Phys. Rev. A 36 (1987) 3091 - 3099
Cross sections for electron capture and loss I. H^+ and H^- impact on H and H_2.
H^+ + B -> H; H^- + B -> H (B= H,H_2)
High temperature oven
0.06 - 2 keV/amu

30
87E24 Gealy, M.W. Van Zyl, B.
Phys. Rev. A 36 (1987) 3100 - 3107
Cross sections for elecron capture and loss II. H impact on H and H_2
H + B -> H^+ ; H^- (B= H,H_2)
High temprature oven technique
0.66 - 2 keV/amu

31
87E86 Geddes, J. Yousif, F.B. Gilbody, H.B.
J. Phys. B 20 (1987) 4773 - 4778
Balmer alpha emission in collisions of H,H^+,H_2^+ and H_3^+ with CH_4.
H^+ + CH_4 -> H(3s; 3d; H-alpha; total)
dissociative capture cross sections given also.

32
87E25 Hagmann, S. Kelbch, S. Schmidt-Bocking, H. Cocke, C.L. Richard, P. Schuch, R. Skutlartz, A. Ullrich, J. Johnson, B. Meron, M. Jones, K. Trautmann, D. Rosel, F.
Phys. Rev. A 36 (1987) 2603 - 2612
K-K charge transfer and electron emission for 0.13 MeV/amu F^{9+} + Ne collisions.
F^{9+} + Ne -> F^{8+} + $Ne^+(K^{-1})$
130 keV/amu
Impact parameter dependence

33
87E27 Hippler, R. Datz, S. Miller, P.D. Pepmiller, P.L. Dittner, P.F.
Phys. Rev. A 35 (1987) 585 - 590
Double-and single-electron capture and loss in collisions of 1 - 2 MeV/u boron,oxgen and silicon projectiles with helium atoms.
B^{5+},O^{8+},Si^{14+} + He -> B^{4+},B^{3+},O^{7+},O^{6+},Si^{13+},Si^{12+}
O^{6+},O^{7+}, Si^{8+},Si^{13+} + He -> O^{7+},O^{8+},Si^{9+},Si^{10+},Si^{14+}
growth method
1000 - 2000 keV/amu

34
87E29 Hippler, R. Faust, M. Woef, R. Kleinpoppen, H. Lutz, H.O.
Phys. Rev. A 36 (1987) 4644 - 4651
Polarization studies of H(2p) charge exchange excitation; H^+ + He collisions
H^+ + He -> H(2p) + He^+
photon spectroscopy
1 - 4 keV/amu
alignment and orientation

35
87E28 Hippler, R. Harbich, W. Madeheim, H. Kleinpoppen, H.K. Lutz, H.O.
Phys. Rev. A 35 (1987) 3139 - 3141

Cross sections for charge excitation to H(2p) in proton-rare gas atom collisions (1 - 25 keV/amu)
$H^+ + B \rightarrow H(2p) + B^+$ (B= He,Ne,Ar)
photon detection method
1 - 25 keV/amu

36
87E26 Hippler, R.H. Schiwietz, G. Bossler, J.
Phys. Rev. A 35 (1987) 485 - 488
δ-electron spectroscopy of transfer and ionization of proton-rare gas atom collisions.
H^+ + He,Ne,Ar ->
delta electron spectroscopy
300keV/amu

37
87E31 Hoekstra, R. Ciric, D. De Heer, F.J. Morgenstern, R.
Phys. Letters A 124 (1987) 73 - 76
Electron capture in collisions of O^{8+} with H ; absolute line emission cross sections.
$O^{8+} + H \rightarrow O^{7+}$ (nl) + H^+
photon spectroscopy
line emission cross sections for n=3->2,n=4->3,n=5->4; n=5->3 and n=6->3 transitions.

38
87E30 Hoekstra, R. DeHeer, F.J. Winter, H.
Nucl. Instr. Meth. in Phys. Res. B 23 (1987) 104 - 108
Two-and more-electron transitions in slow multicharged ion-He collisions.
$C^{4+} + B \rightarrow C^{3+},C^{2+}; N^{4+} + B \rightarrow N^{3+},N^{2+}$
$N^{5+} + B \rightarrow N^{4+},N^{3+}; O^{5+} + B \rightarrow O^{4+},O^{3+}$ (B= He)
retardation method
0.5 - 6 keV/amu

39
87E32 Hopkins, C.J. Watts, M.F. Dunn, K.F. Gilbody, H.B.
J. Phys. B 20 (1987) 3867 - 3872
Measurement of cross section for charge transfer in H^+ - C^+ and H^+ - N^+ collisions.
$H^+ + B^+ \rightarrow H + B^+; H^+ + B^{2+} + e$ (B= C,N)
crossed beam technique
46 - 141 keV/amu

40
87E33 Hormis, W.G. Kamber, E.Y. Hasted, J.B. Brenton, A.G. Beynon, J.H.
Int. J. Mass Spectrom. Ion Processes 76 (1987) 263 - 276
State-selective electron capture by Xe^{q+} ions from rare gas atoms.
Xe^{q+} (q= 2 - 7) + B -> $Xe^{(q-1)+}$
translational energy spectroscopy
$2 \times 10^{-2} \times q$ (keV/amu)
total cross sections. various transfer channels determined.

41
87E34 Horsdal-Pedersen, E.
J. Phys. B 20 (1987) 785 - 792
Probabilities for electron capture by protons from neon at large scattering angles.
H^+ + Ne -> H
400 - 1000 keV/amu
probabilities for electron capture (θ = 22.5 - 90)

42
87E88 Howard, S.L. Rockwood, A.L. Trafton, W. Friedrich, B.F. Anderson S.G. Futrell, J.H.
Can. J. Phys. 65 (1987) 1077 - 1081
Differential cross section for the competing charge-transfer reactions
$Kr^+(^2P_{3/2}) + Kr(^1S_0) \rightarrow Kr(^1S_0) + Kr^+(^2P_{3/2})$ and

$Kr^+(^2P_{3/2}) + Kr(^1S_0) \rightarrow Kr(^1S_0) + Kr^+(^2P_{1/2})$.
$Kr^+(^2P_{3/2}) + Kr \rightarrow Kr(^1S_0) + Kr^+(^2P_{3/2}, ^2P_{1/2})$
crossed-beam technique-translational energy spectroscopy
$1.1 \times 10^{-4} - 2.4 \times 10^{-4}$ keV/amu

43
87E87 Howard, S.L. Rockwood, A.L. Tarbton, W. Friedrich, B. Anderson, S.G. Futrell, J.H.
Chem. Phys. Letters 140 (1987) 385 - 388
Observation of finite-structure transitions in rare gas charge transfer at surprisingly low energies using a crossed molecular beam technique.
$Kr^+(^2P_{3/2}) + Kr(^1S_0) \rightarrow Kr(^1S_0) + Kr^+(^2P_{3/2}, ^2P_{1/2})$
crossed-beam technique
1×10^{-4} keV/amu

44
87E35 Huber, B.A.
Com. At. Mol. Phys. 21 (1987) 15 - 39
Recent applications of translational energy spectroscopy in atomic collision procesess.
a review

45
87E36 Hvelplund, P. Barany, A.B. Cederquist, H. Pedersen, J.O.K.
J. Phys. B 20 (1987) 2515 - 2529
Energy gain spectroscopy studies of electron capture by Xe^{q+} ($10 \le q \le 20$) in collisions with Ne,Ar and Xe.
Xe^{q+}(q= 10 - 20) + B -> $Xe^{(q-1)+}, Xe^{(q-2)+}, Xe^{(q-3)+}$
energy gain spectroscopy
0.01 keV/amu

46
87E89 Jonathan, P. Lee, A.R. Brenton, A.G. Beynon, J.H.
Int. J. Mass Spectro. Ion Processes 79 (1987) 101 - 113
Capture dissociation of H_2^+ in rare gases and small hydrocarbons.
$H_2^+ + B \rightarrow H_2^*$, $H + H^+$, $H^- + H$, $H^+ + H^-$
(B = He,Ne,Ar,Kr,CH_4,C_2H_6,C_3H_8,C_2H_4,C_3H_6 C_4H_8)
translational energy spectroscopy
3 keV/amu
no cross sections given

47
87E90 Kambara, T. Awaya, Y. Kase, M. Kumagai, H. Shibata, H. Tonuma, T.
J. Phys. Soc. Japan 56 (1987) 1907 - 1908
REC X-rays for ^3He and ^4He targets.
X-ray spectroscopy
5.5×10^3 keV/amu
no isotope effect in REC

48
87E39 Kamber, E.Y. Cocke, C.L. Giese, J.P. Pedersen, J.O.K. Waggoner, W.
Phys. Rev. A 36 (1987) 5575 - 5580
State-selective differential single-electron-capture cross sections for O^{2+} - He collisions.
$O^{2+} + He \rightarrow O^+ + He^+$
translational energy spectroscopy
$3.75 \times 10^{-3} - 1.6 \times 10^{-2}$ keV/amu
angular distribution. predominant capture into $2p^3\ ^2P$ state.

49
87E37 Kamber, E.Y. Hormis, W.G. Brenton, A.G. Hasted, J.B. Beynon, J.H.
J. Phys. B 20 (1987) 105 - 120
State-selective electron capture by Kr^{q+} ions from rare-gas atoms.
Kr^{q+}(q=2,3,4) + B = $Kr^{(q-1)+} + B^+$ (B= He,Ne,Ar,Kr,Xe)
translational energy spectroscopy
0.1 - 0.3 keV/amu
partial cross sections for Kr^{4+} + He,Ne -> Kr^{3+}
($4p^3\ ^4S$, $4p^4\ ^4P$, $5s\ ^4P$+ $4p^2(^3P)4d$) and total cross sections.

50
87E38 Kamber, E.Y. Jonathan, P. Brenton, A.G. Benon, J.H.
J. Phys. B 20 (1987) 4129 - 4142
Single electron capture by Ar^{2+} from atomic and molecular targets.
Ar^{2+} + B -> Ar^{+}
(B= He,Ne,Ar,Kr,Xe,O_2,NO,N_2O,NH_3,CO_2,CH_4,C_2H_6,1-C_4H_8,C_6H_6)
translational energy spectroscopy
0.15 keV/amu
identification of transfer channels;no cross sections

51
87E40 Kelly, G.J. Hird, B.
Phys. Rev. A 35 (1987) 5262 - 5265
Double electron capture cross sections for I^{+} in a magnesium-vapor target.
I^{+} + Mg -> I^{-}
Oven
0.16 - 0.70 keV/amu

52
87E91 Kikiani, B.I Lomsadze, R.A. Gochilashvili, M.R. Mosulishvili, N.O. Lavrov, V.M.
Sov. Phys. -JETP 64 (1987) 468 - 474
Ionization,charge exchange, and stripping in K^{+} + He and K^{+} + Ne collisions at ion energies 0.7 - 7.0 keV.
K^{+} + He , Ne -> K
condenser method
1.8×10^{-2} -1.8×10^{-1} keV/amu
also ionization and stripping cross sections given

53
87E41 Kim, H.J. Janev, R.K.
Phys. Rev. Letters 58 (1987) 1837 - 1840
Electron loss sections in symmetric multicharged ion collisions.
A^{3+} + A^{3+} -> A^{4+} + A^{2+} (A= Ar,Kr)
folded beam technique
3.0 keV/amu (Ar); 1.4 keV/amu

54
87E42 Kimura, M. Kobayashi, N. Ohtani, S. Tawara, H.
J. Phys. B 20 (1987) 3873 - 3884
State-selective one-electron capture from H and H_2 by slow, highly stripped C,N,O and Ne ions.
Ne^{q+}(q= 8,9),O^{q+}(q= 6-8),N^{q+}(q= 5-7),C^{q+}(q= 4-6) + H,H_2 -> $A^{(q-1)+}$
translational energy spectroscopy ; MCLZ model
0.6 keV/amu
n - distribution; no cross sections

55
87E43 Knudsen, H. Andersen, L.H. Hvelplund, P. Sorensen, J. Ciric, D.
J. Phys. B 20 (1987) L253 - 257
Simultaneous capture and ionization for fast ion impact on helium.
H^{+},He^{2+} + He -> H,He^{+} + He^{2+} + e ; H,He^{+} + He^{+}
coincidence technique
10^{3} keV/amu (H) ;350 - 1500 keV/amu (He)
ratios only. no cross sections

56
87E44 Laurent, H. Barat, M. Gaboriaud, M.N. Guillemot, L. Roncin, P.
J. Phys. B 20 (1987) 6581 - 6595
Differential cross section and electron transfer mechanisms in multiply charged ion-atom collisions.
C^{6+} + B -> C^{5+}(n),C^{4+}(n,n') (B= He,H_2,Ar,Xe)
N^{6+} + B -> O^{5+}(n),O^{4+}(n,n') (B= H_2,Ar,Kr)
N^{7+} + B -> N^{6+}(n),N^{5+}(n,n') (B= H_2,He,Ar,Xe)
O^{7+} + B -> O^{6+}(n),O^{5+}(n,n') (B= He,H_2)
O^{8+} + B -> O^{7+}(n),O^{6+}(n,n') (B= He,H_2)

Ne^{8+} + B -> Ne^{7+}(n),Ne^{6+}(n,n') (B = He,Ar)
Ne^{9+} + B -> Ne^{8+}(n),Ne^{7+}(n,n') (B = He)
translational energy spectroscopy
-> 0.5 keV/amu
no absolute cross sections

57
87E92 Lee, A.R. Jonathan, P. Brenton, A.G. Beynon, J.H.
Int. J. Mass Spectro. Ion Processes 75 (1987) 329 - 343
Dissociative electron capture of H_2^+ into H^- fragments.
H_2^+ + B -> H^+ + H^- (B = H_2)
translational energy spectroscopy
3 keV/amu

58
87E45 Lee, A.R. Jonathan, P. Brenton, A.G. Benon, J.H.
Phys. Letters A 122 (1987) 346 - 349
Translational energy loss of H^+ fragments from capture-dissociation of H_2^+ in collisions with rare gas atoms.
H_2^+ + B -> H^+ ; H^-
translational energy spectroscopy
3 keV/amu
no cross sections given

59
87E46 Mann, R. Schulte, H.
Z. Phys. D 4 (1987) 343 - 349
Evidence for one-step double electron capture in single collisions of slow O^{6+} and C^{4+} ions with rare gas atoms.
O^{6+},C^{4+} + B -> O^{4+},C^{2+} (B= He,H_2,Ar,Xe)
zero-degree Auger electron spectrocopy
6 - 7 keV/amu
no cross sections given. Coster-Kronig transitions.

60
87E47 Marseille, P. Bliman, S. Indelicato, P. Hitz, D.
J. Phys. B 20 (1987) L423 - 426
Single electron capture into Ar^{6+}(nl) subshells in Ar^{7+} + He collisions.
Ar^{7+} + He -> Ar^{6+} (4l)
VUV spectroscopy
1.75 keV/amu
l-distribution. emission cross section.

61
87E48 Marseille, P. Bliman, S. Desclaux, J.P. Doussin, S. Hitz, D.
J. Phys. B 20 (1987) 5127 - 5132
Spectroscopy of Mg-like Ar produced in low energy charge exchange collisions.
Ar^{7+} + He -> Ar^{6+} + He^+
photon spectroscopy (100 - 1000 Å)
1.75 keV/amu
no cross sections given. n=4 level dominant.

62
87E50 Mathur, D. Kingston, R.G. Harris, F.M. Brenton, A.G. Beynon, J.H.
J. Phys. B 20 (1987) 1811 - 1822
State-selected electron capture by molecular ion collisions of CS_2^{3+} and CS_2^{2+} with monatomic and diatomic targets.
CS_2^{2+},CS_2^{3+} + B -> CS_2^+,CS_2^{2+} (B = He,Ne,Ar,Kr,Xe; H_2,N_2,O_2)
translational energy spectroscopy
no cross sections given

63
87E49 Mathur, D. Reid, C.J. Harris, F.M.
J. Phys. B 20 (1987) L577 - 581
State-diagnosed electron capture by OCS^{3+} ions in collisions with atomic and molecular gases.

OCS^{3+} + B -> OCS^{2+} (B= Ar,Kr,Xe,H ,N ,O ,CH)
translational energy spectroscopy
0.27 keV/amu
energy gain spectrum only. no cross sections given

64
87E51 McAfee, K.B. Szmanda, C.R. Hozack, R.S.
Phys. Rev. A 36 (1987) 2056 - 2060
Excitation energy transfer charge exchange during collisions of N^+ (^1S) with N_2
N^+(^3P,^1D,^1S,^5S) +N_2 -> N + N_2^+ ; N_2^{2+} + N_2 -> N_2^+ + N_2^+
translational energy spectroscopy
no cross sections given

65
87E52 McCullough, R.W. Wilson, S.M. Gilbody, H.B.
J. Phys. B 20 (1987) 2031 - 2055
State-selective capture by slow Ar^{4+},Ar^{5+} and Ar^{6+} recoil ions in H,H_2 and He.
Ar^{q+} (q=4,5,6) + B -> $Ar^{(q-1)+}$(n,l) + B^+ (B= H,H_2,He)
translational energy spectroscopy ; Multichannel Landau-Zener model.
energy-gain spectroscopy. no cross sections. MLZ calculated cross sections.

66
87E53 McGuire, J.H. Salzborn, E. Muller, A.
Phys. Rev. A 35 (1987) 3265 - 3268
Simultaneous capture and ionzation in helium.
A^{Z+} + He -> $A^{(Z-1)+}$ + He^{2+} + e (A= H,He,Li)
projectile-recoil ion coincidence
1 - 5 x 10^3 keV/amu
data compilation and analysis.

67
87E93 Melchert, F. Rink, K. Rinn, K. Salzborn, E.
J. Phys. B 20 (1987) L797 - 801
Ionization in He^+-He^+ collisions.
He^+ + He^+ -> He^+ + He^{2+} + e; He^{2+} + He
crossed beam technique
2.75 - 28 keV/amu

68
87E54 Melchert, F. Rink, K. Rinn, K. Salzborn, E. Grun, N.
J. Phys. B 20 (1987) L223 - 230
Charge transfer in He^+ - He^+ collisions.
He^+ + He -> He^0 + He^{2+}
coincidence technique ; two-state coupling.
15 - 224 keV/amu

69
87E55 Muller, A. Schuch, B. Groh, W. Salzborn, E.
Z. Phys. D 7 (1987) 251 - 260
Multiple-electron processes in 1.4 MeV/u ion-atom collisions.
A^{q+} + B -> $A^{(q-1)}$,$A^{(q-2)}$,$A^{(q-3)+}$ + B^i
(A= N,Fe,Kr,Gd,U; q=6-44; B= Ne,Ar,Kr,Xe; i= 1-19)
projectile-recoil ion coincidence
1400 keV/amu
no cross sections but relative intensities of recoil ions.

70
87E94 Nakai, Y. Shirai, M. Tabata, T. Ito, R.
At. Data and Nucl. Data Tables 37 (1987) 69 - 101
Cross sections for charge transfer of hydrogen atoms and ions colliding with gaseous atoms and molecules.
analytic formula for charge transfer cross sections as a function of collision energy.

71
87E56 Niedner, G. Noll, M. Toennies, J.P.

J. Chem. Phys. 87 (1987) 2067 - 2083
Selective vibrational excitation and mode conservation in H^+ + CO_2/N_2O inelastic and charge transfer collisions.
$H^+ + B \rightarrow H^+ + B(n_1\ n_2\ n_3)$; $H + B^+(n_1\ n_2\ n_3)$ (B= CO_2,N_2O)
TOF
0.01 - 0.03 keV/amu
Angular distribution.

72
87E57 Niedner, G. Noll, M. Toennies, J.P. Schlier, Ch.
J. Chem. Phys. 87 (1987) 2685 - 2694
Observation of vibrationally resolved charge transfer in H^+ + H_2 at Ec.m. = 20 eV.
$H^+ + H_2(v=0) \rightarrow H + H_2^+(v_f)$; $H^+ + H_2(v_f)$
TOF
0.03 keV/amu
doubly differential cross sections for H,H^+.

73
87E58 Ohtani, S. Kimura, M. Kobayashi, N. Tawara, H.
J. Phys. Soc. Japan 56 (1987) 1271 - 1273
Observation of selective electron capture by fully stripped C,N and O ions from H atoms.
$A^{Z+} + H \rightarrow A^{(Z-1)+}(n) + H^+$ (A= C,N,O)
translational energy spectroscopy
0.75 keV/amu
n-distribution. no cross section.

74
87E101 Panev, G.S. Andersen, N. Andersen, T. Dably, P.
Z. Phys. D 5 (1987) 331 - 337
Orientation and alignment of $Mg^+(3p)$ states excited in 1 - 60 keV collisions with He and Ar.
$Mg^+(3s)$ + He,Ar -> $Mg^+(3p)$
photon-particle coincidence technique
0.04 - 2.5 keV/amu

75
87E59 Peart, B. Foster, S.J.
J. Phys. B 20 (1987) L691 - 694
Mesurements of mutual neutralization of Li^+ with H^- ions and of Na^+ with O^- ions.
$Li^+ + H^- \rightarrow Li + H$; $Na^+ + O^- \rightarrow Na + O$
crossed beam technique
0.03 - 2.4 keV/amu

76
87E60 Pedersen, J.O.K. Hvelplund, P.
J. Phys. B 20 (1987) L317 - 322
Energy gain spectroscopy studies of electron capture from neon by double charged CO ions
$CO^{2+} + Ne \rightarrow CO^+ + Ne^+$
energy gain spectroscopy
3×10^{-3} keV/amu
no cross sections given

77
87E61 Phaneuf, R.A. Janev, R.K. Hunter, H.T.
Nucl. Fusion. Special Supplement ...... (1987) 7 - 20
Charge exchange processes involving iron ions.
$Fe^{q+} + B \rightarrow Fe^{(q-1)+} + B^+$ (B= H,H_2,He)
Evaluated cross section and rare coefficients

78
87E62 Politis, M.F. Jouin, H. Bonnefoy, M. Bonnet, J.J. Chassevent, M. Fleury, A.F. Bliman, S. Harel, C.
J. Phys. B 20 (1987) 2267 - 2279
Relative (n,l) populations following electron capture by low energy

N^{7+},O^{8+} and Ne^{8+} ions from two-electron targets (H_2,He).
N^{7+},O^{8+},Ne^{8+} + H_2,He -> N^{6+}(n,l),O^{7+}(n,l),Ne^{7+}($1s^2$,nl)
photon spectroscopy
4 keV/amu
no cross sections. relative population only

79
87E63 Roncin, P. Geboriaud, M.N. Barat, M. Laurent, H.
Europhys. Letters 3 (1987) 53 - 59
Transfer ionization in collisions involving multiply charged ions at low keV energy
N^{7+} + B -> N^{6+} + B^{k+} (B= Ar,Xe; k= 1 - 4)
translational energy spectroscopy + recoil ion
0.75 keV/amu
no cross sections

80
87E64 Schon, W. Krudener, S. Melckert, F. Rinn, K. Wagner, M. Salzborn, E. Karemera, M. Szucs, S. Terao, M. Fussen, D. Janev, R. Urbain, X. Brouillard, F.
Phys. Rev. Letters 59 (1987) 1565 - 1568
Transfer ionization in H^+ + H^- collisions.
H^+ + H^- -> H + H^+ + e
crossed beam,LZ
5×10^{-2} - 40 keV/amu

81
87E65 Schon, W. Krudener, S. Melckert, F. Rinn, K. Wagner, M. Salzborn, E.
J. Phys. B 20 (1987) L759 - 764
Mutual neutralization in H^+ - H^- collisions
H^+ + H^- -> H + H
crossed beam technique
1 - 40 keV/amu

82
87E66 Schulz, M. Justiniano, E. Schuch, R. Mokler, P.H. Reusch, S.
Phys. Rev. Letters 58 (1987) 1734 - 1737
Separated resonances in simultaneous capture and excitation of S^{15+} in H_2 observed by K-X-ray-K-X-ray coincidences.
S^{15+} + H_2 -> S^{14+}(2l,nl) + H_2^+
X-ray-X-ray coincidence
2190 - 5000 keV/amu
resonant capture + excitation

83
87E67 Schulz, M. Justiniano, E. Konrad, J. Schuch, R. Salin, A.
J. Phys. B 20 (1987) 2057 - 2073
K-shell to K-shell charge transfer in collisions of bare decelerated S ion with Ar.
S^{16+} + Ar -> S^{15+}(1s) + Ar^+(K^{-1})
X-ray-X-ray coincidence technique
500 keV/amu
Impact parameter dependence. no cross sections given

84
87E68 Schwab, W. Baptista, G.B. Justiniano, E. Schuch, R. Vogt, H. Weber, E.W.
J. Phys. B 20 (1987) 2825 - 2834
Measurement of the total cross sections for electron capture of 2.0 - 7.5 MeV H^+ in H,H_2 and He.
H^+ + H,H_2,He -> H
liquid nitrogen-cooled Wood tube
2×10^3 - 7.5×10^3 keV/amu

85
87E95 Sedgwick, J.B. Paulson, B.P. Shields, G.C. Moran, T.F.
Int. J. Mass Spectro. Ion Processes 79 (1987) 127 - 140
Competition between single and double electron transfer in collisions of doubly charged molecular pyrroll molecules.
$C_4H_5N^{2+}$ + C_4H_5N -> $C_4H_5N^+$, C_4H_5N

TOF
0.068 - 0.090 keV/amu
$\sigma_{20} = 0.3\sigma_{21}$

86
87E96 Sekiya, H. Tsuji, M. Nishiyamura, Y.
J. Chem. Phys. 87 (1987) 325 - 330
Optical study of the He^{+} + N_2 charge transfer reaction in a flowing afterglow and in a low-pressure chamber coupled with flowing afterglow.
$He^{+} + N_2 \rightarrow He + N_2^{+*}$
photon-spectroscopy + flowing afterglow technique
2×10^{-5} keV/amu
no cross section given

87
87E97 Shul, R.J. Upschulte, B.L. Passarela, R. Keese, R.G. Castleman, A.W.
J. Phys. Chem. 91 (1987) 2556 - 2562
Thermal energy charge-transfer reactions of Ar^{+} and Ar_2^{+}.
$Ar^{+},Ar_2^{+} + B \rightarrow Ar,Ar_2 + B^{+}$ (B = H_2S,CS_2,NO_2, all 26 molecules)
selected ion flow tube technique
rate coefficients at thermal energies

88
87E69 Suzuki, R. Kaneko, T. Tomita, M. Sakisaka, M.
J. Phys. Soc. Japan 56 (1987) 495 - 501
Dissociation and electron capture of CO^{+} and CF^{+} ions in collisions with He,Ne and Ar atoms.
$AC^{+} + B \rightarrow A + C^{+} + B$; $A^{+} + C + B$; $A^{+} + C^{+} + e + B$; $A + C + B^{+}$
$AC + B^{+}$; $AC^{+} + B^{+} + e$ (B= He,Ne,Ar)
coincidence technique
0.13 - 0.5 keV/amu

89
87E70 Tanis, J.A. Clark, M.W. Price, R. Olson, R.E.
Phys. Rev. A 36 (1987) 1952 - 1954
Contribution of transfer ionization to total electron capture from a helium target.
O^{q+} (q= 5,6,7,8,) + He -> $O^{(q-1)+} + He^{+}$; $O^{(q-1)+} + H^{2+} + e$
500 - 1500 keV/amu
large contribution of transfer ionization. scaling law.

90
87E102 Tsurubuchi, S. Arikawa, T.
J. Phys. Soc. Japan 56 (1987) 1996 - 2003
Optical spectroscopic study on Li^{+} + Ne collision.
Li^{+} + Ne -> Li($2P_0,2P_{\pm1/2}$)
photon spectroscopy technique
5.7×10^{-2} - 5.7×10^{-1} keV/amu
transition (2p -> 2s ; 3d -> 2p ; 4d -> 2p) of Li
also Ne^{*} transition

91
87E71 Tunnell, L.N. Cocke, C.L. Giese, J.P. Kamber, E.Y. Varghese, S.L. Waggoner, W.
Phys. Rev. A 35 (1987) 3299 - 3308
Experimental angular distributions for electron capture by slow Ne^{q+}(q= 3-6) ions from He.
Ne^{q+}(q= 3-6) + He -> $Ne^{(q-1)+}$
recoil ion beam
0.01 - 0.06 keV/amu
angular differential cross sections (absolute)

92
87E72 Van Der Zande, W.J. Koot, W. Peterson, J.R. Los, J.
Chem. Phys. Letters 140 (1987) 175 - 180
Charge exchange of O^{2+} with Cs : spectroscopy and predissociation pathways for the π_g Rydberg states of O_2.
$O_2^{+}(X^2\pi_g) + Cs \rightarrow O_2(^1\pi,^3\pi_g)$
translational energy spectroscopy

-> 0.1 keV/amu
Vibrationally separated states determined

93
87E73 Van Zyl, B. Gealy, M.W. Neumann, H.
Phys. Rev. A 35 (1987) 4551 - 1560
Lyman-α emission from H^+ impact on rare-gas atoms.
H^+ + B -> H(2p,Lyman-α) + B^+ (B= He,Ne,Kr,Xe)
0.01 - 2 keV/amu
polarization of Lyman-α lines

94
87E74 Varghese, S.L.
Nucl. Instr. Meth. in Phys. Res.B 24 (1987) 115 - 118
Electron capture phenomena in proton-atom and proton-molecular collsions.
H^+ + Li -> H + Li^+; H^+ + B -> H^+ + B^+
(B = CH_4,C_2H_2,C_2H_4,C_2H_6,C_3H_6,$(CH_2)_6$,C_3H_8,C_4H_8,O_2,CO,CO_2)
growth
0.26 - 3.85 keV/amu (Li); 800 - 3000 keV/amu (B)

95
87E77 Wang, H.Y. Church, D.A.
Phys. Rev. A 36 (1987) 4261 - 4266
Electron transfer collisions of low energy multicharge nitrogen ions with H_2 and N_2.
N^{q+} (q= 2,3,4) + B -> $N^{(q-1)+}$ (B= H_2,N_2)
trapping technique
10^{-4} keV/amu
rate coefficients

96
87E75 Wang, Y. Champion, R.L. Doverspike, L.D.
Phys. Rev. A 35 (1987) 1503 - 1509
Slow collisions of H^- and D^- with Na and K.
H^-,D^- + Na,K -> H,D
growth method
$2x10^{-3}$ - 0.3 keV/amu
electron capture, detachment cross sections

97
87E76 Wang, Y. Champion, R.L. Doverspike, L.D.
Phys. Rev. A 36 (1987) 381 - 383
Slow collisions of H^- and D^- with Cs.
H^-,D^- + Cs -> H,D + Cs^+; H,D, + e + Cs
condenser
$3x10^{-3}$ - 0.25 keV/amu

98
87E98 Warczak, A.
Comm. At. Mol. Phys. 20 (1987) 19 - 34
Pre-collision and post-collisional capture; crucial phenomena for inner-shell processes in very heavy systems.
review

99
87E99 Winter, H. Mack, M. Hoekstra, R. Niehaus, A. de Heer, F.J.
Phys. Rev. Letters 58 (1987) 957
Comment on "Evidence for correlated double-electron capture in low-energy collisions of O^{6+} with He".
O^{6+} + He -> O^{4+} + He^{2+}
short comment

100
87E103 Witte, R. Campbell, E.E.B. Richter, C. Schmidt, H. Hertel, I.V.
Z. Phys. D 5 (1987) 101 - 111
Alignment and orientation effects in resonant charge exchange from laser excited $Na^*(3p)$.
Na^+ + $Na^*(3p)$

laser-excited atom target
$2x10^{-3}$ - $4x10^{-3}$ keV/amu

101
87E100 Yenen, O. Jaecks, D.H. Martin, P.J.
Phys. Rev. A. 36 (1987) 1517 - 1521
Quasidiatomic study of Ly-alpha producing H_2^+-Ne collisions at keV.
H_2^+ + Ne -> H^* + H^+-> Ly-alpha
photon-particle (H,H^+) coincidence technique
2.5keV/amu
direction excitation with subsequent dissociation is more likely than electron capture followed by dissociation.

102
87E78 Yousif, F.B. Lindsay, B.G. Simpson, F.R. Latimer, C.J.
J. Phys. B 20 (1987) 5079 - 5088
Dissociative ionization and charge transfer in He^+ - O_2 collisions.
He^+ + O_2 -> He + $O_2^+(c^4\Sigma_u^-, B^2\Sigma_g^-)$
TOF with dissociated ions
0.7 - 4 keV/amu
Energy and angular distribution of dissociated ions

103
87E79 Zouros, T.J. Schneider, D. Stolterfoht, N.
Phys. Rev. A 35 (1987) 1963 - 1966
Production of $(2s^2)^1S$, $(2p^2)^1D$ and $(2s2p)^1P$ states by double electron capture in 150 - 500 keV $^3He^{2+}$ + He collisions.
$^3He^{2+}$ + He -> He^0 + He^{2+}
o-degree angular spectroscopy
50 - 166 keV/amu

1
88E 1 Andersson, H.A. Astner, G. Cederquist, H.
J.Phys.B 21 (1988) L187 - 93
Total cross sections for different charge changing processes in collisions of highly charged Xe ions with He atoms at low energy.
$Xe^{q+}(q = 11 - 31) + He \rightarrow Xe^{q'}(q' = q-1, q-2) + He^{s+}(s = 1,2)$
coincidence technique
$3x10^{-2}$keV/amu

2
88E 2 Anholt, R. Xu, X.Y. Stoller, Ch. Molitoris, J.D. Meyerhof, W.E.
Phys.Rev.A 37 (1988) 1105 - 1114
Intermediate-velocity atomic collisions; electron capture and loss in 10 - 42 MeV C ions.
$C^{q+}(q = 6,5,4,3) + B \rightarrow C^{(q-1)}(B = H_2,He,N_2,O_2,Ne,Ar,Kr,Xe)$
$C^{5+} + B \rightarrow C^{6+}$
Glauber theory for ionization; eikonal approxmation for electron capture.
833 - 2100 keV/amu
equilibrium-charge distributions calculated from observed data.

3
88E 3 Baker, O.K. Meyerhof, W.E. Spooner, D.W. Stoller, Ch. Scheurer, J.N.
Phys.Rev.Letters. 60 (1988) 913 - 916
Nuclear resonance effect in atomic electron capture by protons.
$H^+ + {}^{22}Ne \rightarrow H + Ne^+$
1500 keV/amu

4
88E61 Barat, M.
Com.At.Mol.Phys. 21 (1988) 307 - 319
Multiple electron capture processes by highly charged ions.
review

5
88E 4 Benoit-Cattin, P. Bordenave-Montesquieu, A. Boudjema, M. Gleizes, A. Dousson, S. Hitz, D.
J.Phys.B 21 (1988) 3387 - 3416
Multiple capture in N^{7+} + Ar investigated by electron spectroscopy (70keV,Θ=10).
$N^{7+} + Ar,He,H_2 \rightarrow N^{5+}(nl,n'l')$ (n = 2,3,4)
electron spectroscopy
5 keV/amu
no cross sections given ; electron peaks assigned to (nln'l')

6
88E 5 Bouchama, T. Druetta, M. Martin, S.
Nucl.Instr.Meth. in Phys.Res.B 31 (1988) 371 - 373
Subshell selective electron capture in collision of O^{q+}(q = 6,7) with H_2,He at 10q keV.
$O^{6+} + H_2 \rightarrow O^{5+}(1s^2nl; n = 3,4); O^{7+} + H_2,He \rightarrow O^{6+}(1s\ nl; n = 3,4)$
photon spectroscopy
3.75 - 4.4 keV/amu

7
88E 6 Brechignac, C. Cahuzac, Ph. Leygnier, J. Pflaum, R. Weiner, J.
Phys.Rev.Letters 61 (1988) 314 - 317
Direct observation of charge-exchange collisions between mass-selected $(Na)_n^+$ clusters and Cs atoms.
$(Na)_n^+ + Cs \rightarrow (Na)_n + Cs^+$ (n = 1 - 21)
TOF
0.05 keV/amu
total cross sections (40 -20 A^2 for n = 1 - 20)

8
88E10 Castro Faria, N.V. Freire, F.L. de Pinho, A.G.
Z.Phys.D 8 (1988) 167 - 170
He^- formation by two-and three-electron capture.

$He^{2+}, He^+ + B \rightarrow He^-$ (B = He,Ne,Ar,Kr)
growth method
187 - 1000 keV/amu

9
88E 9 Castro Faria, N.V. Freire, F.L. de Pinho, A.G.
Phys.Rev.A 37 (1988) 280 - 283
Electron loss and capture by fast helium ions in noble gases.
$He^{2+} + B \rightarrow He^+, He^0$; $He^+ + B \rightarrow He^0$(B = He,Ne,Ar,)
$He^+ + B \rightarrow He^{2+}$ (B = He,Ne,Ar,Kr)
growth/attenuation method
187 - 1000 keV/amu
total cross sections

10
88E 7 Chiu, Y.N. Friedrich, B. Maring, W. Niedner, G. Noll, M. Toennies, J.P.
J.Chem.Phys. 88 (1988) 6814 - 6830
Charge transfer and structured vibrational distributions in $H^+ + CH_4$ low-energy collisions.
$H^+ + CH_4 \rightarrow H^+$(elastic); $H + CH_4^+, CH_3^+, CH_2^+$
crossed beam technique + TOF(energy loss measurement)
10^{-2} - $3x10^{-2}$ keV/amu
elastic scattering : Θ = 0 - 10 : $CH_4^+:CH_3^+:CH_2^+$ = 74:22:4 at 30 eV

11
88E 8 Church, D.A.
Phys.Scripta T 22 (1988) 164 - 170
Studies of ion collisions in ion traps.
$N^{3+} + H_2 \rightarrow N^{2+} + H_2^+$
Penning ion trap
10^{-4} keV/amu
a review on low energy electron transfer.

12
88E11 Engelhardt, C.L. Jaecks, D.H.
Phys.Rev.A 37 (1988) 1041 - 1043
Isotopic velocity-dependent effects in $He^+ + H_2$ or D_2 collisions.
$He^+ + H_2(D_2) \rightarrow He(3^3P;\ m_l=1) + H_2^+(D_2^+)$
0.25 - 3 keV/amu
rotational coupling in united-atom

13
88E12 Ferguson, F.E. Richter, R. Lindinger, W.
J.Chem.Phys. 89 (1988) 1445 - 2447
Competitive charge-transfer and vibrational quenching of $N_2^+(X,v=1)$ in collisions with O_2 and NO.
$N_2^+(X,v=1) + O_2 \rightarrow N_2 + O_2(a^4\Pi_u)$
$N_2^+(X,v=1) + NO \rightarrow N_2 + NO^+(a\ ^3\Sigma^+)$
$3x10^{-6}$ - $3.6x10^{-5}$ keV/amu
rate constants $N_2^+(X,v=1) + B \rightarrow N_2^+(X,v=0) + B$ (B = O_2,NO)
also investigated.

14
88E13 Finck, K. Wang, Y. Roller-Lutz, Z. Hutz, H.O.
Phys.Rev.A 38 (1988) 6115 - 6119
Lyman-alpha emission in collisions of H^+ ions with Na(3s) and laser-assisted Na(3p) atoms
H^+ + Na(3s,3p) -> H(2p)
growth method
0.5 - 10 keV/amu

15
88E14 Gay, T.J. Redd, E. Blankenship, D.M. Park, J.T. Peacher, J.I. Seely, D.G.
J.Phys.B 21 (1988) L467 - 472
Charge transfer in quasi-one-electron systems at 'high' energy.
Mg^+ + He -> Mg; Be^+ + He -> Be
energy-loss spectroscopy
1.25,2.78,6.25 keV/amu(Mg); 6.25 keV/amu(Be)

angle-differential cross sections

16
88E15 Giese, J.P Cocke, C.L. Waggoner, W.T. Pedersen, J.O.K. Kamber, E.Y. Tunnell, L.N.
Phys.Rev.A 38 (1988) 4494 - 4503
Non-Franck-Condon transitions in two-electron capture from D_2 by low-energy, highly charged Ar projectiles.
$Ar^{5+} + D_2 \rightarrow Ar^{3+} + D^+ + D^+$
projectile-break-up proton coincidence
1.25×10^{-2} - 0.25 keV/amu

17
88E16 Guyon, P.M. Baer, T. Cole, S.K. Govers, T.R.
Chem.Phys. 119 (1988) 145 - 158
The electron transfer and collision-induced dissociation cross section of state -selected H_2^+ and D_2^+ ions.
H_2^+, D_2^+(v=1-10) + $H_2 \rightarrow H_2, D_2 + H_2^+$; $H^+ + H, D^+ + D$
TREPICO
- 10^{-2} keV/amu
collision-induced dissociation > charge transfer for high v
the reverse for low v.

18
88E19 Hadman, M. Jonathan, P. Kingston, R.G. Brenton, A.G.
Int.J.Mass Spec.Ion Proc. 83 (1988) 331 - 338
Single-electron capture by $Cl^{2+}(^4S, ^2D, ^2P)$ from rare-gas targets.
$Cl^{2+} + B \rightarrow Cl^{2+*}, Cl^+$ (B = He,Ne,Ar,Kr,Xe); $Cl^+ + He \rightarrow Cl^{+*}$
translation energy spectroscopy
0.17 keV/amu
only energy spectra for identification of levels $Cl^{2+}(^4S)$ and metastable($^2D, ^2P$) states contained.

19
88E17 Hamdan, M. Lee, A.R. Branton, A.G.
J.Phys.B 21 (1988) L561 - 566
Fine-structure translations in collisions of Xe^{2+}, Xe^{3+} and Xe^{4+} ions with He atoms.
$Xe^{2+}(^3P_J, ^1D_2), Xe^{3+}(^4S_{3/2}, D_J, ^2P_J), Xe^{4+}(^1D_2) + He \rightarrow Xe^+, Xe^{2+}, Xe^{3+}$
translational energy spectroscopy
0.04 keV/amu
no cross sections given; only translational energy spectra.

20
88E18 Hamdan, M. Mazumdar, S. Marathe, V.R. Badrinathan, C. Brenton, A.G. Mathur, D.
J.Phys.B 21 (1988) 257 - 284
Excited states of XH^{2+}(X = C,N,O,S) ions : a combined experimental and theoretical study.
$XH^{2+} + He \rightarrow XH^+$(X = C,N,O,S)
translational energy spectroscopy
0.2 - 0.5 keV/amu

21
88E62 Henri, G. Lavollee, M. Dutuit, O. Ozenne, J.B. Guyon, P.M. Gislason, E.A. E.A.
J.Chem.Phys. 88 (1988) 6381 - 6389
State-selected ion-molecule reactions ; $N_2^+(v) + H_2 \rightarrow N_2 + H_2^+$ and $Ar^+(^2P_J) + H_2 \rightarrow Ar + H_2^+$.
$N_2^+(v) + H_2 \rightarrow N_2 + H_2^+$: $Ar^+(^2P_J) + H_2 \rightarrow Ar + H_2^+$
TPEPICO
3.7×10^{-4} - 5.2×10^{-4} keV/amu

22
88E21 Hippler, R. Datz, S. Miller, P.D. Dittner, P.F Pepmiller, P.F.
Z.Phys.D 8 (1988) 163 - 166
Doble and single electron capture and loss in 0.5 - 2.5 MeV/u O^{q+} + Ne (q=5,7,9) collisions.

O^{q+}(q = 5,7,9) + Ne -> $O^{(q-2)+}, ^{(q-1)+}, ^{(q+1)+}, ^{(q+2)+}$
growth
$0.5x10^3$ - $2.5x10^3$ keV/amu
total cross sections

23
88E20 Hippler, R. Datz, S. Krause, H.F. Miller, P.D. Pepmiller, P.L. Dittner, P.F.
Phys.Rev.A 27 (1988) 3201 - 3203
Partial cross sections for electron capture into specific n states for 0.1 - and 0.25 -MeV/nucleon I^{q+} - H_2 collisions (q = 12 -18)
I^{q+}(q = 12 - 18) + H_2 -> $I^{(q-1)+}(n)$
photon spectroscopy
10^2,$2.5x10^2$ keV/amu
strong core-effect

24
88E60 Hird, B. Rahman, F. Orakzai, M.W.
Can.J.Phys. 66 (1988) 973 - 977
Electron capture and loss by fast fluorine atoms in collisions with rare gas targets
F + B -> F^-,F^+ (B = He,Ne,Ar,Kr,Xe)
groeth method
1 - 5.9 keV/amu

25
88E22 Hird, B. Rahman, F. Orakzai, M.W.
Phys.Rev.A 37 (1988) 4620 - 4624
Ion-production cross sections in chlorine-rare gas collisions.
Cl^- + B => Cl,Cl^+ (B = He,Ne,Ar,Kr,Xe)
growth method
0.31 - 3.2 keV/amu
total cross sections

26
88E23 Hoekstra, R. Ciric, D. Zimoviev, A.N. Gordeev, Yu.S. De Heer, F.J. Morgenstern, R.
Z.Phys.D 8 (1988) 57 - 61
Emission cross sections for fully stripped carbon colliding atomic hydrogen.
C^{6+} + H -> C^{5+}(n,n') + H^+ (n-n' = 4-2; 4-3; 3-2; 5-2; 5-3; 7-6; 8-7)
photon-spectroscopy

27
88E24 Howard, S. Rockwood, A. Anderson, S. Howorka, F. Futrell, J.
Phys.Rev.A 37 (1988) 3211 - 3216
Crossed-beam study of the charge-transfer reaction of helium ions with xenon.
He^+ + Xe -> He + Xe^+
crossed-beam technique
$1.3x10^{-3}$ - $2.4x10^{-2}$ keV/amu
6s $^4P_{1/2}$ dominant; no cross sections given

28
88E25 Huq, M.S. Champion, R.L. Doverspike, L.D.
Phys.Rev.A 37 (1988) 2349 - 2353
Low-energy collisions of O^{2+} with atoms and molecules.
O^{2+} + B -> O^+ + B^+ (B = He,Ne,Ar,H_2,D_2,N_2,O_2)
retarding method
$1.8x10^{-4}$ - $2.5x10^{-3}$ keV/amu
only total cross section

29
88E26 Jonathan, P. Hamdan, M. Brenton, A.G. Willett, G.D.
Chem.Phys. 119 (1988) 159 - 170
Translational spectroscopy of the triatomic dications CO^{2+}_2,$OCSs^{2+}_2$ and CS^{2+}_2.
A^{2+} + B -> A^+ + B^+ (A = CO_2,OCS,CS_2; B = rare gases)
translational energy spectroscopy

30
88E27 Kamber, E.Y. Hormis, W.G. Hasted, J.B. Brenton, A.G. Beynon, J.H.
J.Phys.B 21 (1988) 3423 - 3438
Multiple-electron capture processes by multiply charged ions from rare-gas atoms at low velocities.
Kr^{5+} + He,Ne,Ar -> Kr^{4+}; Kr^{5+} + Ne -> Kr^{3+}; Kr^{3+} + Ar,Kr,Xe -> Kr^{+}
Kr^{4+} + Ar,Kr -> Kr^{+}; Xe^{3+} + Ar -> Xe^{+}; Xe^{4+} + Ne,Ar -> Xe^{2+}
Xe^{4+} + Kr -> Xe^{+}
translational energy spectroscopy
energy spectra only. crossing radius estimated.

31
88E63 Kamber, E.Y.
J.Phys.B 21 (1988) 4185 - 4203
State-selective single- and double-electron capture by Ar^{4+} and Ar^{5+} ions from rare-gas atoms.
Ar^{q+} + B -> $Ar^{(q-1)+}$ (q = 4,5 ; B = He,Ne,Ar,Kr)
translational energy spectroscopy
0.3 keV/amu
no cross sections ; only possible channels

32
88E28 Kaname, R. Ushijima, Y. Kitsukawa, M. Kitaguchi, M. Nagata, T.
J.Phys.Soc.Japan 57 (1988) 1212 - 1219
Total cross sections for collisional quenching of H(2s) atom in molecular targets.
H(2s) + B -> sum(H^{+} + H^{-} + H(1s))
(B = H_2,N_2,O_2,CO,CO_2,CH_4)
beam attenuation technique
0.2 - 3.5 keV/amu

33
88E29 Koslowski, H.R. Huber, B.A. Staemmler, V.S.
J.Phys.B 21 (1988) 2923 - 2937
Angular distribution of Ar^{+} ions resulting from single-electron capture in Ar^{2+} - He collisions.
Ar^{2+} + He
translational energy spectroscopy
9.9×10^{-3} keV/amu
only relative angular differential cross sections.

34
88E30 Kushawaha, V. Michael, A. Mahmood, M.
Phys.Rev.A 38 (1988) 1809 - 1818
Collisional studies involving N^{+} and N_2^{+} ion and HgX_2 (X = Cl,Br,I)
A^{+} + HgB_2 -> A + HgB_2^{+} (A = N,N_2; B = Cl,Br,I)
photon spectroscopy
3.6×10^{-5} - 6.4×10^{-2} keV/amu
total cross sections; partial cross sections.

35
88E31 Lembo, L.J. Dazmann, K. Stoller, Ch. Meyerhof, W.E. Hansch, T.W.
Phys.Rev.A 37 (1988) 1141 - 1451
Core effect on the polarization of optical Rydberg transitions following electron capture into slow, highly ionized neon recoil ions.
Ne^{q+}(q = 5 - 10) + Na -> $Ne^{(q-1)+}$
photon-spectroscopy (visible,near UV)
0.2 keV/amu
emission cross sections determined (sharp variation at q = 7 and 8)

36
88E32 Lindsay, B.G. Latimer, C.J.
J.Phys.B 21 (1988) 1617 - 1625
Some state-selected charge transfer processes involving 10 - 1500 eV rare-gas ions and simple molecules.
$Ar^{+}(^2P_{1/2},^2P_{3/2})$ + H_2,N_2,CO -> $Ar(^1S_0)$;
$Kr^{+}(^2P_{1/2},^2P_{3/2})$ + CO -> $Kr(^1S_0)$

PEPICOO
relative cross sections

37
88E33 Martinez, H. Cisneros, C. De Urquijo, J. Alvarez, I.
Phys.Rev.A 38 (1988) 51914 - 51916
Absolute cross section measurements of the direct charge transfer of He^+ in neon in the energy range 0.5 - 5 keV
$He^+ + Ne \rightarrow He + Ne^+$
growth method
0.125 - 1.25 keV/amu

38
88E34 Martinez, R.I. Dheandhanoo, S.
Int.J.Mass Spec.Ion Proc. 84 (1988) 1 - 16
Absolute cross section measurements in XQA instrument : $Ar^+ + N_2 \rightarrow Ar + N_2^+$
$Ar^+ + N_2 \rightarrow Ar + N_2$
triple quadrupole tandem mass spectrometer
$1.25x10^{-4}$ - $1.5x10^{-3}$ keV/amu

39
88E35 Meyer, F.W. Griffin, D.C. Havener, C.C. Hug, M.S. Phaneuf, R.A. Swenson, J.K. Stolterfoht, N.
Phys.Rev.Letters 60 (1988) 1821 - 1824
Population of high-angular-momentum states in low-energy double-electron-capture collisions of O^{6+} with He
$O^{6+} + He \rightarrow O^{4+}(1s^2 2pnl;\ n = 6,7;\ l = 0 - 5\ )$
electron spectroscopy
1.88 - 6.6 keV/amu
relative cross sections for (n,l) distribution

40
88E36 Mokler, P.H. Reusch, S.
Z.Phys.D 8 (1988) 393 - 394
Comments on correlated electron capture in relativistic, high charge, heavy ions
$A^{(Z-3)+} + H_2 \rightarrow A^{(Z-2)+*}$ (A = S,Ti,Ge,Xe,Pb)
RTE scaling for Li-like ions

41
88E64 Montenegro, E.C. Xu, X.Y. Meyerhof, W.E. Anholt, R.
Phys.Rev.A 38 (1988) 3357 - 3364
Intermediate-velocity atomic collisions IV. Ar K-shell ionization and capture by C^{5+} and C^{6+} ions.
$C^{5+,6+} + Ar \rightarrow C^{4+,5+}(K) + Ar^+(K^{-1})$; $C^{5+} + Ar \rightarrow C^{6+}$
X-ray spectroscopy
$1.8x10^3$, $3.5x10^3$ keV/amu
K-shell ionization cross section

42
88E37 Montenegro, E.C. Xu, X.Y. Meyerhof, W.E. Anholt, R. Danzmann, K. Schlachter, A.S. Rude, B.S. McDonald, R.J.
Phys.Rev.A 38 (1988) 1854 - 1859
Intermediate-velocity atomic collisions III. electron capture in 8.6 MeV/amu Ca ions
Ca^{q+}(q = 18,19,20) + B $\rightarrow Ca^{(q-1)+}$ + B^+ (B = H_2,He,N_2,Ne,Ar,Kr,Xe)
growth/K-X-ray coincidence
8600 keV/amu
total cross sections and K-capture cross sections (K-X-ray coincidence)

43
88E38 Mowat, J.R.
Phys.Scripta T22 (1988) 171 - 177
Ion-ion collisions and ion storage rings
review

44

88E39 Oza, D.H. Benoit-Cattin, P. Bordenave-Montesquieu, A. Boudjema, M. Gleizes, A.
J.Phys.B 21 (1988) L131 - 137
Autoionization of $N^{5+}(3ln'l')$ for n'= 3 - 10 : experiment and theory
N^{7+} + B -> $N^{5+}(3ln'l')$ + B^{2+} -> $N^{6+}(2l)$ + e + B^{2+} (B = H_2,He,Ar)
electron spectroscopy : pseudo-state close coupling calculation
electron energies

45
88E40 Penent, F. Champion, R.L. Doverspike, L.D. Esaulov, V.A. Grouard, J.P. Hall, R.I. Montmagnon, J.L.
J.Phys.B 21 (1988) 3375 - 3386
Positive ion production in halogen negative ion collisions.
F^- + B -> F^0,F^+ (B = N_2,Ne); Cl^- + Ar -> Cl^0,Cl^+
growth + electron spectroscopy
$4x10^{-4}$ - $1x10^{-2}$ keV/amu(F); $1.6x10^{-3}$ - $7x10^{-3}$ keV/amu(Cl)

46
88E41 Pommier, J. Kubach, C. Tuan, V.N. Reynaud, C.
J.Phys.B 21 (1988) L665 - 670
Angular analysis in the 100 - 1500 eV energy range
He^+ + Na -> $He^*(2^3S,2^1S,2^3P,2^1P)$ + Na^+
TOF
0.025 - 0.375 keV/amu
= 0 - 4^0

47
88E42 Rajgara, F.A. Badrinathan, C. Mathur, D.
Int.J.Mass Spectrosc.Ion Proc. 85 (1988) 229 - 236
Absolute cross-sections for state-diagnosed electron capture by N^{2+*} ions from molecular hydrogen
$N^{2+*}(2p\ ^2P_{1/2})$ + H_2 -> $N^+(2p^2\ ^1S_2,{}^1D_2;\ 2p^3\ ^3D_3)$
translational energy spectroscopy
0.036 - 0.36 keV/amu
H_2^+ and H^+ + H are distinguished.

48
88E65 Royer, T. Dowek, D. Houver, J.C. Pommier, J. Andersen, N.
Z. Phys. D 10 (1988) 45 - 57
Collision spectroscopy with aligned and oriented atoms I. charge transfer in H^+-Na(3s,3p) collisions.
H^+ + Na(3s,3p) -> H
TOF energy-loss spectroscopy + laser-excited atom target
0.3 - 3 keV/amu

49
88E43 Schlachter, A.S. Bernstein, E.M. Clark, M.W. DuBois, R.D. Graham, W.G. McFarland, R.H. Morgen, T.J. Mueller, D.W. Stockli, M.P Tanis, J.A.
J.Phys.B 21 (1988) L291 - 297
Multiple-electron capture in close nearly symmetric ion-atom collisions
Ca^{17+} + Ar -> $Ca^{(17-r)+}$ (r = 1 - 5)
X-ray-ion coincidence technique
$1.17x10^3$ keV/amu

50
88E44 Schmidt-Böcking, H. Prior, M.H. Dörner, R. Berg, H. Pedersen, J.O.K. Cocke, C.L. Stockli, M. Schlachter, A.S.
Phys.Rev.A 37 (1988) 4640 - 4648
Angular dependence of multiple-electron capture in 90 keV Ne^{7+} - Ne collisions
Ne^{7+} + Ne -> Ne^{r+} + Ne^{p+} (r = 6 - 2; p = 1 - 6)
recoil ion-scattered particle coincidence
angular distributions over 1 - 20 mrad.; no cross sections given

51
88E45 Schönfeldt, W.A. Mokler, P.H. Maor, D.
Z.Phys.D 9 (1988) 47 - 57
Charge transfer in 1.4 MeV/amu Ni^{q+} -> Kr collisions , q = 16 - 22

Ni^{q+}(q = 19 - 22) + Kr -> $Ni^{q'+}$
X-ray measurement
1400 keV/amu
total cross sections

52
88E46 Schuch, R. Schöne, H. Miller, P.D. Krause, H.F. Dittner, P.F. Datz, S. Olson, R.E.
Phys.Rev.Letters 60 (1988) 925 - 928
Charge-and angle-correlated inelasticities in collisions of bare fast carbon ions with neon
C^{6+} + Ne -> C^{5+} + Ne^{4+}; C^{5+} + Ne^{+}; C^{6+} + Ne^{4+}; C^{6+} + Ne^{+}
scattered projectile-recoil ion coindence
833 keV/amu
angular differential cross section

53
88E47 Schulz, M. Schuch, R. Datz, S. Justiniano, E.L.B. Miller, P.D. Schöne, H.
Phys.Rev.A 38 (1988) 5454 - 5457
Resonant transfer and excitation in Li-like F colliding with H_2
F^{6+} + H_2 -> F^{5+}(1s2snln'l') + H_2^{2+}
X-ray-projectile coincidence
789 - 1713 keV/amu

54
88E48 Schweinger, J. Jellen-Wutte, U. Vanek, W. Winter, H. Hansen, J.E.
J.Phys.B 21 (1988) 315 - 328
Correlated transitions in low-energy single-electron capture from Li(2s) by Ne^{2+} and Ar^{2+}
A^{2+} + Li(2s) -> A^{+}(nl) (A = Ne,Ar)
translational energy spectroscopy
no cross sections. identification of various channels

55
88E49 Sedgwick, J.B. Nelson, I.R. Jordan, C.A. Abbey, L.E. Xu, Y. Moran, T.F.
Chem.Phys.Letters 146 (1988) 113 - 120
Resonant and near-resonant charge transfer reactions of gaseous organic ions
$C_nH_mN_p^+$ + C_4H_5N -> $C_nH_mN_p^0$ + $C_4H_5N^+$ (n = 2,3,4; m = 3,4,5; p = 0,1)
TOF
$4x10^{-2}$ keV/amu

56
88E50 Suraud, M.G. Bonnet, J.J. Bonnefoy, M. Chassevent, M. Fleury, A. Bliman, S. Dousson, S. Hitz, D.
J.Phys.B 21 (1988) 1219 - 1228
X-ray emission spectroscopy of one-electron capture into Li-like radiative N^{4+}(1s2ln'l') configurations by metastable N^{5+}(1s2s ^{3}S) ions in collisions with He and H_2 at 3.4 keV/amu
N^{5+}(1s2s ^{3}S) + H_2,He -> N^{4+}(1s2ln'l')
photon spectroscopy
3.4 keV/amu
no cross section given

57
88E51 Tabata, T. Ito, R. Nakai, Y. Shirai, T. Sataka, M. Sugiura, T.
Nucl.Instr.Meth. in Phys.Res.B 31 (1988) 375 - 381
Analytic cross sections for charge transfer of hydrogen atoms and ions colliding with metal vapors
H^{q+}(q = 1,0,-1) + B -> H^{p+} (B = Li,Na,Mg,Ca,Sr,Cs)
analytical fitting

58
88E52 Tsurubuchi, S. Arikawa, T.
J.Phys.Soc.Japan 57 (1988) 1220 - 1225
Excitation of Li(2p) in collisions of Li^{+} with Ar and Kr atoms
Li^{+} + Ar,Kr -> Li^{+}(2p->2s; 3d->2p)

photon spectroscopy
5.7×10^{-2} - 0.57 keV/amu

60
88E53 Underwood, T.A. Breinig, M. Gaither III, C.C. Freyon, J.
Phys.Rev.A 38 (1988) 6138 - 6142
Cusp-electron production in pure-target-ionization and transfer-ionization events for 0.1 MeV/u I^{13+} projectiles on He and H_2 targets
I^{13+} + H_2,He -> I^{12+}; I^{12+} + H_2,He -> I^{11+}
growth method
100 keV/amu
cusp cross sections

61
88E54 Van Zyl, B. Neumann, H.
J.Geophys.Res. 93 (1988) 1023 - 1027
Lyman α emission cross sections for low-energy H and H^+ collisions with N_2 and O_2
H + B -> $H^*(2p)$; H^+ + B -> $H^*(2p)$ (B = N_2,O_2)
Lyman α detection
0.04 - 2.5 keV/amu

62
88E55 Vermeeren, L. De Bisschop, P. Lievens, P. Silverans, R.E.
J.Phys.B 21 (1988) 3417 - 3422
Velocity dependence of neutralization cross sections in collisions of ground state K^+,Rb^+,Sr^+ and metastable $Sr^+(4d)$ ions with Na atoms
K^+,Rb^+,Sr^+,$Sr^+(4d)$ + Na -> K,Rb,Sr,Sr

63
88E56 Vernhet, D. Chetioui, A. Rozet, J.P. Stephan, C. Wohren, K. Touati, A. Politis, M.F. Bouisse, P. Hitz, D. Doussen, S.
J.Phys.B 21 (1988) 3949 - 3968
Characteristics of single capture nl distributions and double capture probabilities in slow collisions of Al^{13+},Al^{12+} and Ne^{9+} ions with two-electron targets (He,H_2)
Ne^{9+} + B -> $Ne^{8+}(nl)$; Al^{12+} + H_2,He -> $Al^{11+}(nl)$; Al^{13+} + He -> $Al^{12+}(nl)$
photon spectroscopy
4 keV/amu
average <l>; double electron capture probabilities

64
88E57 Waggoner, W. Cocke, C.L. Tunnell, L.N. Havener, C.C. Meyer, F.W. Phaneuf, R.A.
Phys,Rev.A 37 (1988) 2386 - 2392
Angular distributions for electron capture from He by multiply charged C,N,O,F and Ne ions
C^{5+},N^{5+},O^{5+},N^{6+},O^{6+},F^{6+},Ne^{6+},O^{7+},F^{7+},N e^{8+} + He -> $A^{(q-1)+}$
angular scattering spectroscopy
0.37 - 1.3 keV/amu
differential cross sections in angle

65
88E58 Wilson, S.M. McCullough, R.W. Gilbody, H.B.
J.Phys.B 21 (1988) 1027 - 1035
State-selective electron capture by slow O^{3+} amd Ne^{3+} recoil ions in H

$O^{3+}(2s^2 2p)^2P^0$ + H -> $O^{2+}(2s^2 2pnl)$ + H^+ (n = 2,3);
$Ne^{3+}(2s^2 2p^3 nl)^4S^0$ + H -> $Ne^{2+}(2s^2 sp^3 nl)$ + H^+ (n = 3)
translational energy spectroscopy
0.26 - 0.75 keV/amu(O); 0.09 - 0.7 keV/amu(Ne)

66
88E59 Zouros, T.J.M. Schneider, D. Stolterfoht, N.
J.Phys.B 21 (1988) L671 - 676
State-selective observation of resonant and non-resonant transfer-excitation in 50 - 500 keV $^3He^+$ + H_2 collisions
He^+ + H_2 -> $He^{**}(2lnl')$ + H_2^+
zero-degree electron spectroscopy
12.5 - 125 keV/amu

1
89E 1 Andersson, L.R. Pedersen, J.O.P. Barany, A. Bangsgaard, J.P. Hvelplund, P.
J.Phys.B 22 (1989) 1603 - 1621
Angular scattering effects in energy-gain spectra of A^{6+} (A = Ne,Ar,Kr,Xe) one-electron capture from He.
A^{6+} + He -> A^{5+} (A = Ne,Ar,Kr,Xe)
energy-gain spectroscopy
$1.5x10^{-3}$ - $1x10^{-1}$ keV/amu
Ar^{6+} + He -> Ar^{5+} (4p,4s,3d) : T: semi-classical multi-state collision model

2
89E 2 Ashburn, J.R. Cline, R.A. Stone, C.D. van der Burgt, P.J. Westveld, W.B. Risley, J.S.
Phys.RevA 40 (1989) 4885 - 4901
Experimental determination of the H(n = 3) density matrix for 80 keV H^{+} on He.
H^{+} + He -> H(n = 3) + He^{+}
photon-polarization technique
80 keV

3
89E 4 Aumayr, F. Schweinzer, J. Winter, H.
J.Phys.B 22 (1989) 1027 - 1034
State-selective electron capture in He^{2+} - Li collisions studied jointly by photon and translational energy spectroscopy.
He^{2+} + Li -> He^{+}(n = 2,3,4,5)
photon spectroscopy + translational energy spectroscopy / coincidence
0.7 - 14 keV/amu
n = 3 dominant at low energies ; emission cross section for He^{+} 468.6 nm.

4
89E 3 Aumayr, F. Winter, H.
Phys.Scripta T 28 (1989) 96 - 100
Experimental investigations on electron capture in the presence of metastable ion beam fractions.
translational energy spectroscopy
a review on techniques for determining metastable beam fractions .

5
89E 5 Bangsgaard, J.P. Hvelplund, P. Pederson, J.O.P. Andersson, L.R. Barany, A.
Phys.Scripta T 28 (1989) 91 - 95
Energy-gain spectroscopy studies of O^{q+}(q = 2 - 5) collisions with He atoms.
O^{q+}(q = 2,3,4,5) + He -> $O^{(q-1)+}$(nl)
translational energy spectroscopy
$1.5x10^{-2}$ - 0.1 keV/amu

6
89E 6 Ben-Itzhak, I. Mann, A. Meron, M. Rosner, B.
Phys.Rev.A 40 (1989) 2928 - 2934
Single- and double-electron capture probabilities in close sub-MeV collisions of He^{2+} on Ar and N_2.
He^{2+} + B -> He^{2+},He^{+},He^{0} (B = Ar,N_2)
scattering technique
10^{2} - $2.5x10^{2}$ keV/amu
scattered angles at 0.7°,1° : T: Bohr-Lindhard model

7
89E7 Bernstein, E.M. Clark, M.W. Tanis, J.A. Woodland, W.T. Berkner, K.H. Schlachter, A.S. Stearns, J.W. DuBois, R.D. Graham, W.G. Muller, D.W. Stockli, M.P.
Phys.Rev.A 40 (1989) 4085 - 4088
Test of predicted Δn≥1 L-shell dielectronic recombination cross sections.
Nb^{q+}(q = 28 - 32) + H_2,He -> $Nb^{(q-1)+}$ + hν
X-ray-projectile coincidence
3.7 - 4.0x10^3 keV/amu
RTE

8
89E 8 Bliman, S. Suraud, M.G. Hitz, D. Rubensson, J.E. Nordgren, J. Cornille, M. Indelicato, P. Knystautas, E.J.
J.Phys.B 22 (1989) 3647 - 3655
Spectroscopic study of doubly excited Na-like argon ions.
$Ar^{8+}(2p^5 3s)$ $^3P_{0,2}$ + H_2 -> $Ar^{7+}(2p^5 3lnl')$
photon spectroscopy
2 keV/amu

9
89E 9 Boduch, P. Chantepie, M. Hennecart, D. Husson, X. Kucal, H. Lecler, D. Lesteven-Vaisse, I.
J.Phys.B 22 (1989) L 377 - 380
Photon emission spectroscopy of single and double electron capture in Ar^{8+} - He or H_2 collisions.
Ar^{8+} + B -> Ar^{7+},Ar^{6+} (B = H_2,He)
photon spectroscopy
3.75 keV/amu
no cross sections given : strong Δn=0 transitions (n=5 for single electron capture ; 3dnl-3dnl'(n = 4,5) for double electron capture)

10
89E10 Boman, S.A. Bernstein, E.M. Tanis, J.A.
Phys.Rev.A 39 (1989) 4423 - 4427
Single-electron capture and loss cross sections versus target Z for 1 MeV/u oxygen ions incident on gases.
O^{q+} (q = 5 - 8) + B -> $O^{(q+1)+}$;$O^{(q-1)+}$ (B = D_2,He,Ne,Ar,Kr)
growth method
10^3 keV/amu

11
89E11 Bouchama, T. Druetta, M. Martin, S.
J.Phys.B 22 (1989) 71 - 89
Electron capture into excited states of low energy Kr^{q+} (q = 8 - 7) ions.
Kr^{8+} + He(H_2) -> Kr^{7+}(4snl), Kr^{6+}
photon (VUV) spectroscopy
emission cross sections for various transitions in Kr^{8+},Kr^{7+} impact.

12
89E12 Boudjema, M. Moretto-Capelle, P. Bondenave-Montesquieu, A. Benoit-Cattin, P. Gleizes, A. Bachaus, H. Galan, P. Martin, F. Riera, A. Yanez, M.
J.Phys.B 22 (1989) L 121 - 127
Double electron capture in collisions of the helium-like ions N^{5+},O^{6+} and Ne^{8+} with helium atoms.
$A^{(Z-2)+}(1s^2)$ + He -> $A^{(Z-4)+}(1s^2 3l3l')$ + He^{2+} (A = N,O,Ne)
Electron spectroscopy
5 keV/amu
cross sections for (3l3l') capture

13
89E13 Brower, M.C. Pipkin, F.M.
Phys.Rev.A 39 (1989) 3323 - 3335
Measurement of cross sections for electron capture into n=3 states of hydrogen.
$H^+ + He \rightarrow H(3,L,M_L ; 4,L) + He^+$
micro-wave resonance,optical method
30 - 80 keV/amu
observed Balmer-alpha line

14
89E14 Cederquist, H. Andersson, H. Astner, G. Hvelplund, P. Pedersen, J.O.P.
Phys.Rev.Letters 62 (1989) 1465 - 1468
Evidence for radiative stabilization of two-electron transfer process in slow Xe^{q+}-Xe ($15 \le q \le 35$) collisions.
$Xe^{q+} + Xe \rightarrow Xe^{(q-2)+} + Xe^{2+}$ (q = 15 - 35)
translational energy spectroscopy
3.1×10^{-2} q keV/amu
radiative stabilization for high q ions

15
89E15 Cederquist, H. Liljeby, L. Biedermann, C. Levin, J.C. O, C.S. Rothard, H. Groeneveld, K.O. Vane, C.R. Sellin, I.A.
Phys.Rev.A 39 (1989) 4308 - 4311
State-selected angular distributions of single-electron capture in very slow Ar^{4+} - Ar collisions.
$Ar^{4+} + Ar \rightarrow Ar^{3+}(4p)$
translational energy-spectroscopy
8×10^{-4} - 5×10^{-3} keV/amu
no 4s capture

16
89E16 Church, D.A. Holzscheiter, H.M.
Phys.Rev.A 40 (1989) 54 - 58
Charge transfer from molecular hydrogen to stored O^{2+} and O^{3+} ions.
$O^{3+}, O^{2+} (^3P, ^1D) + H_2 \rightarrow O^{2+}, O^+ + H_2^+$
ion trapping technique/attenuation
8×10^{-5} keV/amu (O^{2+}) ; 1.3×10^{-4} keV/amu (O^{3+})
rate coefficients

17
89E17 Cornet, A. Chen, S.H. Urbain, X. Antoine, Ph. Lorent, V. Brouillard, F.
J.Phys.B 22 (1989) L 647 - 650
Measurement of the angular distribution of the metastable hydrogen atoms formed in the transfer process $H^+ + Cs \rightarrow H(2s) + Cs^+$ in the energy range 200 - 2000 eV.
$H^+ + Cs \rightarrow H(2s) + Cs^+$
0.2 - 2 keV/amu
angular distribution proportional to E^{-1}.

18
89E64 Dillingham, T.R. Doughty, B.M. Hall, J.M. Tipping, T.N. Sanders, J.M. Shinpaugh, J.L.
Nucl. Instr. Meth. in Phys. Res. B 40/41 (1989) 40 - 43
Single electron capture by 0.5 - 1.5 MeV/amu F^{9+} and F^{8+} on hydro carbon gases.
$F^{9+} + B \rightarrow F^{8+}$; $F^{8+} + B \rightarrow F^{9+}, F^{7+}$
($B = CH_4, C_2H_4, C_2H_6, C_3H_6, C_3H_8, H_2$)
growth method
5×10^2 - 1.5×10^3 keV/amu
cross sections for carbon atoms deduced from those for hydrocarbons.

19
89E18 DuBois, R.D. Kover, A.
Phys.Rev.A 40 (1989) 3605 - 3612
Single and double ionization of helium by hydrogen-atom impact.
$H + He \to H^- + He^+$; $H^- + He^{2+} + e$
projectile-recoil coincidence
25 - 300 keV/amu
also direct ionization and electron loss cross sections given
over 25 - 1000 keV/amu

20
89E19 Fukuroda, A. Kobayashi, N. Kaneko, Y.
J.Phys.B 22 (1989) 3457 - 3469
One-electron capture processes in Ne^{2+} - H_2 collisions.
$Ne^{2+}(^1S) + H^2 \to N^+(^2S) + H_2^+(X\ ^2\Sigma, v)$
translational energy spectroscopy
0.025 - 0.1 keV/amu
relative cross sections

21
89E20 Fukuroda, A. Kobayashi, N. Kaneko, Y.
J.Phys.B 22 (1989) 3471 - 3481
High-resolution study of one-electron capture processes
in $Kr^{2+}(^1D)$ - Ne collisions.
$Kr^{2+}(^1D) + Ne \to Kr^+(^2P_{1/2,3/2}) + Ne^+(^2P_{1/2,3/2})$
translational energy spectroscopy
5×10^{-3} - 2.4×10^{-2} keV/amu
relative cross sections

22
89E21 Gilbody, H.B.
Phys.Scripta T 28 (1989) 49 - 57
Total cross sections for charge exchange and ionization in collisions
of C^{q+} and O^{q+} ions with H, H_2 and He.
review

23
89E24 Hamdan, M. Almeida, D.P. Brenton, A.G.
J.Phys.B 22 (1989) 1817 - 1822
Translational-energy spectroscopy of OCS^{3+} and CS_2^{3+}
single-electron capture from Ne and Ar targets.
$OCS^{3+}, CS_2^{3+} + B \to OCS^{2+}, CS_2^{2+}$ (B = Ne,Ar)
0.07 keV/amu
only energy spectra.

24
89E22 Hamdan, M. Brenton, A.G.
J.Phys.B 22 (1989) L 9 - 13
Translational energy spectroscopy of $^{29}N_2^{2+}$: one-electron
capture in collision with He and Ne atoms.
$^{29}N_2^{2+} + He(Ne) \to N_2^+ + He^+(Ne^+)$
translational energy spectroscopy
0.2 keV/amu
various channels observed ; no cross sections given

25
89E23 Hamdan, M. Brenton, A.G.
J.Phys.B 22 (1989) L 45 - 50
High-resolution translational energy spectroscopy of CO^{2+}.
$CO^{2+} + Ne \to CO^+$
translational energy spectroscopy
0.2 keV/amu
double ionization energy = 41.76 ±0.1eV ; various excited states
observed ; no cross sections

26
89E25 Havener, C.C. Huq, M.S. Krause, H.F. Schultz, P.A. Phanef, R.A.
Phys.Rev.A 39 (1989) 1725 - 1740
Merged-beams measurements of electron capture cross sections for O^{5+} + H at electron-volt energies.
$O^{5+} + H \rightarrow O^{4+} + H^+$
merged-beams technique
9×10^{-4} - 8×10^{-1} keV/amu

27
89E26 Hird, B. Orakzai, M.W. Rahman, F.
Phys.Rev.A 39 (1989) 5010 -5013
Electron loss and transfer for 20 - 110 keV iodine-rare gas collisions.
$I + B \rightarrow I^-, I^+$ (B = He,Ne,Ar,Kr,Xe)
growth method
0.15 - 0.86 keV/amu

28
89E27 Hoekstra, R. Ciric, D. de Heer, F.J. Morgenstern, R.
Phys.Scripta T 28 (1989) 81 - 90
State-selective electron capture in collisions of C^{6+} and O^{8+} on atomic and molecular hydrogen studied by photon emission spectroscopy.
$C^{6+}, O^{8+} + H, H_2 \rightarrow C^{5+}, O^{7+}$
photon spectroscopy
1 - 9 keV/amu
emission cross sections

29
89E28 Hoekstra, R. Schlatmann, A.R. de Heer, F.J. Morgenstern, R.
J.Phys.B 22 (1989) L 603 - 607
Electron capture into $He^+(2p)$ in low energy collisions of He^{2+} with atomic and molecular hydrogen.
$He^{2+} + H, H_2 \rightarrow He^+(2p)$
photon spectroscopy
0.3 - 1.75 keV/amu

30
89E29 Houver, J.C. Dowek, D. Pommier, J. Richter, C.
J.Phys.B 22 (1989) L 585 - 589
Collisions spectroscopy with aligned and oriented atoms II. charge exchange in He^+ - Na(3p) collisions.
He^+ + Na(3s,3p) -> He(n) + Na^+
TOF method
0.125 - 0.75 keV/amu
n=2 dominant at low energies : n=3 at high energies

31
89E30 Huq, M.S. Havener, C.C. Phaneuf, R.A.
Phys.Rev.A 40 (1989) 1811 - 1816
Low energy electron capture by N^{3+}, N^{4+} and N^{5+} from hydrogen atoms using merged beams.
N^{q+}(q = 3,4,5) + H -> $N^{(q-1)+}$ + H^+
merged-beam technique
1×10^{-3} - 1.4 keV/amu

32
89E31 Hutton, R. Prior, M.H. Chantrenne, S. Chen, M.H. Schneider, D.
Phys.Rev.A 39 (1989) 4902 - 4905
Double and single electron capture in slow collisions of $Ar^{9+,8+}$ ions with He atoms.
$Ar^{9+} + He \rightarrow Ar^{7+}$; $Ar^{8+} + He \rightarrow Ar^{7+}$
zero-degree electron spectroscopy
2 keV/amu

33
89E32 Itoh, Y.
J.Phys.Soc.Japan 58 (1989) 1871 - 1874
One-electron capture and deexcitation processes in Ar^{++} - He collisions at 10 eV.
Ar^{2+}(^3P ; ^1D) + He -> $Ar^{+}(^2P)$ + $He^{+}(^2S)$
translational energy spectroscopy
2.5x10^{-4} keV/amu
angle = 0 - 3

34
89E33 Johnson, L.K. Gao, R.S. Dixon, R.G. Smith, K.A. Lane, N.F. Stebbings, R.F. Kimura, M.
Phys.Rev.A 40 (1989) 3026 - 3631
Absolute differential cross sections for small angle H^{+} - He direct and charge transfer scattering at keV energies.
H^{+} + He -> H(0.02 - 1°)
position-sensitive detection
5 keV/amu
angular distribution (0.02 - 1°). also direct scattering
H^{+} + He -> H^{+} + He : T: MO close-coupling calculation

35
89E34 Johnson, L.K. Gao, R.S. Hakes, C.L. Smith, K.A. Stebbings, R.F.
Phys.Rev.A 40 (1989) 4920 - 4925
Direct and charge transfer scattering of KeV energy H^{+} and He^{+} projectiles from rare gas atoms to obtain small-angle absolute cross sections.
A^{+} + B -> A (A = H,He ; B = Ne,Ar,Kr,Xe)
0.5 - 5.0 keV/amu
diff. cross sections for scattering angle = 0.03 - 1.0 deg.

36
89E35 Koslowski, H.R. Huber, B.A.
J.Phys.B 22 (1989) 2255 - 2264
Double-electron capture in low-energy collisions of Ar^{4+} with Ar and Kr.
Ar^{4+} + B -> Ar^{2+}
translational energy spectroscopy
2x10^{-2} keV/amu
angular distributions ; no cross section given.

37
89E36 Lavollee, M. Henri, G.
J.Phys.B 22 (1989) 2019 - 2025
State-selected atomic ion reactions ; a new experimental method. first results on the O^{+}($^4S,^2D,^2P$) + N_2 system.
$O^{+}(^2P)$ + N_2 -> $O(^3P)$ + $N_2^{+}(v=1)$; $O^{+}(^2D)$ + N_2 -> $O(^1D)$ + $N_2^{+}(v=0)$
modified TPEPICO
5x10^{-4} - 1.25x10^{-3} keV/amu
ratios for $^2P/^2D(<1)$; no absolute cross sections

38
89E37 Lebius, H. Koslowski, H.R. Huber, B.A.
Z.Phys.D 11 (1989) 53 - 61
State-selective single electron capture by multiply charged ions-reaction window and multichannel Landau-Zener calculations.
Ar^{3+} + Ar -> Ar^{2+} ; Ne^{3+} + He -> Ne^{2+} ; Ne^{3+} + Ne -> Ne^{2+}
Ar^{3+} + Ne -> Ar^{2+}
translational energy spectroscopy
1.5x10^{-2} keV/amu
cross sections for different (nl) states : T: Landau-Zener calculation

39
89E38 Lei, Z.M. Yang, F. Liu, J.R. Pan, G.Y. Yu, D.H. Sun, S.
Nucl.Instr.Meth.in Phys.Res.B 42 (1989) 38 - 40
He^{2+} collisions with Ne and Ar atoms into excited states.
He^{2+} + B -> He^{+}(6g $^2G_{7/2}$ -> 4f $^2F^0_{5/2}$) ; He(3^3S -> 2^3P ; 2^3S)
(B = Ne,Ar)
photon spectroscopy
35 - 85 keV/amu
emission cross sections ; Ar^*,Ne^* emission cross sections in
He^+,He^{2+} collisions

40
89E39 Liu, C.J. Dunford, R.W. Berry, H.G. Parao, R.C. Groeneveld, K.O. Haas, M. Raphaelian, M.L.A.
J.Phys.B 22 (1989) 1217 - 1224
Subshell selective electron capture (2 - 105 keV/amu) studied by VUV spectroscopy in O^{6+} + He collisions.
O^{6+} + He -> O^{5+} + He^+
photon spectroscopy
2 - 105 keV/amu
emission cross sections for 3p->2s ; 3s->2p ; 3d->2p ;4f->3d ; 4d->3p

41
89E40 Loyd, D.H. Dawson, H.R.
Nucl.Instr.Meth.in Phys.Res.B 40/41 (1989) 219 - 220
Balmer-α emission from H^+ impact on Kr and Xe atoms.
H^+ + Kr,Xe -> H(3l)
photon-spectroscopy
4 - 20 keV/amu

42
89E41 Mack, M. Nijland, J.H. Straten, P.V.D. Niehaus, A. Morgenstern, R.
Phys.Rev.A 39 (1989) 3846 - 3854
Correlation in double electron capture in collisions of fully stripped ions on He and H_2.
C^{6+} + H_2 -> C^{4+}(3l,3l') ; O^{8+} + He -> O^{6+}(3l,3l') + He^{2+}
electron spectroscopy
5 - 6 keV/amu

43
89E42 Martin, S. Salmoun, A. Ouerdane, Y. Druetta, M. Desesquelles, J. Denis, A.
Phys.Rev.Letters 62 (1989) 2112 - 2115
Double Rydberg of high angular momentum (l = 6 - 8) produced in Ar VIII by Ar^{9+} + Cs collisions.
Ar^{9+} + Cs -> Ar^{7+}($1s^22s^22p^55gnl$: n = 7 - 9)
photon spectroscory
2.25 keV/amu
transition energies ; no cross sections given

44
89E43 Martinez, H. Morales, A. de Urquijo, J. Alvarez, I. Cisneros, C.
Nucl.Instr.Meth. in Phys.Rev.B 40/41 (1989) 44 - 46
Absolute differential cross sections for single-electron capture of H^0 in Ar at keV energies.
H + Ar -> H^-
angular distribution
1 - 4 keV/amu
differential cross sections also given

45
89E44 Melchert, F. Debus. W. Liehr, M. Olson, R.E. Salzborn, E.
Europhys.Letters 9 (1989) 433 - 439
Single- and double-electron removal from H^- in energetic collisions with multiply-charged argon ions.
$H^- + Ar^{q+}$(q = 1 - 8) -> H, H^+
crossed beam technique
3 - 100 keV/amu
scaled as $q^{1.3}$

46
89E45 Moretto-Capelle, P. Oza, D.H. Benoit-Cattin, P. Bordenave-Montesquieu, A. Boudjema, M. Gleizes, A. Dousson, S. Hitz, D.
J.Phys.B 22 (1989) 271 - 286
Double capture in the O^{8+} + He collision investigated by electron spectroscopy (80 keV, 10°).
O^{8+} + He -> O^{6+}(3,n; n = 3,4,5) + He^{2+}
electron spectroscopy
5 keV/amu
identification of various channels : their energies and lifetimes.

47
89E46 Nakai, Y. Shirai, T. Tabata, T. Ito, R.
Phys.Scripta T 28 (1989) 77 - 80
A semiempirical formula for single-electron capture cross sections of multiply charged ions colliding with H, H_2 and He.
analytical fitting

48
89E47 Okuno, K. Fukuroda, A. Kobayashi, N. Kaneko, Y.
J.Phys.Soc.Japan 58 (1989) 1590 - 1594
High resolution translational enegy spectroscopy of one-electron capture in Ne^{2+} - N_2 collisions.
$Ne^{2+}(^1S_0)$ + N_2 ->
$Ne^+(^2S_{1/2})$ + N_2^+(X $^2\Sigma_g^+$; v = 0.1 : A $^2\Pi_u$; v = 0 - 4)
translational energy spectroscopy
$2x10^{-2}$ - $8x10^{-2}$ keV/amu

49
89E48 Peart, B. Foster, S.J. Dolder, K.
J.Phys.B 22 (1989) 1035 - 1042
Measurement of the mutual neutralization of N^+/O^- and O^+/O^-.
$N^+ + O^-$ -> N + O ; $O^+ + O^-$ -> O + O
inclined-beam technique
$3.3x10^{-2}$ - 2 keV/amu

50
89E49 Rebrion, C. Rowe, B.R. Marquette, J.B.
J.Chem.Phys. 91 (1989) 6142 - 6147
Reactions of Ar^+ with H_2, N_2, O_2 and CO at 20, 30 and 70 K.
$Ar^+(^2P_{3/2})$ + B -> Ar (B = H_2,N_2,O_2,CO)
cold nozzle technique
20,30,70 K
rate coefficients

51
89E50 Roncin, P. Barat, M. Gaboriaud, M.N. Guillemot, L. Laureut, H.
J.Phys.B 22 (1989) 509 - 524
Collision spectroscopy of O^{6+} and N^{6+} colliding on a He target.
A^{6+} + He -> A^{5+}(n = 2,3,4), A^{4+}(2lnl') (A = N,O)
energy-gain spectroscopy
0.6 keV/amu
angular distributions (0 - 0.15°)

52
89E51 Salzborn, E.
J. de Phys. 50 (1989) C1/ 207 - 228
Electron capture and ionization in ion-ion collisions.
a review

53
89E66 Sarkadi, L. Polinkas, J. Kover, A. Berenyi, D. Vajnai, T.
Phys. Rev. Letters 62 (1989) 527 - 530
Observation of electron capture into continuum states of neutral atoms.
$He + B \rightarrow He + e + B^{+}$ (B = He,Ar)
projectile-cusp electron coincidence
75 keV/amu

54
89E52 Saunders, W.A.
Phys.Rev.Letters 62 (1989) 1037 - 1040
Charge exchange and metastability of small multiply charged gold clusters.
$(Au)_n^{2+} + B \rightarrow (Au)_n^{+}$; $(Au)_4^{3} + B \rightarrow (Au)_4^{2+}$
(n = 2 - 4 ; B = Ar,N_2,Kr,CO,Xe,O_2)
$3x10^{-5}$ keV/amu
fragmentation cross sections are comparable to charge exchange cross sections.

55
89E54 Schauer, M.M. Jefferts, S.R. Barlow, S.E. Dunn, G.H.
J.Chem.Phys. 91 (1989) 4593 - 4596
Reactions of H_2 with He^{+} at temperatures below 40K.
$He^{+} + H_2 \rightarrow He + H + H^{+}$, $He + H_2^{+}$
trapped ion technique
15 - 40 K
dissociative capture is dominant. : rate coefficients

56
89E55 Schluz, M. Giese, J.P. Swenson, J.K. Datz, S. Dittner, P.F. Krause, H.F. Schöne, H. Vane, C.R. Benhenni, M. Shafroth, S.M.
Phys.Rev.Letters 62 (1989) 1738 - 1741
Electron-electron interactions in transfer and excitation in $F^{8+} \rightarrow H_2$ collisions.
$F^{8+} + H_2 \rightarrow F^{7+*} + H_2^{+}$
zero-degree electron spectroscopy
$9x10^{2}$- $1.7x10^{3}$ keV/amu
electron-electron interaction in ion-atom collisions.

57
89E56 Schweinzer, J. Winter, H.
J.Phys.B 22 (1989) 893 - 905
State-selective preparation of long-lived highly excited ions by means of single electron capture.
$Ar^{2+} + B \rightarrow Ar^{+*}$ (B = Mg,Li,Na,K)
translational energy spectroscopy
$7.5x10^{-3}$ - $2.5x10^{-1}$ keV/amu
fractions of metastable ions (2 - 5 %)

58
89E57 Shah, M.B. McCallion, P. Gilbody, H.B.
J.Phys.B 22 (1989) 3938 - 3988
Ionization and electron capture in collisions of slow H^{+} and He^{2+} ions with hydrogens.
$A^{Z+} + H_2 \rightarrow A^{Z+} + H_2^{+}$; $A^{Z+} + H + H^{+}$; $A^{Z+} + H^{+} + H^{+}$;
$A^{(Z-1)+} + H^{+} + H^{+}$; $A^{(Z-1)+} + H_2^{+}$; $A^{(Z-1)+} + H^{+} + H$ (A = H^{+},He^{2+})
TOF
38 - 1500 keV/amu (H) : 31 - 550 keV/amu (He)

59
89E53 Shah, M.B. McCallion, P. Gilbody, H.B.
J.Phys.B 22 (1989) 3037 - 3045
Electron capture and ionization in collisions of slow H^+ and He^{2+} ions with helium.
$H^+ + He \to H + He^+$; $H + He^+ + e$: $He^{2+} + He \to He^+ + He^+$; $He^+ + He^{2+} + e$
coincidence tecnique
9 - 100 keV/amu (H) ; 6 - 67 keV/amu (He)
also $H^+ + He \to H^+ + He^+ + e$; $H^+ + He^{2+} + 2e$;
$He^{2+} + He \to He^{2+} + He^+ + e$

60
89E58 Sofield, C.J. Bridwell, L.B. Moak, C.D. Miller, P.D. Gregory, D.C. Jones, C.M. Alton, G.D. Pepmiller, P.L. Hall, J.M.
Phys.Rev.A 40 (1989) 59 - 68
Charge exchange cross sections for 445 MeV Cl ions in solid C targets.
$Cl^{16+} + C \to Cl^{17+}$; $Cl^{15+} + C \to Cl^{16+}, Cl^{17+}$;
$Cl^{17+} + C \to Cl^{16+}$ (total; 2p; 3p) ; $Cl^{16+} + C \to Cl^{15+}(5n)$
growth + fitting
1.27×10^4 keV/amu
also excitation $Cl^{16+} + C \to Cl^{16+}(2p,3p)$; $Cl^{15+} + C \to Cl^{15+}(2\ ^1P)$

61
89E59 Sonnenfroh, D.M. Leone, S.R.
J.Chem.Phys. 90 (1989) 1077 - 1085
A laser-induced fluorescence study of product rotational state distributions in the charge transfer reaction :
$Ar^+(^2P_{3/2}) + N_2 \to Ar + N_2^+(X)$ at 0.28 and 0.40 eV.
$Ar^+(^2P_{3/2}) + N_2 \to Ar + N_2^+(X)$
ion-molecule crossed beam technique
$(7 - 10) \times 10^{-5}$ keV/amu
X-distribution

62
89E60 Tanis, J.A. Schwietz, G. Schneider, D. Stolterfoht, N. Graham, W.G. Altevogt, H. Kowallik, R. Mattis, A. Skogvall, B. Schneider, T. Szmola, E.
Phys.Rev.A 39 (1989) 1571 - 1574
Evidence for electron correlation during double capture in fast ($v \approx 10$ a.u.) collisions.
$Ne^{10+} + B \to Ne^{9+}, Ne^{8+}$ (B = He,Ne,Ar)
electron-projectile coincidence
3.5×10^3 keV/amu
strong electron correlation

63
89E61 Tawara, H. Fritsch, W.
Phys.Scripta T 28 (1989) 58 - 66
Electron transfer data for C^{q+} and O^{q+} ions in collisions with H, H_2 and He targets - Present status and some related data needs in applications to fusion research.
review

64
89E63 Tonuma, T. Kumagai, T. Matsuo, T. Tawara, H.
Phys.Rev.A 40 (1989) 6238 - 6245
Coincidence measurements of slow recoil ions with projectile ions in 42 MeV Ar^{q+} - Ar collisions.
$Ar^{q+} + Ar \to A^{q'+}$ (q = 4,6,8,10,12,14)
projectile-recoil ion coincidence
10^3 keV/amu
recoil ion production cross sections

65

89E62 Zouros, T.J.M. Lee, D.H. Richard, P. Sanders, J.M. Shinpaugh, J.L. Varghese, S.L. Karim, K.R. Bhalla, C.P.
Phys.Rev.A 40 (1989) 6246 - 6250
State-selective observation of resonant transfer excitation in collisions of F^{6+} with He and H_2 targets.
F^{6+} + H_2,He -> $F^{5+}(1s2s2p^2)$ ^3D,^1D
zero-degree Auger electron spectroscopy
263 - 1740 keV/amu

66

89E65 van Zyl, B. Gealy, M.W. Neuman, H.
Phys. Rev. A 40 (1989) 1664 - 1666
Lyman-alpha emission from low-energy H + H_2 and H^+ + H_2 collisions.
H + H_2, H^+ + H_2 -> H^*(Lyman-alpha)
Lyman-alpha emission due to excited projectiles (not due to dissociative excitation of H_2)

1
90E 1 Anderson, H. Cederquist, H. Astner, G. Hvelplund, P. Pedersen, J.O.P.
Phys. Scripta 42 (1990) 150 - 158
Radiative stabilization of double-Rydberg states formed in slow Xe^{q+}-Xe ($15 \le q \le 35$) collisions.
$Xe^{q+} + Xe \rightarrow Xe^{(q-2)+**} \rightarrow Xe^{(q-1)+} + e; Xe^{(q-2)+} + h\nu$
translational energy spectroscopy
0.4 - 1.0 keV/amu
for higher q, radiative stabilization plays a roll

2
90E 2 Ashburn, J.R. Cline, R.A. van der Burgt, P.J.M. Westerveld, W.B.
Risley, J.S.
Phys. Rev. A 41 (1990) 2407 - 2421
Experimentally determined density matrices for H(n=3) formed in H^+-He collisions from 20 to 100 keV.
$H^+ + He \rightarrow H(n=3)$
photon spectroscopy (Balmer line)

3
90E 3 Barat, M. Roncin, P. Guillemot, L. Gaboriaud, M.N. Laurent, H.
J. Phys. B 23 (1990) 2811 - 2819
Single and double electron capture by C^{4+} ions colliding with helium target.
$C^{4+} + He \rightarrow C^{3+}, C^{2+}$
translational energy spectroscopy
0.5 - 0.8 keV/amu
also angular differential cross sections given

4
90E 4 Biedermann, C. Cederquist, H. Andersson, L.R. Levin, J.C. Short, R.T.
Elston, S.B. Gibbons, J.P. Andersson, H. Liljeby, L. Sellin, I.A.
Phys. Rev. A 41 (1990) 5889 - 5908
Experimental and model angular distributions of one- and two- electron capture processes in 0.5 - 20 eV/u Ar^{4+}-Ar collisions.
$Ar^{4+} + Ar \rightarrow Ar^{3+}, Ar^{2+}$
transfer energy spectroscopy
0.5×10^{-3} - 2×10^{-2} keV/amu
angular distribution ; only 4p Ls, but no 4s population

5
90E 5 Biedermann, C. Levin, J.C. Short, R.T. Elston, S.B. Gibbons, J.P.
Sellin, I.A. Cederquist, H. Andersson, L.A. Andersson, H. Liljeby, L.
Phys. Rev. A 42 (1990) 6905 - 6908
Total capture cross sections for very slow Ar^{4+}-Ar and Ar^{6+}-Ar collisions.
$Ar^{q+}(q = 4,6) + Ar \rightarrow Ar^{(q-1)+}, Ar^{(q-2)+}$
Angular distribution measurements
2.5×10^{-3} - 2.5×10^{-2} keV/amu

6
90E 6 Campbell, E.E.B. Hulser, H. Witte, R. Hertel, I.U.
Z. Phys. D 16 (1990) 21 - 33
Near resonant charge transfer in Na(4D) + $K^+ \rightarrow Na^+ + K^*$: optical pumping of the Na(4D) state and energy dependence of rank 4 alignment.
$K^+ + Na(4D) \rightarrow K^* + Na^+$
optical pumping
8×10^{-3} - 8×10^{-2} keV/amu
relative cross sections

7
90E 7 Cheng, S. Cocke, C.L. Kamber, E.Y. Hsu, C.C. Varghese, S.L.
Phys. Rev. A 42 (1990) 214 - 222
Measurement of electron capture and ionization cross sections for D_2 in collisions with fast O^{8+} ions.
$O^{8+} + D_2 \rightarrow O^{8+} + D_2^+$; $O^{8+} + D^+ + D^+$; $O^{8+} + D_2^{+*}$; $O^{7+} + D_2^+$; $O^{7+} + D^+ + D^+$; $O^{7+} + D_2^{+*}$
projectile-recoil ion coincidence technique
0.5 - 1.25×10^3 keV/amu
different channels for D^+ ion production

8
90E 8 Chetioui, A. Martin, F. Politis, M.F. Rozet, J.P. Touati, A. Blumenfeld, L. Vernhet, D. Wohrer, K. Stephan, C. Barat, M. Gaboriaud, M.N. Laurent, H. Roncin, P.
J. Phys. B 23 (1990) 3659 - 3675
Doubly excited states populated in collisions of O^{8+} ions with He and H_2 at 1.24 keV/amu.
O^{8+} + He,H_2 -> $O^{6+}(n,n')$
projectile + X-ray coincidence technique
1.24 keV/amu

9
90E 9 Datz, S. Hippler, R. Andersen, L.H. Dittner, P.F. Knudsen, H. Krause, H.F. Miller, P.D. Pepmiller, P.L. Rosseel, T. Schuch, R. Stolterfoht, N. Yamazaki, Y. Vane, C.R.
Phys. Rev. A 41 (1990) 3559 - 3571
Coincidence studies of capture and ionization in highly-charged I^{q+}-He and U^{q+}-He collisions at medium velocities.
A^{q+} + He -> A^{q+} + He^+ + e; A^{q+} + He^{2+} + 2e; $A^{(q-1)+}$ + He^+; $A^{(q-1)+}$ + He^{2+} + e [A = I,U; q = 5 - 44]
projectile-recoil coincidence
10^2 - 10^3 keV/amu

10
90E10 de Jong, R. Niehaus, A.
J. Phys. B 23 (1990) 3933 - 3954
Transfer ionization in He^{2+}-xenon collisions.
He^{2+} + Xe -> He^+ + Xe^{2+} + e
electron + translational energy spectroscopy
10^{-3} - 5.5×10^{-2} keV/amu
also angular distribution

11
90E11 DePaola, B.D. Parameswaran, R. Axmann, W.J.
Phys. Rev. A 41 (1990) 6533 - 6535
High-resolution state-selective study of transfer with excitation in the F^{8+} + H_2 system.
$F^{8+}(1s)$ + H_2 -> $F^{6+*}(2p^2\ ^1D,\ 2s2p\ ^1P)$
electron spectroscopy
9.5×10^2 - 1.6×10^3 keV/amu
electron spectra in non-resonant transfer excitation (NTE)

12
90E12 Dowek, D. Houver, J.C. Pommier, J. Richter, C. Royer, T. Andersen, N. Palsdottir, B.
Phys. Rev. Letters 64 (1990) 1713 - 1716
Strong effects of initial orbital alignment observed for electron capture in keV H^+-Na(3p) collisions.
H^+ + Na(3s,3p) -> H(n=2,3) + Na^+
translational energy spectroscopy
0.5 - 5 keV/ amu
aligned with polarized light

13
90E13 Gao, R.S. Johnson, L.K. Hakes, C.L. Smith, K.A. Stebbings, R.F.
Phys. Rev. A 41 (1990) 5929 - 5933
Collisions of kilo-electron-volt H^+ and He^+ with molecules at small angles : absolute differential cross sections for charge transfer.
$H^+ + B \rightarrow H$ (B = $N_2, O_2, CO, CO_2, NO, CH_4$)
: $He^+ + B \rightarrow He$ (B = H_2, N_2, O_2, CO, NO)
position-sensitive detector
0.5 - 5 keV/amu (H); 0.4 keV/amu (He)

15
90E14 Gardner, J.A. Dressler, R.A. Salter, R.H. Murad, E.
J. Chem. Phys. 93 (1990) 7780 - 7786
Reaction cross section and product ion T-O-F measurements for collisions of N^+ and N_2^+ with CO_2 at suprathermal energies.
$N^+ + CO_2 \rightarrow N + CO_2^+$: $N_2^+ + CO_2 \rightarrow N_2 + CO_2^+$
translational energy spectroscopy
$10^{-4} \sim 10^{-3}$ keV/amu
$N^+ + CO_2 \rightarrow NO + CO^+$ also

16
90E62 Graham, W.G. Berkner, K.H. Bernstein, E.M. Clark, M.W. Feinberg, B. McMahan, M.A. Morgan, T.J. Rathbun, W. Schlachter, A.S. Tanis, J.A.
Phys. Rev. Letters 65 (1990) 2773 - 2776
Resonant transfer and excitation for U^{90+} projectiles in hydrogen.
$U^{90+} + H_2 \rightarrow U^{89+*}$
X-ray-projectile coincidence
(97 - 150)x10^3 keV/amu

17
90E15 Guillemot, L. Roncin, P. Gaboriaud, M.N. Barat, M. Laurent, H. Bliman, S. Suraud, M.G. Hitz, D. Bonnet, J.J. Bonnefoy, M. Chassevent, A. Fleury, A.
J. Phys. B 23 (1990) 3353 - 3360
Collisions of metastable He-like C^{4+} ions on He and H_2 targets.
$C^{4+}(1s2s\ ^3S) + B \rightarrow C^{3+}, C^{2+}$ (B = H_2,He)
translational energy + photon spectroscopy
0.8 - 3.3 keV/amu
no cross section given

18
90E16 Guillemot, L. Roncin, P. Gaboriaud, M.N. Laurent, H. Barat, M.
J. Phys. B 23 (1990) 4293 - 4312
Critical study of the molecular Coulombic barrier model for multiple electron capture by highly charged ions.
Ar^{q+}(q = 11,9,8,7) + Ar -> Ar^{r+}; Ar^{9+} + Xe -> Ar^{r+}
; O^{8+} + He,Ar -> O^{6+}; N^{7+} + He -> N^{5+}
translational energy spectroscopy
~ 0.3 keV/amu
relative angular distributions

19
90E18 Hoekstra, R. Beijers, J.P.M. Schlatmann, A.R. Morgenstern, R.
de Heer, F.J.
Phys. Rev. A 41 (1990) 4800 - 4808
State-selective charge transfer in slow collisions of C^{4+} with H and H_2.
C^{4+} + H,H_2 -> C^{3+}(3s,3p,3d)
photon spectroscopy
$5x10^{-2}$ - 1.3 keV/amu
retarded beam

20
90E17 Hird, B. Elrick, B.M. Lacasse, H. Lacasse, J.H. Tune, P.
Phys. Rev. A 41 (1990) 5217 - 5220
Bromine-rare gas electron transfer and electron loss cross sections at 15 - 130 keV collision energies.
Br + B -> Br^+ (B = He,Ne,Ar,Kr,Xe), Br^- (B = Ar,Kr,Xe)
growth method
0.2 - 1.6 keV/amu

21
90E19 Holland, R.F. Cobb, D.D. Maier II, W.B. Clodius, W.B. Oshea, P.G.
Bos, R. Froggot, B.C.
Phys. Rev. A 41 (1990) 2429 - 2436
Production of N_2^+ first negative emission by impact of 1 MeV H^0,H^+ and H^- on N_2.
H^- + N_2 -> H^0
10^3 keV/amu
N_2^+ first negative (0-0),(0-1) band emissions.

22
90E21 Hülser, H. Campbell, E.E.B. Witte, R. Genger, H. Hertel, I.V.
Phys. Rev. Letters 64 (1990) 392 - 395
Observation of rank-4 alignment in near-resonant charge transfer Na(4D) + K^+ -> Na^+ + K^*
K^+ + Na(4D) -> K^* + Na^+
polarized laser excitation
$1x10^{-2}$ - $3.8x10^{-2}$ keV/amu
alignment factor

23
90E20 Huels, M.A. Champion, R.L. Doverspike, L.D. Wang, Y.
Phys. Rev. A 41 (1990) 4809 - 4815
Charge transfer and electron detachment for collisions of H^- and D^- with H.
H^-,D^- + H -> H,D + H^-; H,D + e + H
crossed-beam method
$7x10^{-3}$ - 0.4 keV/amu

24
90E22 Jensen, B. Pedersen, E.H.
J. Phys. B 23 (1990) 1501 - 1518
Electron capture by Mg^+ and Mg^{2+} in slow collisions with Mg or Zn.
H^+ + Mg -> H
Mg^+ + Mg -> Mg + Mg^+
Mg^{2+} + Mg -> Mg + Mg^{2+}, Mg^+ + Mg^+
Mg^+ + Zn -> Mg + Zn^+
Mg^{2+} + Zn -> Mg^+ + Zn^+, Mg + Zn^{2+}
Zn^+ + Zn -> Zn + Zn^+
coincidence technique
3 - 10 keV/amu (H); $4x10^{-2}$ - 20 keV/amu (Mg); 0.15 - 7.7 keV/amu

25
90E23 Jogwich, M. Huber, B.A. Wiesemann, K.
Z. Phys. D 17 (1990) 171 - 179
A spectroscopic study of double electron transfer from Cu to ArIII in an ECR-microwave discharge.
Ar^{2+} + Cu -> Ar^{0}(6d[3/2]^{0}; 8s[3/2]^{0})
photon spectroscopy
thermal energy
cross sections (10^{-15} ~ 10^{-14} cm^2)

26
90E24 Kamber, E.Y. Brenton, A.G. Hughes, S.
J. Phys. B 23 (1990) L311 - 316
State-selective single-electron stripping processes of Ar^{2+} ions in collisions with He and Ar.
Ar^{2+} + He,Ar -> Ar^{3+}
translational energy spectroscopy
0.2 keV/amu
dominant contribution of ions in long-lived highly excited dtates

27
90E63 Kikiani, B.I. Lomsadze, R.A. Mosulishvili, N.O. Gochitashvili, M.R. Lavrov, V.M.
Sov. Phys. - JETP 71 (1990) 51 - 56
Ionization and charge transfer in collisions of Li^+ with Ar,Ne and He in the energy range 0.5 - 7.0 keV.
Li^+ + B -> Li (B = He,Ne,Ar)
condenser-method
0.07 - 1 keV/amu

28
90E25 Kusakabe, T. Yoneda, H. Mizumoto, Y. Katsurayama, K.
J. Phys. Soc. Japan 59 (1990) 1218 - 1224
Charge transfer cross sections of $^3He^{2+}$ ions in collisions with He atoms and H_2 molecules in the energy range of 1 - 10 keV.
He^{2+} + B -> He^+; He (B = He,H_2)
growth method
0.33 - 3.3 keV/amu

29
90E26 Kusakabe, T. Mizumoto, Y. Katsurayama, K. Tawara, H.
J. Phys. Soc. Japan 59 (1990) 1987 - 1994
Electron capture by C^+,N^+ and O^+ ions in collisions with H_2 molecules and He atoms at low keV energies.
C^+,N^+,O^+ + He,H_2 -> C,N,O
growth method
$5x10^{-2}$ - 1 keV/amu
controlled electron energy ion source used.
contribution of metastable ions.

30
90E27 Kwong, V.H.S. Gibbons, T.T. Fang, Z. Jiang, J. Knocke, H. Jiang, Y. Ruger, B. Huang, S. Braganza, E. Clark, W. Gardner, L.D.
Rev. Sci. Instr. 61 (1990) 1931 - 1939
Experimental apparatus for production, cooling and storing multiply charged ions for charge-transfer measurements.
W^{2+} + Ar -> W^+; N^{2+} + N_2 -> N^+
ion-trapping method
thermal energy
rate coefficient

31
90E28 MacAdam, K.B. Gray, L.G. Rolfes, R.G.
Phys. Rev. A 42 (1990) 5269 - 5281
Projectile n distributions following charge transfer of Ar^+ and Na^+ in a Na Rydberg target.
A^+ + Na(nl) -> A(n) (A = Ar,Na)
laser-excited target + field ionization

32
90E31 Martin, S. Denis, A. Desesquelles, J. Ouerdane, Y.
Phys. Rev. A 42 (1990) 6564 - 6569
Rydberg transition emission after multi-electron capture in low-energy collisions of Ar^{9+} with He,Ne and Ar.
Ar^{9+} + B -> Ar^{r+} (r = 7 ~ 4) (B = He,Ne,Ar)
photon spectroscopy
4.5 keV/amu
transition energies determined

33
90E30 Martin, S. Dennis, A. Querdane, Y. Salmoun, A. El Motassadeq, A. Desesquelles, J.
Phys. Rev. Letters 64 (1990) 2633 - 2636
Multielectron capture in Kr^{18+} collisions with Kr and Ar at low energies by Rydberg transition spectroscopy.
Kr^{18+} + B -> $Kr^{(18-q')+}$ [q' = 2 - 6; B = Ar,Kr]
photon spectroscopy
4 keV/amu
emission cross sections given

34
90E29 Mathur, D. Rajgara, F.A. Badrinathan, C.
Phys. Rev. A 42 (1990) 5282 - 5285
State-diagnosed charge stripping in low-energy collisions of ground-state and highly excited N^+ ions with He.
$N^+(2p^2\ ^3P,\ 2pnl)$ + He -> $N^{2+}(2p\ ^2P_{1/2})$ + He + e
translational energy spectroscopy
0.14 keV/amu

35
90E32 McLaughlin, T.K. Wilson, S.M. McCullough, R.W. Gilbody, H.B.
J. Phys. B 23 (1990) 737 - 744
State-selective electron capture by 2 - 8 keV O^{2+} recoil ions in H,H_2 and He.
O^{2+} + B -> O^+(nl) [B = H,H_2,He]
translational energy spectroscopy
0.13 - 0.50 keV/amu
no cross section given

36
90E33 Mokler, P.H. Rousch, S. Warczak, A. Stachura, Z. Kambara, T. Müller, A. Schuch, R. Schulz, M.
Phys. Rev. Letters 65 (1990) 3108 - 3111
Single transfer-excitation resonance observed via the two-photon decay in He-like Ge^{30+}.
Ge^{30+} + H_2 -> $Ge^{29+}(1s2s\ ^1S_0 - 1s^2\ ^1S_0)$
photon-photon coincidence technique
$1.2x10^4$ - $1.9x10^4$ keV/amu

37
90E34 Monce, M.N.
Phys. Rev. A 42 (1990) 2453 -
Formation of $He(3^3D)$ by electron capture in collisions of He^+ with various polyatomic molecules.
$He^+ + B \rightarrow He(3^3D - 2^3P)$
($B = H_2, N_2, O_2, O, CO_2, N_2O, CH_4, C_2H_2, C_2H_4, C_2H_6$)
photon spectroscopy
25 - 75 keV/amu
photon-emission cross sections

38
90E35 Nicolai, P. Chabot, M. Rozet, J.P. Politis, M.F. Chetioui, A. Stephan, C. Touati, A. Vernhet, D. Wohrer, K.
J. Phys. B 23 (1990) 3609 - 3627
Contribution of intrashell excitation to the l mixing of excited states of one-electron ions in solids.
Kr^{36+} + C,Al,Cu(foil) -> $Kr^{35+}(nl)$
photon spectroscopy
3.3×10^4 keV/amu

39
90E36 Pedersen, E.H. Giese, J.P.
Phys. Rev. A 41 (1990) 4831 - 4836
Electron capture by fast protons in Ar : cross sections for capture from the M-shell.
$H^+ + Ar \rightarrow H + Ar^{q+}$
recoil-projectile coincidence method
$8 \times 10^2 - 3.5 \times 10^3$ keV/amu

40
90E37 Posthumus, J.H. Morgenstern, R.
J. Phys. B 23 (1990) 2293 - 2304
He-like ions colliding on H_2 ; an analysis of the $1s^2 3l3l'$ electron spectra.
$N^{5+}(1s^2)$, $O^{6+}(1s^2)$ + H_2 -> $N^{3+}(1s^2 3l3l')$, $O^{4+}(1s^2 3l3l')$
Electron spectroscopy
1.7 - 7.7 keV/amu

41
90E38 Poulsen, J. Andersen, T. Cowan, R.D. Dahl, P. Hansen, J.E. Engholm Pedersen, J.
J. Phys. B 23 (1990) 457 - 469
Electron detachment and excitation procsses in F^--He,Ne collisions : electron and optical emission from excited F^- and F states.
F^- + He,Ne -> F
2.6×10^{-2} - 0.79 keV/amu
optical emission cross sections given also

42
90E39 Reese, C. Ebel, M.
J. Phys. B 23 (1990) 3869 - 3880
Occupation of fine structure levels in electron capture of Ar^{2+} ions from various alkali atoms.
$Ar^{2+} + B \rightarrow Ar^+(3p^4\ (^1D,^3P)\ nl) + B^+$ (B = Na,K,Rb,Cs)
photon spectroscopy
$5.7 \times 10^{-2} - 1.6 \times 10^{-1}$ keV/amu

43
90E40 Richter, C. Dowek, D. Houver, J.C. Andersen, N.
J. Phys. B 23 (1990) 3925 - 3932
Collision spectroscopy with aligned and oriented atoms : III.
effects of initial orbital alignment on H^+-Na(3p) charge transfer.
H^+ + Na(3p) -> H(n=2; $n \geq 3$)
translational energy spectroscopy
0.5 - 2 keV/amu
only relative cross sections

44
90E41 Roncin, P. Gaboriaud, M.N. Guillemot, L. Laurent, H. Ohtain, S.
Barat, M.
J. Phys. B 23 (1990) 1215 - 1223
Electron capture by multiply charged ions on a helium target
; a population mechanism for minor channels.
C^{4+} + He -> C^{3+}; C^{6+} + He -> C^{5+}(nl); N^{6+} + He -> N^{5+}(nl)
O^{6+} + He -> O^{5+}(nl); O^{8+} + He -> O^{7+}(nl)
O^{8+} + He -> O^{6+}(n,n')
translational energy spectroscopy + recoil ion coincidence
0.5 keV/amu
angular distribution

45
90E42 Roncin, P. Adjouri, C. Gaboriaud, M.N. Guillemot, L. Barat, M.
Andersen, N.
Phys. Rev. Letters 65 (1990) 3261 - 3264
Observation of orientation propensity for electron capture in
multiply-charged-ion-atom collisions.
B^{3+} + He -> B^{2+}(2p -> 2s)
photon spectroscopy (polarizer)
0.2 - 1.7 keV/amu

46
90E43 Sadilek, M. Vancura, J. Farnik, M. Herman, Z.
Int. J. Mass Spectro. Ion. Proc. 100 (1990) 197 - 207
Beam scattering study of the charged transfer process N^{2+}(He,He^+)N^+
at low collision energies.
$N^{2+}(^2P)$ + He -> $N^+(^1D,^3P)$ + He^+
~ 10^{-2} keV/amu

47
90E44 Sakaue, H.A. Kanai, Y. Ohta, K. Kushima, M. Inaba, T. Ohtani, S.
Wakiya, K. Suzuki, H. Takayanagi, T. Kambara, T. Danjo, A. Yoshino, M.
Awaya, Y.
J. Phys. B 23 (1990) L401 - 405
Autoionization of C^{4+}(2lnl') measured by electron spectroscopy in
collisions of C^{6+} with He.
C^{6+} + He -> C^{4+}(2lnl')
electron spectroscopy
5 keV/amu

48
90E45 Sataka, M. Yagishita, A. Nakai, Y.
J. Phys. B 23 (1990) 1225 - 1234
Measurements of charge-changing cross sections in collisions of He and
He^+ and with H_2,O_2,CH_4,CO and CO_2.
He + B -> He^+,He^{2+} ; He^+ + B -> He,He^{2+} [B = H_2,O_2,CH_4,CO,CO_2]
growth method
75 - 450 keV/amu

49
90E46 Schauer, M.M. Jefferts, S.R. Dunn, G.H.
Phys. Rev. A 42 (1990) 5332 - 5337
Nonresonant charge transfer in the threshold region for
$^3He^+ + {}^4He^+ \rightarrow {}^3He + {}^4He^+$.
$^3He^+ + {}^4He \rightarrow {}^3He + {}^4He^+$
Penning trap
8 ~ 80 K
rate coefficient rates given

50
90E47 Schultz, D.R. Olson, R.E. Reinhold, C.O. Kebch, S. Kebch, C.
Schmidt-Böcking, H. Ullrich, J.
J. Phys. B 23 (1990) 3839 - 3847
Coincident charge state production in F^{6+} + Ne collisions.
F^{6+} + Ne -> F^{5+},F^{4+} + Ne^{i+}
projectile + recoil coincidence technique
$5x10^2$ - $7.9x10^2$ keV/amu
also F^{6+} + Ne -> F^{7+} + Ne^{i+}

51
90E49 Schweinzer, J. Winter, H.
J. Phys. B 23 (1990) 3881 - 3898
Single electron capture from alkali atoms by slow doubly charged ions :
I. He^{2+}(0.5 - 6 keV)-Li,Na,K-one-electron processes.
He^{2+} + B -> He^+(nl) + B^+ (B = Li,Na,K)
translational energy spectroscopy
0.125 - 1.5 keV/amu

52
90E48 Schweinzer, J. Winter, H.
J. Phys. B 23 (1990) 3899 - 3908
Single electron capture from alkali atoms by slow doubly charged ions :
II. Ne^{2+},Ar^{2+}(0.5 - 6 keV)-Li,Na,K-two-electron processes.
$Ne^{2+}(2p^4\ {}^3P,{}^1D,{}^3S)$ + B -> $Ne^+\{(2p^4\ {}^3P,{}^1D,{}^1S)nl\}$:
$Ar^{2+}(3p^4\ {}^3P,{}^1D,{}^3S)$ + B -> $Ar^+\{(3p^4\ {}^3P,{}^1D,{}^1S)nl\}$
(B = Li,Na,K)
translational energy spectroscopy
$2.5x10^{-2}$ - 0.3 keV/amu (Ne) ; $1.25x10^{-2}$ - 0.15 keV/amu (Ar)

53
90E50 Shah, M.B. Gilbody, H.B.
J. Phys. B 23 (1990) 1491 - 1499
Ionization and electron capture in collisions of H^+ and He^{2+} ions
with carbon monoxide.
A^{Z+} + CO -> $A^{(Z-1)+}$ + CO^+, C^+ + O, C + O^+, CO^{2+}, C^+ + O^+
; C^{2+}; A^{Z+} + CO^+, C^+ + O, C + O^+ (A = H,He)
projectile-recoil coincidence method
10 - 98 keV/amu (H) ; 6.7 - 6.5 keV/amu (He)

54
90E51 Stolterfoht, N. Swenson, J.K. Havener, C.C. Meyer, F.W.
Phys. Rev. A 42 (1990) 5396 - 5405
Electron-correlation effects in double-electron capture collisions of
60 keV C^{6+} with He.
C^{6+} + He -> C^{4+}(nln'l')
zero-degree electron spectroscopy
5 keV/amu

55
90E52 Tawara, H. Tonuma, T. Kumagai, H. Matsuo, T.
Phys. Scripta 42 (1990) 434 - 438
Multiply charged carbon ions and their production mechanisms in MeV/amu Ar^{q+}(q = 14 - 4) + CH_4 collisions.
$Ar^{q+} + CH_4 \to Ar^{(q-1)+}, Ar^{(q-2)+}, Ar^{(q+1)+}, Ar^{(q+2)+}$
projectile + recoil ion coincidence
10^3 keV/amu
also multiply charged carbon ion production cross sections given

56
90E53 Tu, S. Church, D.A.
Chem. Phys. Letters 174 (1990) 301 - 303
Electron transfer collisions of Be^{2+} with H_2 and Be.
$Be^{2+} + H_2, Be \to Be^{+}$
ion trap technique
thermal energies
rate coefficients at themal energies

57
90E54 Vermeeren, L. Lieveus, P. Silverans, R.E.
Phys. Rev. A 42 (1990) 3901 - 3906
Velocity-dependent neutralization cross sections of Ba^{+} ground and metastable states by Na.
$Ba^{+}(5d\ ^2D_{3/2}, ^2D_{5/2}\ 6s) + Na \to Ba$
laser-pumping technique

58
90E55 Warczak, A. Stachura, Z. Szymanski, A. Stöhlker, Th. Kozhuharov, C. Livingston, A.E. Mokler, P.H. Reusch, S.
Phys. Letters A 146 (1990) 122 - 127
Evidence for resonant two-electron capture and excitation in collisions of H-like Ge with Ne.
$Ge^{31+} + Ne \to Ge^{29+*}$
X-ray-projectile coincidence technique
4.5 - 11.5x10^3 keV/amu

59
90E56 Wilson, S.M. McLaughlin, T.K. McCullough, R.W. Gilbody, H.B.
J. Phys. B 23 (1990) 1315 - 1323
State-selective electron capture by slow S^{3+} recoil ions in H,H_2 and He.
$S^{3+} + H, H_2, He \to S^{2+}(nl)$
translational energy spectroscopy
0.075 - 0.28 keV/amu
no cross sections given

60
90E57 Wilson, S.M. McLaughlin, T.K. McCullough, R.W. Gilbody, H.B.
J. Phys. B 23 (1990) 2969 - 2976
State selective electron capture by slow S^{2+} recoil ions in atomic and molecular hydrogen.
$S^{2+} + H, H_2 \to S^{+}(nl)$
translational energy spectroscopy
0.06 - 0.25 keV/amu
no cross section given

61
90E59 Xu, Y. Thomas, E.W. Moran, T.F.
J. Phys. B 23 (1990) 1235 - 1243
Charge transfer reactions of ground $O^{+}(^4S)$ and metastable $O^{+}(^2D, ^2P)$ ions with H_2 molecules.
$O^{+}(^4S, ^2D, ^2P) + H_2 \to O$
10^{-3} - 3x10^{-2} keV/amu
metastable state cross sections $\simeq$ 10x ground state cross sections.

62
90E58 Xu, Y. Moran, T.F. Thomas, E.W.
Phys. Rev. A 41 (1990) 1408 - 1412
Charge-transfer reactions of ground-state $C^+(^2P)$ and metastable-state $C^+(^4P)$ ions with H_2 molecules.
$C^+(^2P,^4P) + H_2 \to C^0$
beam attenuation + growth method
8×10^{-4} - 4×10^{-2} keV/amu

63
90E60 Zouros, T.J.M. Bhalla, C.P. Lee, D.H. Richard, P.
Phys. Rev. A 42 (1990) 678 - 681
Effects of alignment and interference in resonant transfer and excitation for F^{6+} and O^{5+} collisions with H_2 in 0^0 Auger measurements.
$F^{6+} + H_2 \to F^{5+*}$; $O^{5+} + H_2 \to O^{4+*}$
zero-degree electron spectroscopy
250 - 2000 keV/amu

1
91E 1 Andersson, L.R. Cederquist, H. Barany, A. Liljeby, L. Biedermann, C. Levin, J.C. Keller, N. Elston, S.B. Gibbons, J.P. Kimura, K. Sellin, I.A.
Phys. Rev. A 43 (1991) 4075 - 4078
Simultaneous single-electron capture and projectile-core excitation enhanced through configuration interaction in very slow Ar^{6+} - He collisions.
Ar^{6+} + He -> $Ar^{5+}(3s^24s, 3s^24p, 3s3p3d)$
E: position-sensitive method; T: multichannel Landau-Zener model
$1.6x10^{-3}$ - $1.3x10^{-2}$ keV/amu
angular distribution

2
91E 2 Atan, H. Steckelmacher, W. Lucas, M.W.
J. Phys. B 24 (1991) 2559 - 2569
Single electron loss and single electron capture for 0.6 - 2.2 MeV colliding with rare gasses.
He^{+} + B -> He^{2+},He^{0} (B = He,Ne,Ar)
growth method
125 - 550 keV/amu

3
91E 3 Aumayr, F. Gieler, M. Unterreiter, E. Winter, H.
Europhys. Letters 16 (1991) 557 - 561
State-selective electron capture by He^{2+} ions from laser-excited $Na^{*}(3p)$.
He^{2+} + Na(3p) -> He^{+}(n=4,5); He^{2+} + Na(3s) -> He^{+}(n=3)
translational energy spectroscopy
1.5 keV/amu

4
91E 4 Belyaev, V.A. Dubrovin, M.M. Khlopkin, A.N.
Sov. J. Plasma Phys. 17 (1991) 337 - 341
Measurement of the effective charge exchange cross section of hydrogen atoms on triply charged carbon ions.
C^{3+} + H -> C^{2+}
merged-beam method
$1.5x10^{-3}$ - 0.7 keV/amu

5
91E 5 Bernstein, E.M. Kanal, A. Zaharakis, K.E. Clark, M.W. Tanis, J.A. Ferguson, S.M. Badnell, N.R.
Phys. Rev. A 44 (1991) 4210 - 4214
Resonant transfer excitation in collisions of F^{6+} and Mg^{9+} with H_2.
F^{6+},$Mg^{9+}(1s^22s)$ + H_2 -> F^{5+},$Mg^{8+}(1s^2nln'l')$
X-ray-particle coincidence technique
$1.90x10^{2}$ - $2x10^{3}$ keV/amu (F); $1.3x10^{3}$ - $2.5x10^{3}$ keV/amu (Mg)

6
91E 6 Boudjema, M. Cornille, M. Dubau, J. Moretto-Capelle, P. Bordenave-Montesquieu, A. Benoit-Catin, P. Gleizes, A.
J. Phys. B 24 (1991) 1713 - 1737
Investigation of double capture in Ne^{8+} + He,H_2 by electron spectroscopy at 80 keV II. experimental results.
$Ne^{8+}(1s^2)$ + He,H_2 -> $Ne^{6+}(1s^23lnl'; 1s^24lnl')$
electron spectroscopy
4 keV/amu

7
91E 7 Campbell, E.E.B. Witte, R. Hertel, I.V.
J. Phys. B 24 (1991) 4245 - 4247
Integral alignment of Na(3p) in resonant charge transfer collisions.
Na^{+} + Na(3p) -> $Na(3p\sigma,\pi^{+},\pi^{-})$
laser-excited technique
$4x10^{-3}$ - $1x10^{-1}$ keV/amu
relative cross section

8
91E 8 Cederquist, H.
Phys. Rev. A 43 (1991) 2306 - 2310
Transfer excitation in slow collisions between ions of very high charge and two-electron targets.
Xe^{q+}(q = 10 - 31) + He -> $Xe^{(q-1)+}$ + He^{**}; $Xe^{(q-2)+}$ + He^{2+}
E: growth method; T: extended over-barrier model
$3x10^{-2}$xq (keV/amu)

9
91E 9 Cederquist, H.
Z. Phys. D 21 (1991) S99 - 104
Radiative stabilization following transfer of two electrons to Xe^{q+}($q \leq 35$) in slow collisions with He and Xe.
review

10
91E12 Cheng, S. Cocke, C.L. Frohne, V. Kamber, E.Y. Varghese, S.L.
Nucl. Instr. Meth. in Phys. Res. B 56/57 (1991) 78 - 81
Electron capture by O^{8+} from aligned molecular deuterium.
O^{8+} + D_2 -> O^{7+}
recoil-ion-projectile ion coincidence technique
625 keV/amu

11
91E11 Cherkani, C.H. Szücs, S. Hus, H. Brouillard, F.
J. Phys. B 24 (1991) 2367 - 2377
Transfer ionization in He^{2+} - H^- collisions: measurements of the exothermicity and theoretical interpretation.
He^{2+} + H^- -> He^+ + H^+ + e
E: merged beam technique; T: semiclassical calculation
single electron capture at large γ + resonant Penning ionization at small γ.

12
91E10 Cherkani, M.H. Szücs, S. Terao, M. Hus, H. Brouillard, F.
J. Phys. B 24 (1991) 209 - 218
Transfer ionization in He^{2+} - H^- collisions: cross section measurements in the energy range 0.2 - 1300 eV.
He^{2+} + H^- -> He^+ + H^+ +e
merged beam technique with coincidence
$5x10^{-5}$ - 0.4 keV/amu

13
91E13 Cline, R.A. Westerveld, W.B. Risley, J.S.
Phys. Rev. A 43 (1991) 1611 - 1613
Measurement of electron-transfer cross sections for intermediate-energy H^+ - He collisions.
H^+ + He -> H(3l) + He^+
photon spectroscopy
25 - 100 keV/amu

14
91E14 Cornille, M. Ludac, T. Hitz, D. Bliman, S. Heckman, G.A. Knystautas, E.J.
Phys. Rev. A 43 (1991) 115 - 120
Spectroscopic study of low-velocity charge-exchange collisions of S^{7+} ions with H_2 and He targets.
S^{7+} + H_2,He -> S^{6+},S^{5+}(nl)
photon spectroscopy
2 keV/amu
no absolute cross sections

15
91E15 Donnelly, A. Geddes, J. Gilbody, H.B.
J. Phys. B 24 (1991) 165 - 172
Balmer alpha emission in collisions of H^+,He^+ and He^{2+} with hydrogen atoms.
H^+,He^+,He^{2+} + H -> H(Balmer-alpha)
crossed-beam method
2.5 - 10^2 keV/amu
charge transfer is important at low H^+ + H collisions.

16
91E16 Donnelly, A. Geddes, J. Gilbody, H.B.
J. Phys. B 24 (1991) 3403 - 3408
Balmer alpha emission in collisions of He^+ and He^{2+} ions with hydrogen.
He^+,He^{2+} + H_2 -> H^*(n = 3 -> 2)
2.5 - 25 keV/amu (He^+); 17 - 67 keV/amu (He^{2+})
dissociative electron capture

17
91E17 Dowek, D. Houver, J.C. Richter, C. Andersen, N.
Z. Phys. D 18 (1991) 231 - 234
Collision spectroscopy with aligned and oriented atoms IV. neutralization in H^- - Na(3s,3p) collisions.
H^- + Na(3s,3p) -> H
translational energy spectroscopy + laser excitation
0.15 - 1.5 keV/amu

18
91E18 Dupeyrat, G. Marquette, J.B. Rowe, B.R. Rebrion, C.
Int. J. Mass Spectro. Ion Proc. 103 (1991) 149 - 156
Reactions of $Ar^{2+}(^3P)$ ions with some neutrals at 30K.
$Ar^{2+}(^3P)$ + B -> Ar^+ (B = He,Ar,H_2,N_2,O_2,CO_2)
30K
rate coefficients at 30K.

19
91E19 Gao, R.S. Johnson, L.K. Smith, G.J. Hakes, C.L. Smith, K.A. Lane, N.F. Stebbings, R.F. Kimura, M.
Phys. Rev. A 44 (1991) 5599 - 5604
Collisions between H^+ and H_2 at kilo-electron-volt energies: absolute differential cross sections for small-angle direct, single-and double-charge-transfer scattering.
H^+ + H_2 -> H,H^-
E: scattering experiment; T: MO model
0.5,1.5,5.0 keV/amu
angular distribution

20
91E21 Gieler, M. Ziegelwager, P. Aumayr, F. Winter, H. Fritsch, W.
J. Phys. B 24 (1991) 647 - 655
Experimental and theoretical investigation of electron capture and target excitation in (1 - 20 keV) H^+ - K collisions.
H^+ + K(4s) -> H + K^+; H^+ + K^*(4p->4s)
growth + photon spectroscopy
1 - 20 keV/amu

21
91E22 Gieler, M. Aumayr, F. Hutteneder, M. Winter, H.
J. Phys. B 24 (1991) 4419 - 4429
Laser enhanced Lα emission from (50eV - 15 keV) H^+ - Na collisions.
H^+ + Na(3s,3p) -> H^*(2p,2s -> 1s)
photon-spectroscopy + laser-excitation
0.05 - 15 keV/amu

22
91E20 Gieler, M. Aumayr, F. Ziegelwanger, P. Winter, H. Fritsch, W.
Phys. Rev. A 43 (1991) 127 - 133
Lα emission from (0.1 - 20 keV) H^+ impact on Li,Na and K.
$H^+,D^+ + B \rightarrow H,D($ 2p-Lyman α) (B = Li,Na,K)
photon spectroscopy
0.1 - 20 keV/amu

23
91E23 Hansen, S.B. Gray, L.G. Hordal-Pedersen, E. McAdam, K.B.
J. Phys. B 24 (1991) L315 - 320
Velocity dependence of total charge transfer from state-selected Na Rydberg targets.
$Na^+ + Na(n,l) \rightarrow Na(n'l'm') + Na^+$ (n' = 22 - 41)
laser-excited target
relative cross sections

24
91E24 Higgins, M.J. Latimer, C.J.
J. Phys. B 24 (1991) 2571 - 2578
The production of highly excited xenon atoms in charge exchange collisions.
$Xe^+ + B \rightarrow Xe^*(n=24-43) + B^+$ (B = He,Ne,Ar,CH_4)
; $H^+ + Ne \rightarrow H^*(n=24-43)$
field-ionization technique

25
91E25 Hoekstra, R. de Heer, F.J. Mongenstern, R.
J. Phys. B 24 (1991) 4025 - 4048
State-selective electron capture in collisions of He^{2+} with H.
$He^{2+} + H \rightarrow He^+$(2p->1s; 3p->1s; 4p->1s: n=3->2; 4->3; n=4s,4p,4d)
2 - 13 keV/amu

26
91E26 Hoekstra, R. de Heer, F.J. Morgenstern, R.
Z. Phys. D 21 (1991) S81 - 85
Photons shedding light upon basic charge exchange processes.
review

27
91E27 Holt, R.A. Prior, M.H. Randall, K.L. Hutton, R. McDonald, J. Schneider, D.
Phys. Rev. A 43 (1991) 607 - 610
Magnetic substates populated by double-electron capture.
$C^{5+} + He \rightarrow C^{3+}(1s2l2l'\ L) \rightarrow C^{4+}(1s^2) + e$
electron spectroscopy
1.5 - 5 keV/amu
relative population among L

28
91E28 Hopkins, C.J. Dunn, K.F. Gilbody, H.B.
J. Phys. B 24 (1991) 2379 - 2385
Ionization and charge transfer in collisions of protons with Ba^+ and Sr^+ ions.
$H^+ + B^+ \rightarrow H + B^{2+}$; $H^+ + B^{2+} + e$ (B = Ba^+,Sr^+)
crossed beam method
50 - 500 keV/amu

29
91E29 Hughes, I.G. Dunn, K.F. Gilbody, H.B.
J. Phys. B 24 (1991) L485 - 487
Electron capture in H^+-Tl^+ collisions.
$H^+ + Tl^+ \rightarrow H + Tl^{n+} + (n-2)e\ (n \geq 2)$
crossed-beam technique
2×10^2 - 5×10^2 keV/amu
dominant transfer ionization

30

91E30 Hulskotter, H.P. Feinberg, B. Meyerhof, W.E. Belkacem, A. Alonso, J.R. Blumenfeld, L. Dillard, E.A. Gould, H. Guardala, N. Krebs, C.F. McMahan, M.A. Rhoades-Brown, M.E. Rude, B.S. Schweppe, J. Spooner, D.W. Street, K. Thieberger, P. Wegner, H.E.
Phys. Rev. A 44 (1991) 1712 - 1724
Electron-electron interaction in projectile electron loss.
Li^{2+},C^{5+},O^{7+} + H_2,He -> Li^{3+},C^{6+},O^{8+}
Au^{52+},Au^{75+} + B -> Au^{53+},Au^{76+} (B = H_2,He,C,N_2)
U^{86+},U^{90+} + H_2,He -> U^{87+},U^{91+}
$7.5x10^2$ - $4x10^5$ keV/amu

31

91E31 Hutton, R. Schneider, D. Prior, M.H.
Phys. Rev. A 44 (1991) 243 - 252
Isoelectronic study of double-electron capture in slow ion-atom collisions.
$Si^{5+},Ar^{9+},Sc^{12+},Ti^{13+},Fe^{17+},Cu^{20+}$ + He -> $Si^{3+},Ar^{7+},Sc^{10+},Ti^{11+},Fe^{15+},Cu^{18+}$
Auger-electron spectroscopy
1.4 keV/amu
Auger electron spectra
no cross section given

32

91E32 Irvine, A.D. Latimer, C.J.
J. Phys. B 24 (1991) L145 - L147
Charge transfer rections of ground state O^+ ions with H_2 molecules.
$O^+(^4S)$ + H_2 -> O + H_2^+
photoionization source + growth technique
$6x10^{-3}$ - $6x10^{-2}$ keV/amu

33

91E33 Koslowski, H.R. Lebius, H. Staimmler, V. Fink, R. Wiesemann, K. Huber, B.A.
J. Phys. B 24 (1991) 5023 - 5034
Collisions of doubly charged nitrogen molecules with rare gas atoms.
$N_2^{2+}(c^3\Sigma_u^+(v=0,1))$ + B -> $N_2^+(X^2\Sigma_g^+(v'))$ (B = He,Ne,Ar)
Translational energy specroscopy
$1x10^{-2}$ keV/amu

34

91E34 Kristensen, F.G. Horsdal, E.
Phys. Rev. A 44 (1991) 1604 - 1612
Electron capture from Ar by fast protons: capture from the M subshell.
H^+ +Ar -> H + $Ar^+(3s3p^6\ ^2S)$; H + $Ar^{2+}(3s3p^5\ ^1P;^3P)$;
H + $Ar^{3+}(3s3p^4\ ^4P;^2D;^2P)$; H + $Ar^{4+}(3s3p^3\ ^3D)$
photon-ion coincidence
100 - 800 keV/amu

35

91E35 Lee, D.H. Richard, P. Sanders, J.M. Zouros, T.J.M. Shinpaugh, J.L. Varghese, S.L.
Phys. Rev. A 44 (1991) 1636 - 1643
KLL resonant transfer excitation to $F^{6+}(1s2l2l')$ intermediate states.
$F^{7+}(1s^2,1s2s)$ + H_2,He -> $F^{6+}(1s2l2l')$
zero-degree electron spectroscopy
$2.5x10^2$ - $2x10^3$ keV/amu

36
91E36 Liu, C.J. Dunford, R.W. Berry, H.G. Church, D.A.
Phys. Rev. A 43 (1991) 572 - 574
Alignment of Ne^{7+} following electron capture by Ne^{8+} ions in a sodium target.
Ne^{8+} + Na -> Ne^{7+}(n = 9->8; 8->7)
photon spectroscopy
4.8 - 32.8 keV/amu
linear polarizaton measured
no cross section

37
91E37 Lorent, V. Brouillard, F. Cornet, A. Urbain, X.
J. Phys. B 24 (1991) 219 - 226
Electron capture by H(3l) atoms in collisions with Ne and Ar atoms.
H(3l) + Ne,Ar -> H^-
laser-assisted technique
0.6 - 3 keV/amu

38
91E38 Martin, S.J. Stevens, J. Pollack, E.
Phys. Rev. A 43 (1991) 3503 - 3508
Single-electron capture and direct scattering in He^{2+} + D_2,O_2 and N_2.
He^{2+} + B -> He^+ (B = D_2,O_2,N_2)
translational energy spectroscopy
0.5 - 1 keV/amu
angular distribution measured

39
91E39 Nakai, Y. Saıaka, M.
J. Phys. B 24 (1991) L89 - 91
Electron capture and loss cross sections in collisions of C atoms with He.
C + He -> C^+,C^{2+},C^-
growth technique
25 - 125 keV/amu

40
91E40 Okuno, K. Soejima, K. Kaneko, Y.
Nucl. Instr. Meth. B 53 (1991) 387 - 394
Application of mini-EBIS to cross section measurements of single and double electron capture in low energy collisions of C^{4+},N^{4+} and O^{4+} with He.
A^{4+} + He -> A^{3+},A^{2+} (A = C,N,O)
OPIG + growth method
$3x10^{-5}$ - $1x10^{-1}$ keV/amu

41
91E41 Parameswaran, R. Bhalla, C.P. Walch, B.P. DePaola, B.D.
Phys. Rev. A 43 (1991) 5929 - 5933
Resonant transfer and excitation in collisions of C^{5+} with H_2 and He targets.
C^{5+} + H_2,He -> C^{4+}(2l,n'l')
zero-degree electron spectroscopy
333 - 833 keV/amu

42
91E42 Raphaelian, M.L.A. Berry, H.G. Mansour, N. Schneider, D.
Phys. Rev. A 43 (1991) 4071 - 4074
Non-resonant transfer and excitation in Ne^{6+} - He collisions at intermediate energies.
$Ne^{6+}(1s^22s^2)$ + He -> $Ne^{5+}(1s^22snln'l')$
zero-degree electron spectroscopy
15 - 60 keV/amu
no cross sections given

43
91E43 Reese, C. Elbel, M.
J. Phys. B 24 (1991) L191
Reply to comment on occupation of fine structure levels in electron capture of Ar^{2+} ions from various alkali atoms.

44
91E44 Richter, C. Dowek, D. Houver, J.C.
J. Phys. B 24 (1991) L213 - 218
Collision spectroscopy with aligned and oriented atoms : V neutral particle production in H_2^+ - Na(3s) and H_2^+ - Na(3p) collisions.
H_2^+ + Na(3s,3p) -> H_2($B^1\Sigma_u^+$, $c^3\Pi_u$, $C^1\Pi_u$)
translational energy spectroscopy
0.25 - 2 keV/amu

45
91E45 Roncin, P. Gaboriaud, M.N. Barat, M.
Europhys. Letters 16 (1991) 551 - 556
Mechanism of true double electron capture by multiply charged ions.
A^{q+} + B -> $A^{(q-2)+}$
(A = N^{7+},O^{7+},O^{8+},Ne^{7+},Ar^{8+},Ar^{9+},Ar^{11+}; B = He,Ar,Kr,Xe)
translational energy spectroscopy
~ 1 keV/amu
angle-differential cross sections

46
91E46 Roncin, P. Laurent, H. Guillemot, L. Gaboriaud, M.N. Barat, M.
Z. Phys. D 21 (1991) S93 - 98
Two electron processes in charge exchange reactions involving multiply charged ions.
review

47
91E47 Sakabe, S. Izawa, Y. Hashida, M. Naka, T. Sudo, T. Mochizuki, T. Yamanaka, T. Nakai, S.
Rev. Sci. Instr. 61 (1991) 3678 - 3685
New cross-beam technique for charge transfer cross section measurement using a pulsed ion beam produced by laser photoionization.
Gd^+ + Gd -> Gd + Gd^+
crossed-beam technique
$6x10^{-4}$ - $6x10^{-3}$ keV/amu

48
91E49 Schuch, R. Justiniano, E. Schulz, M. Datz, S. Dittner, P.F. Giese, J.P. Krause, H.F. Shône, H. Vane, R.
Phys. Rev. A 43 (1991) 5180 - 5183
Population of highly excited intermediate resonance states by electron transfer and excitation.
S^{15+} + H_2 -> S^{14+*}
X-ray - X-ray coincidence technique
$4.7x10^3$ - $7.0x10^3$ keV/amu
Kα-Kα, Kα-Kβ, Kα-Kγ, X-ray... coincidence

49
91E48 Schuch, R. Justiniano, E. Vogt, H. Decos, G. Gruen, N.
J. Phys. B 24 (1991) L133 - 138
Double electron capture of He^{2+} from He at high velocity.
He^{2+} + He -> He + He^{2+}
E: growth method; T: CDW
$3.75x10^2$ - $1.5x10^3$ keV/amu
angular cross sections at 1.5 MeV

50
91E50 Schulze, R. Melchert, F. Hagmann, M. Krüdener, S. Krüger, J. Salzborn, E. Reinhold, C.O. Olson, R.E.
J. Phys. B 24 (1991) L7 - 12
Mutual ionization in H^- - H^- collisions.
$H^- + H^- \rightarrow H^0 + H^0 + 2e; H + H^+ + 3e$
crossed-beam technique with coincidence
1.5 - 90 keV/amu

51
91E51 Schweinzer, J. Winter, H.
J. Phys. B 24 (1991) L189 - 190
Comments on occupation of fine structure levels in electron capture of Ar^{2+} ions from various alkali atoms.
$Ar^{2+} + B \rightarrow Ar^+$ (B = Na,K,Rb,Cs)

52
91E52 Shah, M.B. Gilbody, H.B.
J. Phys. B 24 (1991) 977 - 982
Screening-antiscreening effects in one-electron loss by fast Li^+ and Li^{2+} ions in collisions with H,H_2 and He.
$Li^+ + B \rightarrow Li^{2+}$ (B = H,H_2); $Li^{2+} + B \rightarrow Li^{3+}$ (B = H,H_2,He)
growth method
43 - 386 keV/amu

53
91E53 Smith, G.J. Johnson, L.K. Gao, R.S. Smith, K.A. Stebbings, R.F.
Phys. Rev. A 44 (1991) 5647 - 5652
Absolute differential cross sections for electron capture and loss by kilo-electron-volt hydrogen atoms.
$H + B \rightarrow H^+,H^-$ (B = H_2,N_2,O_2,Ar,He)
2.0 - 5.0 keV/amu
angular distribution

54
91E54 Suraud, M.G. Hoekstra, R. de Heer, F.J. Bonnet, J.J. Morgenstern, R.
J. Phys. B 24 (1991) 2543 - 2558
State-selective electron capture into nl subshells in slow collisions of C^{5+} and N^{6+} with He and H_2 studied by photon emission spectroscopy.
$C^{5+} + H_2 \rightarrow C^{4+}(3l;4l)$; C^{5+},N^{6+} + He,H_2 -> C^{4+},N^{5+}(2p,3p,4p->1s)
photon spectroscopy

55
91E55 Tanis, J.A. Bernstein, E.M. Clark, M.W. Ferguson, S.M. Price, R.N.
Phys. Rev. A 43 (1991) 4723 - 4726
Target ionization accompanied by projectile electron loss in fast $O^{6,7+}$ + He collisions.
O^{6+} + He -> O^{5+},O^{7+}; O^{7+} + He -> O^{6+},O^{8+}
projectile-recoil ion coincidence technique
6.25×10^2 - 2.5×10^3 keV/amu

56
91E57 Underwood, T.A. Breinig, M. Gaither, C.C.
Phys. Rev. A 44 (1991) 1668 - 1676
Production of doubly excited projectile states in collisions of 0.1 MeV/u Ag^{4+} ions with He,H_2 and Ar targets.
$Ag^{4+} + B \rightarrow Ag^{3+},Ag^{5+},Ag^{6+}$ (B = He,H_2,Ar)
electron spectroscopy
10^2 keV/amu

57
91E56 Unterreiter, E. Schweinzer, J. Winter, H.
J. Phys. B 24 (1991) 1003 - 1016
Single electron capture for impact of (0.5 - 9 keV) C^{2+} on H_2,Ar and H_2.
$C^{2+}(2s^2\ ^1S,\ 2s2p\ ^3P^o)$ + He,Ar,H_2 -> C^+
growth + attenuation technique
$5x10^{-2}$ - $4.6x10^{-1}$ keV/amu

1
92E 1 Ali, R. Frohne, V. Cocke, C.L. Stockli, M. Cheng, S. Raphaelian, M.L.A.
Phys. Rev. Letters 69 (1992) 2491 - 2494
Q-value measurements in charge-transfer collisions of highly charged ions with atoms by recoil longitudinal momentum spectroscopy.
Ar^{15+} + Ar -> $Ar^{(15-k)+}$ (k = 1,2) + Ar^{i+} (i = 1 - 5)
recoil longitudinal momentum spectroscopy
1.25 keV/amu

2
92E 2 Andersson, L.R. Cederquist, H. Barany, A. Liljeby, L. Biedermann, C. Levin, J.C. Keller, N. Elston, S.B. Gibbons, J.P. Sellin, I.A.
Phys. Rev. A 45 (1992) R4 - 7
One- and two-electron capture in slow Ar^{6+}-He collisions.
Ar^{6+} + He -> Ar^{4+}(3p4s; 3p4p)
translational energy spectroscopy
$1.5x10^{-2}$ - $3.0x10^{-2}$ keV/amu
Angular distributions

3
92E 3 Andriamonje, S. Chevallier, M. Cohen, C. Cue, N. Dauvergne, D. Dural, J. Genre, R. Girard, Y. Kirsch, R. L'Hoir, A. Poizat, J.C. Quere, Y. Remillieux, J. Schmaus, D. Toulemonde, M.
Phys. Letters A 164 (1992) 184 - 190
RTE measurement with Xe^{52+} ions channeled in a Si crystal.
Xe^{52+} + Si<110> -> Xe^{51+*}
(3.3 - 4.3)$x10^{4}$ keV/amu

4
92E 4 Aumayr, F. Gieler, M. Schweinzer, J. Winter, H.
Phys. Rev. Letters 68 (1992) 3277 - 3280
Electron capture in He^{2+} collisions with aligned Na^{*}(3p) atoms.
He^{2+} + Na^{*}(3p) -> He^{+}(n=4)
translational energy spectroscopy
0.5 - 3.0 keV/amu

5
92E48 Beijers, J.P.M. Hoekstra, R. Morgenstern, R. de Heer, F.J.
J. Phys. B 25 (1992) 4851 - 4864
State- selective electron capture and core excitation in slow Ne^{6+} - He collisions.
$Ne^{6+}(1s^2 2s^2\ ^1S;\ 1s^2 2s2p\ ^3P^o)$ + He -> $Ne^{5+}(1s^2 2s^2 3l;\ 1s^2 2s2p3l)$
photon spectroscopy
0.07 - 1.2 keV/amu

6
92E 5 Beijers, J.P.M. Hoekstra, R. Schlatmann, A.R. Morgenstern, R. de Heer, F.J.
J. Phys. B 25 (1992) 463 - 474
State-selective electron capture in slow collisions of C^{6+} and O^{6+} with He.
C^{6+} + He -> C^{5+}(n=3->2; n=4->2); O^{6+} + He -> O^{5+}(3s,3p,3d)
photon-spectroscopy
$6x10^{-2}$ - 1.5 keV/amu (O) : 0.3 - 1.8 keV/amu (C)

7
92E 6 Bliman, S. Barany, A. Bonnefoy, M. Bonnet, J.J. Chassevent, M. Fleury, A.G. Hitz, D. Knystautas, E.J. Nordgren, J. Rubensson, J.E. Suraud, M.G.
J. Phys. B 25 (1992) 2065 - 2080
Single and double charge exchange collision spectroscopy of O^{6+} + He at 3.8 keV/amu.
$O^{6+}(1s^2;\ 1s2s)$ + He -> $O^{5+}(1s^2nl;\ 1s2l3l)$, $O^{4+}(1s^2nln'l')$
photon spectroscopy
3.8 keV/amu

8
92E 7 Bliman, S. Nordgren, J. Knystautas, E.J. Suraud, M.G.
J. Phys. B 25 (1992) L435 - 438
Rydberg level population in the electron capture collision O^{6+} + He at low velocity.
$O^{6+}(1s^2)$ + He -> $O^{5+}(1s^2nl)$ (n = 3 - 7)
photon spectroscopy
3.75 keV/amu

9
92E 8 Bliman, S. Suraud, M.G. Hitz, D. Huber, B.A. Lebius, H. Cornille, M. Rubensson, J.E. Nordgren, J. Knystautas, E.J.
Phys. Rev. A 46 (1992) 1321 - 1332
Collision spectroscopy of Ar^{8+} + He at low velocities (v < 1 a.u.).
Ar^{8+} + He -> Ar^{7+},Ar^{6+}
photon spectroscopy
0.2 keV/amu

10
92E10 Boduch, P. Chantepie, M. Hennecart, D. Husson, X. Lecler, D. Druetta, M. Wilson, M.
Phys. Scripta 46 (1992) 337 - 342
Spectroscopic analysis of visible and near UV light emitted in 120 keV Kr^{8+}-He and Kr^{8+}-H_2 collisions.
Kr^{8+} + He,H_2 -> Kr^{7+}(nl), Kr^{6+}(nln'l')
photon spectroscopy
1.4 keV/amu
emission cross sections

11
92E 9 Boduch, P. Chantepie, M. Hennecart, D. Husson, X. Kucal, H. Lecler, D. Stolterfoht, N.
Phys. Scripta 45 (1992) 203 - 211
Spectroscopic analysis of visible and near UV light emitted by Ar^{7+} and Ar^{6+} ions produced in Ar^{8+} + He and Ar^{8+} + H_2 collisions at 120 keV.
Ar^{8+} + He,H_2 -> A^{7+},A^{6+} ($h\nu$)
photon spectroscopy
3 keV/amu
photon transitions

12
92E11 Bordenave-Montesquieu, D. Dagnac, R.
J. Phys. B 25 (1992) 2573 - 2586
Single-electron capture for 2 - 8 keV incident energy and direct scattering at 6 keV in He^{2+}-He collisions.
He^{2+} + He -> He^{+}
translational energy spectroscopy
0.5 - 2 keV/amu
angular scattering

13
92E13 Cederquist, H. Andersson, H. Beebe, E. Biedermann, C. Brongstrom, L. Engstrom, A. Gao, H. Hutton, R. Levin, J.C. Liljeby, L. Pajek, M. Quinteros, T. Selberg, N. Sigray, P.
Phys. Rev. A 46 (1992) 2592 - 2595
Increase of true double-electron-capture cross sections in slow Xe^{q+} - (Xe,He) collisions at very high q.
Xe^{q+} + B -> $Xe^{(q-2)+}$ (q = 15 - 42)
projectile + recoil ion coincidence
$3x10^{-2}$xq (keV/amu)

14
92E12 Cederquist, H. Beebe, E. Biedermann, C. Engström, A. Gao, H. Hutton, R. Levin, J.C. Liljeby, L. Quinteros, T. Selberg, N. Sigray, P.
J. Phys. B 25 (1992) L69 - 75
On the role of transfer excitation in slow Xe^{q+} - He,Xe ($15 \le q \le 42$) collisions.
Xe^{q+}(q = 15 - 42) + He,Xe -> $Xe^{(q-1)+}$,$Xe^{(q-2)+}$
projectile-recoil ion coincidence
0.25 - 1.0 keV/amu

15
92E14 Clark, M.W. Tanis, J.A. Bernstein, E.M. Badnell, N.R. DuBois, R.D. Graham, W.G. Morgan, T.J. Plano, V.L. Schlachter, A.S. Stockli, M.P.
Phys. Rev. A 45 (1992) 7846 - 7850
Cross sections for resonant transfer and excitation in Fe^{q+} + H_2 collisions.
Fe^{q+}(q=23,24,25) + H_2 -> $Fe^{(q-1)+*}$
X-ray + projectile coincidence
$5.9x10^3$ - $9.4x10^3$ keV/amu

16
92E15 Fremont, F. Sommer, K. Lecler, D. Hickam, S. Boduch, P. Husson, X. Stolterfoht, N.
Phys. Rev. A 46 (1992) 222 - 229
Angular distribution of Auger-electron emission following double electron capture in C^{6+} + He collisions.
C^{6+} + He -> C^{4+}(2ln'l')
electron spectroscopy
5 keV/amu

17
92E16 Frieling, G.J. Hoekstra, R. Smulders, E. Dickson, W.J. Zinoviev, A.N. Kuppens, S.J. de Heer, F.J.
J. Phys. B 25 (1992) 1245 - 1255
Cross sections for l-selective electron capture into the He^+(n=4) shell in intermediate energy collisions of He^{2+} with H and H_2.
He^{2+} + H,H_2 -> He^+(n=4,4s,4p,4d,4f; n=4 -> n=3)
photon spectroscopy
27 - 132 keV/amu

18
92E17 Gao, R.S. Dutta, C.M. Lane, N.F. Smith, K.A. Stebbings, R.F. Kimura, M.
Phys. Rev. A 45 (1992) 6388 - 6394
Experimental and theoretical studies of the He^{2+} + He system : differential cross sections for direct, single and double-charge-transfer scattering at keV energies.
He^{2+} + He -> He^+,He
E: position sensitive detection; T: quantum-mechanical MO
0.5 - 3.3 keV/amu
angular distribution

19
92E55 Gauntt, D.M. Danzmann, K.
Phys. Rev. A 46 (1992) 5580 - 5593
Velocity dependence of electron-capture particle cross sections and alignment in low-energy collisions of Ne^{8+} and Ar^{8+} with atomic Na.
Ne^{8+} + Na -> Ne^{7+}(nlm,n=9-8) + Na^+
Ar^{8+} + Na -> Ar^{7+}(n=9-8) + Na^+
photon-spectroscopy technique
polarization measured

20
92E49 Gieler, M. Aumayr, F. Windholz, L.
Phys. Rev. Letters 69 (1992) 3452 - 3454
Coherent population trapping probed by charge exchange reactions.
He^{2+} + Na(3s,3p) -> He^{+}
translational spectroscopy
2.5 keV/amu

21
92E56 Herrmann, R. Prior, M.H. Dörner, R. Schmidt-Böcking, H. Lyneis, C.M. Wille, U.
Phys. Rev. A 46 (1992) 5631 - 5642
Multiple electron transfer in slow Ne^{9+}-Ne collisions.
Ne^{9+} + Ne -> Ne^{q+}(q=8-4) + Ne^{i+}(i=2-7)
projectile-recoil ion coincidence technique
4.5 keV/amu
angular distribution (θ = 12 - 75 mrad)

22
92E50 Hoekstra, R. Summers, H.P. de Heer, F.J.
Supplement to Nucl. Fusion 3 (1992) 63 - 69
Charge transfer in collisions of protons with helium.
H^{+} + He -> H(total,2s,2p,3s,3p,3d)
0.3 - 500 keV/amu
evaluated data

23
92E18 Hoekstra, R. Wolfrum, E. Beijers, J.P.M. de Heer, F.J. Winter, H. Morgenstern, R.
J. Phys. B 25 (1992) 2587 - 2596
Electron capture into He^{+}(4l) states in collisions of He^{2+} on Li.
He^{2+} + Li -> He^{+}(4s,4d,4f)
photon spectroscopy
0.8 - 9.75 keV/amu
n=4->3 photon emission

24
92E19 Houver, J.C. Dowek, D. Richter, C. Andersen, N.
Phys. Rev. Letters 68 (1992) 162 - 165
Strong right-left asymmetry observed in charge transfer from circular atomic states near the matching velocity.
H^{+} + Na(3p, m_l=±1) -> H(n=2) + Na^{+}
laser-excited beam technique
1.0 keV/amu
asymmetry parameter

25
92E20 Hvelplund, P. Bjornelund, S.K. Knudsen, H. Tawara, H.
Phys. Scripta 45 (1992) 231 - 237
Electron capture in collisions between medium velocity multiply charged ions and H and H_2.
Dy^{q+} + H,H_2 -> $Dy^{(q-1)+}$(q = 4 - 20)
Re^{q+} + H,H_2 -> $Re^{(q-1)+}$(q = 6 - 20)
Ta^{q+} + H,H_2 -> $Ta^{(q-1)+}$(q = 4 - 21)
Au^{q+} + H,H_2 -> $Au^{(q-1)+}$(q = 3 - 24)
U^{q+} + H,H_2 -> $U^{(q-1)+}$(q = 4 - 25)
100 keV/amu (Dy,Ta,Re,U); 25 - 100 keV/amu (Au)

26
92E52 Janev, R.K.
Supplement to Nucl. Fusion 3 (1992) 71 - 78
Cross section scaling for one- and two- electron loss processes in collisions of helium atoms with multiply charged ions.
empirical formula
scaling formula

27
92E21 Kravis, S.D. Church, D.A. Johnson, B.M. Meron, M. Jones, K.W. Levin, J.C. Sellin, I.A. Azuma, Y. Berrah-Mansour, N. Berry, H.G. Druetta, M.
Phys. Rev. A 45 (1992) 6379 - 6387
Electron transfer from H_2 and Ar to stored multiply charged Ar ions produced by synchrotron radiation.
$Ar^{q+}(q=3-6) + H_2, Ar \rightarrow Ar^{(q-1)+}$
Penning ion trap
thermal energies

28
92E51 Krishnamurthi, V. Krishnamurthy, M. Marathe, V.R. Mathur, D.
J. Phys. B 25 (1992) 5149 - 5162
Translational energy spectroscopic and quantum chemical study of $CS^{q+}(q=1,2)$ radicals : charge stripping and dissociation.
$CS^{q+}(q=1,2) + He \rightarrow CS^{(q+1)+}, C^+ + S, C + S^+, C^+ + S^+$
translational energy spectroscopy
0.07 keV/amu

29
92E22 Kwong, V.H.S. Fang, Z. Jiang, Y. Gibbons, T.T. Gardner, L.D.
Phys. Rev. A 46 (1992) 201 - 205
Measurement of thermal-energy charge transfer rate coefficient of Mo^{6+} and argon.
$Mo^{6+} + Ar \rightarrow Mo^{5+}$
ion trapping technique
thermal energy
rate coefficient

30
92E23 Lebius, H. Huber, B.A.
Z. Phys. D 23 (1992) 61 - 66
Electron-electron interaction in slow charge exchange collisions.
$Ar^{8+}(2p^6\ ^1S;\ 2p^5 3s\ ^3P) + He \rightarrow Ar^{7+}$
translational energy spectroscopy
0.2 keV/amu

31
92E25 Martin, S. Denis, A. Ouerdane, Y. Carre, M.
Phys. Letters A 65 (1992) 441 - 446
Coincidence measurements between photons, projectiles and recoil ions in low energy Kr^{18+} + Kr collisions : autoionizing and radiative effect of multi-excited states.
$Kr^{18+} + Kr \rightarrow Kr^{16+}, Kr^{15+} + Kr^{r+}(\ r = 2 - 10\ )$
photon-projectile-recoil ion coincidence
4 keV/amu

32
92E24 Martin, S. Denis, A. Ouerdane, Y. Carre, M. Buchet-Poulizac, M.C. Desesquelles, J.
Phys. Rev. A 46 (1992) 1316 - 1320
Rydberg spectroscopy of single-electron capture in low-energy collisions of Ar^{9+} and Ar^{8+} with cesium.
$Ar^{9+}(1s^2 2s^2 2p^2 3s) + Cs \rightarrow Ar^{7+}(1s^2 2s^2 2p^2 3snl=8-12)$
$Ar^{8+}(1s^2 2s^2 2p^2 3s^2) + Cs \rightarrow Ar^{8+}(1s^2 2s^2 2p^2 3s^2 nl=8-12)$
photon spectroscopy
0.2 and 4 keV/amu

33
92E26 McCullough, R.W. McLaughlin, T.K. Koizuni, T. Gilbody, H.B.
J. Phys. B 25 (1992) L193 - 197
State-selective one-electron capture by 8 keV He^{2+} ions in collisions with oxygen atoms.
$He^{2+} + O, O_2 \rightarrow He^+$
translational energy spectroscopy
2 keV/amu

34
92E27 McLaughlin, T.K. McCullough, R.W. Gilbody, H.B.
J. Phys. B 25 (1992) 1257 - 1264
State-selective electron capture by slow C^{4+} ions in collisions with H and H_2.
$C^{4+} + H,H_2 \rightarrow C^{3+}(1s^2\ 3s,3p,3d)$
translational energy spectroscopy
4 - 16 keV

35
92E28 Mokler, P.H. Stohlker, Th. Kozhuharov, C. Stachura, Z. Warczak, A.
Z. Phys. D 21 (1992) 127 - 200
Radiative electron capture : a tool for structure studies of heavy few-electron ions.
$Ge^{31+} + H_2 \rightarrow Ge^{30+}$
Photon measurement
4×10^3 - 12×10^3 keV/amu

36
92E29 Montenegro, E.C. Sigaud, G.M. Meyerhof, W.E.
Phys. Rev. A 45 (1992) 1575 - 1582
Intermediate-velocity atomic collisions V. Electron capture and loss in C^{3+} and O^{5+} collisions with H_2 and He.
$C^{3+} + B \rightarrow C^{2+},C^{4+}$; $O^{5+} + B \rightarrow O^{4+},O^{6+}$ ($B = H_2$,He)
growth method
125 - 333 keV/amu (C); 94 - 250 keV/amu (O)

37
92E30 Okuno, K. Soejima, K. Kaneko, Y.
J. Phys. B 25 (1992) L105 - 108
Single- and double-electron capture in $^3He^{2+}$-H_2 collisions at low energies from 1 to 2000 eV.
$^3He^{2+} + H_2,He \rightarrow He^+,He^0$
attenuation method
0.3×10^{-3} - 0.7 keV/amu

38
92E31 Panev, G.S. Vitanov, N.V.
J. Phys. B 25 (1992) L23 - 27
Total charge transfer cross sections in collisions of Sr^+ ions with Mg and Ca atoms.
$Sr^+ + Mg,Ca \rightarrow Sr$
growth method
2.8×10^{-3} - 1.5×10^{-2} keV/amu

39
92E53 Peart, B. Hayton, D.A.
J. Phys. B 25 (1992) 5109 - 5119
Merged beam measurements of mutual neutralization of H^+ and H^- ions.
$H^+ + H^- \rightarrow H + H$
merged-beam technique
0.003 - 0.5 keV/amu

40
92E54 Phaneuf, R.A. Janev, R.K. Tawara, H. Kimura, M. Krstic, P.S. Peach, G. Mazing, M.A.
Supplement to Nucl. Fusion 3 (1992) 105 - 112
Status and critical assessment of the database for collisions of Be^{q+} and B^{q+} ions with H,H_2,He.
$Be^{q+}(q=1-4)$, $B^{q+}(q=1-5) + T \rightarrow Be^{(q-1)+}$, $B^{(q-1)+}$ ($T = H,H_2$,He)
T: evaluation

41
92E32 Posthumus, J.H. Lukey, P. Morgenstern, R.
J. Phys. B 25 (1992) 987 - 999
The influence of angular momentum on double electron capture by highly charged ions.
C^{6+} + H_2 -> C^{4+}(3l3l'); O^{8+} + He -> O^{6+}(3l3l')
electron spectroscopy
96 keV

42
92E33 Posthumus, J.H. Morgenstern, R.
Phys. Rev. Letters 68 (1992) 1315 - 1318
Coincidences between electrons and target ions to identify capture channels in collisions of multiply charged ions on gas targets.
Ar^{9+} + Ar -> $A^{(9-K)+}$ (K = 2 - 6)
electron-recoil ion coincidence technique
2.7 keV/amu
electron energy spectra, no cross sections

43
92E57 Posthumus, J.H. Morgenstern, R.
J. Phys. B 25 (1991) 4533 - 4552
Multiple electron capture in slow Ar^{9+} and C^{5+} on Ne, studied by e^--Ne^{q+} coincidences.
C^{5+} + Ne -> $C^{(5-i)+}$ + Ne^{i+} (i = 2,3)
Ar^{9+} + Ne -> $Ar^{(9-i)+}$ + Ne^{i+} (i = 2 - 5)
e-recoil ion coincidence technique
6.7 keV/amu (C) ; 2.7 keV/amu (Ar)

44
92E34 Roller-Lutz, Z. Finck, K. Wang, Y. Lutz, H.O.
Phys. Letters A 169 (1992) 173 - 176
Angle-differential measurement of H(2p) electron capture in H^+ collision with Na(3s) and laser-excited Na(3p) atoms.
H^+ + Na(3s),Na(3p) -> H(2p)
laser-excited Na target
1 keV/amu
angular distribution (0.05 - 0.3)

45
92E35 Saito, M. Imai, M. Iwasawa, K. Sakura, N. Imanishi, N. Fukuzawa, F.
J. Phys. Soc. Japan 61 (1992) 2748 - 2753
Cross sections of charge exchange for fast He ions passing through Zn vapor.
He + Zn -> He^+,He^{2+}; He^+ + Zn -> He^{2+},He^0; He^{2+} + Zn -> He^+,He^0
growth technique
200 - 500 keV/amu

46
92E36 Sakabe, S. Izawa, Y. Hashida, M. Nakai, S. Yamanaka, C.
Phys. Rev. A 45 (1992) 252 - 258
Symmetric charge transfer cross sections for gadolinium in the energy range 10 - 1000 eV.
Ga^+ + Ga -> Ga + Ga^+
laser-evaporation / ionization method
$6x10^{-5}$ - $6x10^{-3}$ keV/amu

47
92E37 Schlatmann, A. Hoekstra, R. Folkerts, H.O. Morgenstern, R.
J. Phys. B 25 (1992) 3155 - 3164
Electron capture and excitation in He^{2+}-Na collisions.
He^{2+} + Na ->
He^+(n = 4->3; 5->3; 4->2; 3->2) + Na^*(3p->3s; 4p->3s; 4d->3p)
photon spectroscopy
2 - 9 keV/amu
photon emission cross sections

48
92E38 Schulz, M. Blankenship, D.M. Bross, S.W. Gaus, A.D. Gay, T.J. Htwe, W. Park, J.T. Peacher, J.L.
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State-selective capture in collisions of protons with noble gases.
$H^+ + B \to H(2p)$ (B = He,Ne,Ar)
Lyman-α-H coincidence technique
50 keV/amu
angular distribution

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92E39 Seely, D.G. Bross, S.W. Gaus, A.D. Edwards, J.W. Schultz, D.R. Gay, T.J. Park, J.T. Peacher, J.L.
Phys. Rev. A 45 (1992) R1287 - 1290
Angular-differential cross sections for H(2p) formation in intermediate-energy proton-helium collisions.
$H^+ + He \to H(2p)$
E: photon-projectile coincidense; T: CTMC
25 - 100 keV/amu
angular distributions

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92E40 Shah, M.B. McCallion, P. Itoh, Y. Gilbody, H.B.
J. Phys. B 25 (1992) 3693 - 3708
Electron capture and ionization in collisions of fast H^+ and He^{2+} ions with magnesium atoms.
$H^+, He^{2+} + Mg \to H, He^+ + Mg^{i+}$ (i = 1 - 4)
projectile-recoil ion coincidence technique
90 - 2000 keV/amu (H); 43 - 500 keV/amu (He)

51
92E41 Shinpaugh, J.L. Sanders, J.M. Hall, J.M. Lee, D.H. Schmidt-Böcking, H. Tipping, T.N. Zouros, T.J. Richard, P.
Phys. Rev. A 45 (1992) 2922 - 2928
Electron capture and target ionization in collisions of bare projectile ions incident on helium.
$A^{Z+} + He \to A^{(Z-1)+} + He^+$, $A^{(Z-1)+} + He^{2+} + e$, $A^{Z+} + He^+ + e$,
$A^{Z+} + He^{2+} + 2e$ (A = C,N,O,F)
projectile-recoil ion coincidence method
$25 \times 10^2 - 2 \times 10^3$ keV/amu

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92E42 Soejima, K. Latimer, C.J. Okuno, K. Kobayashi, N. Kaneko, Y.
J. Phys. B 25 (1992) 3009 - 3014
Cross sections for single and multiple electron capture in low energy collisions of C^{4+} with H_2,O_2 and N_2.
$C^{4+} + H_2, O_2, N_2 \to C^{3+}, C^{2+}, C^+$
3×10^{-4} - 0.7 keV/amu

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92E58 Stöhlker, Th. Kozhuharov, Ch. Mokler, P.H. Olson, R.E. Stachura, Z. Warczak, A.
J. Phys. B 25 (1992) 4522 - 4532
Single and double electron capture in collisions of highly ionized, decelerated Ge ions with Ne.
$Ge^{31+} + Ne \to Ge^{30+}, Ge^{29+}$
E: growth-method ; T: CTMC
$(4 - 12) \times 10^3$ keV/amu

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92E43 Stohlker, Th. Kozhuharov, C. Livingston, A.E. Mokler, P.H. Stachura, Z. Warczak, A.
Z. Phys. D 23 (1992) 121 - 125
Radiative electron capture into K-, L- and M-shell of decelerated hydrogenic Ge projectiles.
$Ge^{31+} + H_2 \rightarrow Ge^{30+}$
radiative capture technique
4.5×10^3 - 10×10^3 keV/amu

55
92E44 Suraud, M.G. Bliman, S. Hitz, D. Rubensson, J.E. Nordgren, J. Bonnet, J.J. Bonnefoy, M. Chassevent, M. Fleury, A. Cornille, M. Knystautas, E.J. Barany, A.
J. Phys. B 25 (1992) 2363 - 2381
Slow collisions of O^{6+} with H_2 at 3.8 keV/amu.
$O^{6+} + H_2 \rightarrow O^{5+}(1s^2nl)$; $O^{4+}(1s^2nln'l')$
photon spectroscopy
3.8 keV/amu
relative cross sections

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92E45 Vermeeren, L. Lievens, P. Buekenhoudt, A. Silverans, R.E.
J. Phys. B 25 (1992) 1009 - 1019
Charge exchange collisions between alkaline-earth ions and alkaliatoms.
$Ba^{+}(5d,6s)$ + Na,Rb,Cs -> Ba; $Sr^{+}(4d,5s)$ + Na,Rb -> Sr;
$Ca^{+}(3d,4s)$ + Na -> Ca
laser-excited target technique
0.5 - 30 keV

57
92E46 Wolfrum, E. Hoekstra, R. de Heer, F.J. Morgenstern, R. Winter, H.
J. Phys. B 25 (1992) 2597 - 2606
Absolute visible light emission cross sections for electron capture from Li atoms by slow, highly charged ions.
C^{6+},Ne^{q+}(q=6,7,8,9) + Li -> C^{5+}(n=8->7,7->6), $Ne^{(q-1)+}$(n=10->9,9->8,8->7)
photon spectroscopy
1 - 9 keV/amu
300 - 600 nm photons

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92E47 Wolfrum, E. Schweinzer, J. Winter, H.
Phys. Rev. A 45 (1992) R4218 - 4221
Suppressed electron capture in slow $O^{+}(^4S^o,^2D^o,^2P^o)$ - He collisions.
$O^{+}(^4S^o,^2D^o,^2P^o)$ + He -> $O^{0}(^3P)$
translational energy spectroscopy + attenuation method
0.06 - 0.38 keV/amu

List of references of theories

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Charge transfer in asymmetric heavy ion collisions
$H^{+} + B \rightarrow H^{0} + B^{+}(1s^{-1})$ (B = C, Ne, Ar)
IA
200 - 6000 keV/amu
Impact parameter dependence of capture probabilities.

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80T34 Baliunas, S.L. Butler, S.E.
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Silicon lines spectral diagnostics : the effect of charge transfer.
$Si^{+} + H^{+} \rightarrow Si^{2+} + H$; $Si^{2+} + He^{+} \rightarrow Si^{3+} + He$
modelling

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Phys. Rev. A 22 (1980) 1452-1454
Charge exchange between simple structured projectiles in high energy collisions
$H(1s) + H(1s) \rightarrow H^{-} + H^{+}$
continuum-intermediate-state approximation
2 - 90 keV/amu

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Contributions of multi-electron processes to innershell charge transfer and vacancy production; projectile charge dependence in collisions of bare nuclei with argon
He^{2+}, C^{6+} + Ar -> He^{+}, C^{5+} + $Ar^{+}(1s^{-1})$
CC
1000 - 5000 keV/amu
Z_p-scaling

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80T 4 Bransden,B.H. Newby,C.W. Noble,C.J.
J. Phys. B 13 (1980) 42450-4255
Electron capture by fully stripped ions of helium, lithium, beryllium and boron from atomic hydrogen
He^{2+}, Li^{3+}, Be^{4+}, B^{5+} + H -> He^{+}, Li^{2+}, Be^{3+}, $B^{4+}(nl)$ + H^{+}
CC (2-AO)
5 - 200 keV/amu

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J. Phys. B 13 (1980) 771-784
The second Born approximation to the electron transfer cross section
$A^{z1+} + B^{(z2-1)+}(n'l'm') \rightarrow A^{(z1-1)+}(nlm) + B^{z2+}$
second Born (approximate)

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80T 7 Butler,S.E. Dalgarno,A.
Astrophys. J. 241 (1980) 838-843
Charge transfer of multiply charged ions with hydrogen and helium; Landau-Zener calculations
$A^{q+} + B \rightarrow A^{(q-1)+} + B^{+}$
(A = C^{3+}, C^{4+}, N^{2+} - N^{4+}, O^{3+}, O^{4+}, Ne^{2+} - Ne^{4+},
Mg^{2+} - Mg^{4+}, Si^{3+}, Si^{4+}, S^{2+} - S^{4+}, Ar^{2+} - Ar^{4+};
B = H, He)
Landau-Zener model
10^{-5} - 4×10^{-3} keV/amu
rate coefficients

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80T 6 Butler,S.E. Heil,T.G. Dalgarno,A.
Astrophys. J. 241 (1980) 442-447
Charge transfer of multiply charged ions with hydrogen and helium; quantal calculations
A^{2+}, A^{3+} + H, He -> A^{+}, A^{2+} + H^{+}, He^{+} (A = C, N, O, Ne)
quantal calculation
5×10^{3} - 5×10^{4} (K)
rate coefficient

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80T 8 Chamband,G. Launay,J.M. Levy,B. Mille,P. Roueff,E. Minh,F.T.
J. Phys. B 13 (1980) 4205-4216
Charge exchange and fine structure excitation in O - H^{+} collisions
O^{+} + H -> O + H^{+}; H^{+} + $O(^{3}P_{2})$ -> H^{0} + O^{+} ($^{4}S_{3/2}$)
CC
10 - 1000 K

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80T 9 Crothers,D.S.F. Todd,N.R.
J. Phys. B 13 (1980) 547-563
Electron capture by slow Zn^{2+}, Cd^{2+}, B^{2+}, Mg^{2+} and C^{6+} ions in H
Zn^{2+}, Cd^{2+}, B^{2+}, Mg^{2+}, C^{6+} + H
Phase-integral interpretation of the two-state exponential model within IP
2.5×10^{-3} - 25 (Zn^{2+}, Cd^{2+}), 0.25 - 2.5×10^{3} (B^{2+}),
400 - 1225 (Mg), 0 - 25 (C^{6+}) keV/amu

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80T10 Crothers,D.S.F. Todd,N.R.
J. Phys. B 13 (1980) 2277-2294
One-electron capture by fast multiply charged ions in H; q^{3} scaling
A^{q+} + H -> $A^{(q-1)+}$ + H^{+}
OBK, eikonal, CDW, CIS
1.3 - 250 keV/amu
q^{3} scaling low

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80T35 Dalgarno, A. Butler, S.E. Heil, T.G.
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Charge transfer of doubly charged oxygen ions in helium.
O^{2+} + He -> O^{+} + He^{+}
LZ
2.6×10^{-4} keV/amu
rate coefficient at 300 K

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J. Phys. B 13 (1980) 539-546
Charge transfer in He^{2+}-H(1s) collisions
He^{2+} + H(1s) -> He^{+}(1s, 2s, 2p) + H^{+}
Coulomb-Born
25 - 2500 keV/amu

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80T12 Eichler,J. Narumi,H.
Z. Phys. A 295 (1980) 209-214
On the classical-trajectory eikonal approximation for electron capture into multicharged ions
He^{2+} + H(1s) -> H^{+}(1s) + H^{+}
Eikonal approximation
200 - 50000 keV/amu
General expression for 1s-1s transfer for any projectile-target combination, normalized to OBK.

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80T15 Gozdanov,T.P.
J. Phys. B 13 (1980) 3835-3847
Classical model for electron capture in collisions of highly charged, fully stripped ions with hydrogen atoms
$A^{z+} + H \rightarrow A^{(z-1)+} + H^{+}$ (z = 8, 10, 14, 18, 26, 36)
classical over-barrier model
0.5 - 100 keV/amu
total cross sections

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80T13 Grozdanov,T.P. Janev,R.K.
J. Phys. B 13 (1980) L69-72
Electron capture in slow collsions of multiply charged ions with hydrogen molecules
$Kr^{4+\rightarrow 7+} + H_2 \rightarrow Kr^{3+\rightarrow 6+}$
tunnelling model
0.012 - 0.24 keV/amu
total cross section

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80T14 Grozdanov,T.P. Janev,R.K.
J. Phys. B 13 (1980) 3431-3442
Two-electron capture in slow ion-atom collisions
He^{2+}, C^{4+} + He -> He^{0}, C^{2+} + He^{2+}
asymptotic Landau-Herring method
0.5 - 12 keV/amu
total cross section

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80T16 Harel,C. Salin,A.
J. Phys. B 13 (1980) 785-789
Application of OEDM orbitals to many-electron systems; He^{2+}-He collisions
He^{2+} + He -> $He^{+}(n)$ + $He^{+}(1s)$, He + He^{++} (n = 1, 2)
MO close-coupling
3.3 - 33 keV/amu

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80T17 Jakubassa-Amundsen,D.H. Amundsen,P.A.
Z. Phys. A 297 (1980) 203-214
On the semiclassical impulse approximation for electron caputure in asymmetric ion-atom collisions
H^{+} + B -> H(1s) + $B^{+}(1s^{-1})$ (B = C, N, O, Ne, Ar)
semiclassical impulse approximation
400 - 20000 keV/amu
angular distribution

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80T18 Jakubassa-Amundsen,D.H. Amundsen,P.A.
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Charge transfer in heavy ion collisions at relativistic velocities
impulse approximation

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80T19 Lapicki,G. McDaniel,F.D.
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Electron capture from K shell by fully stripped ions
modified OBK with corrections
scaling law

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Improved atomic model for charge transfer in multielectron ion-atom collisions at intermediate energies
H^{+} + Ar -> $H^{0}(1s)$ + $Ar^{+}(1s^{-1})$
H^{+} + Ne, Kr -> H(1s) + $Ne^{+}(2s^{-1}, 2p^{-1})$, $Kr^{+}(4s^{-1}, 4p^{-1})$
F^{q+} + Ar -> $F^{8+}(1s)$ + $Ar^{+}(1s^{-1})$
Two-center AO expansion method
1 - 200 keV/amu (H); 1000 - 24000 keV/amu (F)

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80T21 Macek,J.H. Shakeshaft,R.
Phys. Rev. A 22 (1980) 1441-1446
Second Born approximation with the Coulomb Green's function; electron capture from hydrogen-like ions by a bare ion
H^{+} + $B^{(z-1)+}(1s)$ -> H(1s) (B = Ne, Ca)
second Born approximation
2500 - 10000 keV/amu

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80T22 McCarroll,R. Valiron,P.
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Thermal charge exchange reaction with multicharged ions of astrophysical interest; application to the N^{3+} - H system
N^{3+} + H -> N^{2+} + H^{+}
quantal calculation/Landau-Zener model
10^{-7} - 10^{-3} keV/amu

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80T23 Moiseiwitsch,B.L. Stockman,S.G.
J. Phys. B 13 (1980) 2975-2981
Electron capture by charged particles at relativistic energies
H^{+}, Ne^{10+} + H(1s) -> H(1s), $Ne^{9+}(1s)$ + H^{+}
OBK with Dirac wave function
10000 - 10000000 keV/amu
analytic expression

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80T24 Moiseiwitsch,B.L. Stockman,S.G.
J. Phys. B 13 (1980) 4031-4037
Non-orthogonality of atomic wave functions in electron capture at relativistic energies
A^{z+} + $B^{(z-1)+}(1s)$ -> $A^{(z-1)+}(1s)$ (A = H, Ne, Ar; B = H, Cu)
relativistic OBK
$1x10^{6}$ - $1x10^{37}$ keV/amu

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80T25 Mukherjee,S. Sil,N.C.
J. Phys. B 13 (1980) 3421-3430
Ion-ion capture collisions in continuum distorted-wave approximation
H^{+} + He^{+}, Li^{2+}, Be^{3+}, C^{5+} -> H(1s, 2s) + He^{+}, Li^{3+}, Be^{4+}, C^{6+}
CDW
400 - 2000 keV/amu

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80T26 Olson,R.E.
J. Phys. B 13 (1980) 483-492
Ion-Rydberg atom collisions cross sections
A^{q+} + $B^{(z-1)+}(n)$ -> $A^{(q-1)+}(n')$ + B^{Z+} (q = 1, 2, 5, 10; n = 1, 2, 5, 10, 20)
CTMC

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80T28 Rivarola,R.D. Piancetini,R.D. Salin,A. Belkic,Dz.
J. Phys. B 13 (1980) 2601-2609
The influence of the static potential in high energy K-shell electron capture collisions
$H^{+} + He(1s^{2}) \to H(1s) + He^{+}(1s)$
CDW
293 keV/amu

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80T29 Roy,P.K. Saha,B.C. Sil,N.C.
J. Phys. B 13 (1980) 3401-3420
Formation of hydrogen atoms in arbitrary excited states by electron capture in p-H collision
$H^{+} + H(1s) \to H(nlm) + H^{+}$
Born approx.; distorted-wave (Bassel-Gerjuoy) approx.; time-dependent two-state(Band) approx.
25 - 4000 keV/amu

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80T30 Ryufuku,H. Sasaki,K. Watanabe,T.
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Oscillatory behavior of charge transfer cross sections as a function of the charge of projectiles in low energy collisions
$A^{z+} + H \to A^{(z-1)+} + H^{+}$ ($A^{z+} = B^{2+}$-B^{5+}; C^{3+}-C^{6+}; N^{3+}-N^{6+}; O^{3+}-O^{6+})
UDWA, classical barrier model
1 - 25 keV/amu
oscillation of cross sections at low energies

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80T31 Saha,H.P. Maiti,N. Sil,N.C.
J. Phys. B 13 (1980) 327-342
Electron capture in the 3s level by proton and alpha-particle from atomic hydrogen
$H^{+} + H \to H(3s) + H^{+}$, $He^{++} + H \to He^{+}(3s) + H^{+}$
Bates formula
25 - 800 (H^{+}), 6.25 - 200 (He^{++}) keV/amu

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80T32 Shakeshaft,R.
Phys. Rev. Letters 44 (1980) 442-444
Innershell electron capture by a swift bare ion; second Born effects
$A^{z+} + B^{(z-1)+} \to A^{(z-1)+} + B^{z+}$
second Born approximation
Second and higher-order Born terms needed for innershell electron capture.

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80T33 Winter,T.G. Hatton,G.
Phys. Rev. A 21 (1980) 793-807
Plane-wave-factor, molecular-state treatment of electron transfer in collisions of He^{2+} ions with H atoms
$He^{2+} + H \to He^{+}(nl) + H^{+}$
CC (3,4,10 MO) with ETF
0.25 - 17.5

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81T 1 Borondo,F. Macias,A. Riera,A.
Phys. Rev. Letters 46 (1981) 420-423
Asymmetry effect in the nentralization reaction $H^+ + H^-$
$H^+ + H^- \rightarrow H(1s) + H(nl)$
semi-classical approach
0.1 - 100 keV/amu

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Charge exchange in He^{++} - Li collisions
$He^{2+} + Li \rightarrow He^+(n) + Li^+$
CC (2-AO)
1.25 - 16.0 keV/amu

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81T 2 Bransden,B.H. Noble,C.J.
J. Phys. B 14 (1981) 1849-1856
Charge transfer in $H^+ + He^+$ and He^{2+} + H collisions
$H^+ + He^+ \rightarrow H + He^{2+}$; $He^{2+} + H \rightarrow He^+ + H$
Impact parameter
0.5 - 50 keV/amu

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81T37 Burgdorfer, J.
Phys.Rev.A 24 (1981) 1756 - 1767
Influence of the linear Stark effect on electron capture into fully stripped ions.
H^+ + H,He -> H(n=2); $O^{8+} + He \rightarrow O^{7+}(n=2)$
OBK
50 -400 keV/amu(H^+); $7x10^2$ = $1.3x10^3$ keV/amu(O^{8+})
alignment parameters given; (2p)/(2s) ratios given

5
81T36 Burgdorfer,J.
Phys. Rev. A 24 (1981) 1736-1767
Influence of the linear Stark effect on electron capture into fully stripped ions
H^+ + H, He -> H(n=2) + H^+; $O^{8+} + He \rightarrow O^{7+}(n=2)$; $C^{6+} + He \rightarrow C^{5+}(n=2)$
modified OBK
50 - 400 keV/amu

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81T 4 Burgdorfer,J.
J. Phys. B 14 (1981) 1019-1034
Angular momentum coherences in the differential capture amplitude in hydrogen
H^+, He^{2+} + Ar -> H(1s, 2s, 2p, 3s), He^+(1s, 2s, $2p_1$, 3s)
Coulomb-Brinkman-Kramers approximation
6000 keV/amu
angular distribution; $A^{z+} + B^{(z-1)+}(1s) \rightarrow A^{(z-1)+}(nlm)$

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81T 5 Casaubon,J.I. Piancentini,R.D. Salin,A.
J. Phys. B 14 (1981) L297-299
Charge exchange in low-energy Li^{3+} - H collisions
$Li^{3+} + H \rightarrow Li^{2+}(nl) + H^+$
impact parameter molecular approximation
1 - 5.7 keV/amu

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Exchange interaction between an atom and a multiply charged ion.
analytical expression for exchange interaction

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Asymptotic form of three electron exchange in slow collisions of atoms and ions.
asymptotic form for 3-electron exchange for triply charged ions;
1) direct exchange 2) successive exchange

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81T 6 Christensen,R.B. Watson,W.D.
Phys. Rev. A 24 (1981) 1331-1341
Charge transfer in S^{2+} + H collisions at eV collision energies
$S^{2+}(^3P)$ + H(1s) -> S^+ + H^+
ab initio MO method
10^{-3} keV/amu

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81T 7 Crothers,D.S.F.
J. Phys. B 14 (1981) 1035-1040
Continuum distorted waves; capture into the nth shell
A^{z+} + H(1s) -> $A^{(z-1)+}(n)$ + H^+ (A = H, He, Li, Be, B, C)
C.D.W
130 keV/amu

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81T 8 Crothers,D.S.F. Todd,N.R.
J. Phys. B 14 (1981) 2251-2258
Molecular treatment of charge-transfer in He^{2+} - H collisions
He^{2+} + H -> $He^+(nl)$ + H^+
CC(5-MO) with ETF
0.5 - 6.0 keV/amu

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81T40 Dalgarno, A. Heil, T.G. Butler, S.E.
Astrophys.J. 245 (1981) 793 - 797
Charge transfer of O IV with hydrogen.
O^{3+} + H -> $O^{2+}(2s^22p3s\ ^1P^0,^3P^0;\ 2s^22p3p\ ^1D,^3D;2s^22p3p\ ^1S,^3S)$
MO
$5x10^3$ - $5x10^4$ K

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81T 9 Devi,K.R.S. Koonin,S.E.
Phys. Rev. Letters 47 (1981) 27-30
Mean-field approximation to P + He scattering
H^+ + He -> H^0
time-dependent Hartree-Fock method
4 - 100 keV/amu

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81T10 Dube,L.J. Briggs,J.S.
J. Phys. B 14 (1981) 4595-4617
Systematics of the single and double electron scattering contribution to charge exchange
A^{z+} + $B^{(z-1)+}(nlm)$ -> $A^{(z-1)+}(n'l'm')$
first and second Born approximations
25 - 10000 keV/amu

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81T11 Eichler,J.
Phys. Rev. A 23 (1981) 498-509
Eikonal theory of charge exchange between arbitrary hydrogenic states of target and projectile
A^{z+} + H(nl) -> $A^{(z-1)+}(n'l')$ + H^+ (A = H, He, Li, B, C, Fe)
eikonal approximation
10 - 3000 keV/amu

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81T13 Fijiwara,K.
J. Phys. B 14 (1981) 3977-3986
Close-coupling calculation for electron capture by an alpha particle from atomic hydrogen
$He^{2+} + H \rightarrow He^{+}(nlm) + H^{+}$
CC (19AO)
1.3 - 100 keV/amu

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81T12 Ford,A.L. Reading,J.F. Becker,R.L.
Phys. Rev. A 23 (1981) 510-518
Innershell capture and ionization in collisions of H^{+}, He^{2+} and Li^{3+} projectiles with neon and carbon
$A^{z+} + B \rightarrow A^{(z-1)+}(1s) + B^{+}(1s^{-1}, 2l^{-1})$ (A = H, He, Li; B = C, Ne)
target-centered basis expansion method
200 - 2000 keV/amu (C); 400 - 4000 keV/amu (Ne)

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81T14 Gargaud,M. Hanssen,J. McCarroll,R. Valiron,P.
J. Phys. B 14 (1981) 2259-2276
Charge exchange with multiply charged ions at low energies; application to the N^{3+}/H and C^{4+}/H systems
$N^{3+} + H \rightarrow N^{2+}(nl) + H^{+}$; $C^{4+} + H \rightarrow C^{3+}(nl) + H^{+}$
CC (MO)
7×10^{-7} - 7×10^{-3} (N^{3+}), 8×10^{-7} - 8×10^{-3} (C^{4+}) keV/amu

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81T15 Gayet,R. Rivarola,R.D.R. Salin,A.
J. Phys. B 14 (1981) 2421-2427
Double electron capture by fast neuclei
$He^{2+} + He \rightarrow He^{0}$; $F^{9+} + Ar \rightarrow F^{7+}(1s^{2})$
CDW
125 - 350 keV/amu (He); 1578 - 3263 keV/amu (F)

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81T16 Green,T.A. Shipsey,E.J. Brown,J.C.
Phys. Rev. A 23 (1981) 546-561
Modified method of perturbed stationary states. III. Charge-exchange cross-sections for C^{6+} - H collisions
$C^{6+} + H \rightarrow C^{5+}(n) + H^{+}$
CC (MO)
0.05- 30.0 keV/amu

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81T17 Heil,T.G. Butler,S.E. Dalgarno,A.
Phys. Rev. A 23 (1981) 1100-1109
Charge transfer of multiply charged ions at thermal energies
$N^{2+} + H \rightarrow N^{+} + H^{+}$; $C^{3+} + H \rightarrow C^{2+}(nl) + H$
CC (MO)
1.4×10^{-6} - 5.8×10^{-4} (N^{2+}), 2.2×10^{-5} - 6.7×10^{-4} (C^{3+}) keV/amu

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81T19 Ho,T.S. Lieber,M. Chan,F.T.
Phys. Rev. A 24 (1981) 2925-2932
Eikonal approximation of electron-capture cross sections in collisions of H-atoms with fast projectiles
$P + H \rightarrow H(nl) + P$; $C^{6+} + H \rightarrow C^{5+}(nl) + P$; $O^{8+} + H \rightarrow O^{7+}(nl) + P$; $Fe^{24+} + H \rightarrow Fe^{23+} + H^{+}$
eikonal approximation
20 - 100 (P), 40 - 200 (others) keV/amu

24
81T20 Ho,T.S. Lieber,M. Chan,F.T. Omidvar,K.
Phys. Rev. A 24 (1981) 2933-2945
Eikonal approximation for charge transfer from a multielectron atom to fast projectiles
H^+ + He, C, Ar, N_2, O_2 -> H; He^{2+} + He, C -> He^+; Li^{3+} + C, Ne -> Li^{2+}
eikonal approximation
500 - 10000 keV/amu

25
81T18 Ho,T.S. Umberger,D. Day,R.L. Lieber,M. Chan,F.T.
Phys. Rev. A 24 (1981) 705-713
Eikonal calculation of electron capture cross sections from an arbitrary nlm shell of a hydrogenic target into arbitrary n'l'm' shell of a fast bare projectile
A^{z+} + $B^{(z-1)+}(nlm)$ -> $A^{(z-1)+}(n'l'm')$ + B^{z+}
Eikonal, OBK
20 - 200 keV/amu

26
81T21 Jakubassa-Amundsen,D.H.
J. Phys. B 14 (1981) 2647-2656
Semiclassical impulse approximation for L-shell electron capture in asymmetric heavy ion collisions
H^+ + B -> H + B^+ $(2l^{-1})$ (B = Ne, Ar)
semiclassical impulse approximation
50 - 4000 keV/amu
capture probability

27
81T22 Kimura,M. Thorson,W.R.
Phys. Rev. A 24 (1981) 1780-1792
Direct and charge-exchange excitation processes in H^+ - H(1s) collisions at 1 to 7 keV
H^+ + H(1s) -> H(2s, 2p) + H^+
MO with ETF
1 - 7 keV/amu

28
81T23 Kimura,M. Thorson,W.R.
Phys. Rev. A 24 (1981) 3019-3031
Molecular-state study of He^{2+} + H(1s) and He^+ + He^+(1s) collisions
He^{2+} + H(1s) -> He^+(total, 2l); H^+ + He^+(1s) -> H(1s; n=2)
CC
0.25 - 5 keV/amu

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81T24 Kubach,C. Sidis,V.
Phys. Rev. A 23 (1981) 110-118
Theoretical study of near-resonant charge exchange collisions of H^+ with alkali atoms
H^+ + B -> H^0(2s+2p) (B = Rb, K, Na)
CC
0.2 - 6 keV/amu

30
81T25 Ludde,H.J. Dreizler,R.M.
J. Phys. B 14 (1981) 2191-2201
Direct and capture processes in proton-hydrogen scattering I. Pilot study for bombarding energies of 2 and 8 keV
H^+ + H -> H(total, 2s, 2p) + H^+
numerical solution of time-dependent Schroedinger equation
2 - 8 keV/amu

31
81T26 Macek,J. Taulbjerg,K.
Phys. Rev. Letters 46 (1981) 170-174
Correction to Zp/Zt expansions for electron capture
H^{+} + Ar -> H^{0} + $Ar^{+}(1s^{-1})$
second Born approximation
2000 - 15000 keV/amu

32
81T27 Macias,A. Riera,A. Yonez,M.
Phys. Rev. A 23 (1981) 2941-2949
Molecular treatment of He^{+} + H collisions
$He^{+}(1s)$ + H(1s) -> He(1s2p, $^{1,3}P$)
MO with IP
0.125 - 7.25 keV/amu

33
81T28 Mandal,C.R. Datta,S. Mukherjee,S.C.
Phys. Rev. 24 (1981) 3044-3050
Charge-transfer cross sections for collisions of fast Li^{3+} ions with atomic hydrogen
Li^{3+} + H -> Li^{2+}(1s, 2s, 2p, 3s, 3p, 3d) + H^{+}
Coulomb-Born, Born
14.4 - 288 keV/amu

34
81T29 Olson,R.E.
Phys. Rev. A 24 (1981) 1726-1733
n, l distribution in A^{q+} + H electron-capture collisions
Z^{z+} + H -> $Z^{(z-1)+}$ + H^{+} (Z = 1-20)
CTMC
50, 100 keV/amu

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81T30 Presnyakov,L.P. Uskov,D.B. Janev,R.K.
Phys. Letters 84A (1981) 243-246
New analytic approach to the theory of charge exchange in atom-multiply charged ion collisions
A^{z+} + H -> $A^{(z-1)+}$(nl) + H^{+} (z = 5-15, 20, 30)
modified decay model
0.5 - 25 keV/amu
Analytic expression for l-distribution; q-oscillation; only total cross sections given.

36
81T31 Shimakura,N. Inoue,H. Koike,F. Watanabe,T.
J. Phys. B 14 (1981) 2203-2214
Impact parameter treatment for Li^{+}-Li collisions using molecular basis with electron translation factors
Li^{+} + Li -> Li(2s) + Li^{+}
MO with ETF
0.015 - 0.14 keV/amu
differential in angle

37
81T32 Shipsey,E.J. Browne,J.C. Olson,R.E.
J. Phys. B 14 (1981) 869-880
Electron capture and ionization in C^{5+}, N^{5+}, O^{6+} + H collisions
C^{5+}, N^{5+}, O^{6+} + H -> C^{4+}, N^{4+}, O^{5+} + H^{+}
PSS (low velocities), CTMC (high velocities)
10^{-2} - 10^{3} keV/amu
total cross sections

38
81T33 Sidis,V. Kubach,C. Fussen,D.
Phys. Rev. Letters 47 (1981) 1280-1284
Developments in the H^+ + H^- problem
$H^+ + H^- \rightarrow H^0(n) + H^0$
IPM
0.02 - 10 keV/amu

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81T34 Sidis,V. Kubach,C. Pommier,J.
Phys. Rev. A 23 (1981) 119-126
Systematic theoretical investigation of charge exchange in
He^+ - alkali-atom collisions
$He^+ + B \rightarrow H(2s+2p)$ (B = Cs, Rb, K, Na)
CC
0.013-0.3 keV/amu

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81T35 Simony,P.R. McGuire,J.H.
J. Phys. B 14 (1981) L737-741
Exact second Born calculations of 1s-1s electron capture in P + H
$H^+ + H(1s) \rightarrow H(1s)$
second Born approximation
10000, 50000 keV/amu
angular differential cross section

1
82T 1 Bienstock,S. Heil,T.G. Bottcher,C. Dalgarno,A.
Phys. Rev. A 25 (1982) 2850-2852
Charge transfer of C^{3+} ions in atomic hydrogen
C^{3+} + H -> C^{2+}(2lnl') + H^{+}
CC (MO)
0.00083 - 0.416 keV/amu

2
82T 2 Bottcher,C. Heil,T.G.
Chem. Phys. Letters 86 (1982) 506-509
Low-energy charge exchange from hydrogen atoms by few-electron ions
Be^{4+}, B^{5+}, C^{6+} + H -> Be^{3+}, B^{4+}, C^{5+}
C^{4+}, C^{5+} + H -> C^{3+}, C^{4+}
fully quantal PSS
1.0×10^{-4} - 0.1 keV/amu
total cross section

3
82T 3 Bransden,B.H. Noble,C.J.
J. Phys. B 15 (1982) 451-455
Charge transfer in Li^{3+} + H collisions
Li^{3+} + H -> Li^{2+}(nlm) + H^{+}
CC (8, 14, 20-AO)
1.4 - 200 keV/amu

4
82T 4 Briggs,J.S. Greenland,P.T. Kocbach,L.
J. Phys. B 15 (1982) 3085-3102
Differential cross sections for high energy electron capture in the impulse approximation
H^{+} + H, Ne -> H^{0}; Li^{3+} + Ne^{9+} -> Li^{2+}
impulse approximation
10000 keV/amu (H); 20000 keV/amu (Li)
angular differential cross sections

5
82E 5 Bruch,R. Dube,L.J. Trabert,E. Heckmann,P.H. Raith,B. Brand,K.
J. Phys. B 15 (1982) L857-862
Electron capture to Rydberg states; C^{4+} in collisions with H_2
C^{4+} + H_2, He -> C^{3+}(nl) + H_2^{+}, He^{+}
E. EUV; T. TA, CDW, first and second Born
166 - 416 keV/amu

6
82T 5 Crothers,D.S.F. McCann,J.F.
Phys. Letters 92A (1982) 170-174
Continuum-distorted-wave capture into the n-th shell; l, m distribution
C^{6+} + H(1s) -> C^{5+}(nlm) + H^{+}
CDW

7
82T 6 Datta,S. Mandal,C.R. Mukherjee,S.C. Sil,N.C.
Phys. Rev. A 26 (1982) 2551-2566
Calculation of cross sections for electron capture by fast Li^{3+} ions from atomic hydrogen in the continuum distorted wave approximation
Li^{3+} + H -> Li^{2+}(1s, 2s, 2p, 3s, 3p, 3d)
CDW
100 - 1500 keV/amu

8
82T 7 Eichenauer,D. Grun,N. Scheid,W.
J. Phys. B 15 (1982) L17-20
Classical trajectory calculations of the differential cross sections for charge transfer in H^+ - H collisions
H^+ + H(1s) -> H(1s)
CTMC
25, 60 keV/amu
angular differential cross sections

9
82T 9 Ermolaev,A.M. Miraglia,J.E. Bransden,B.H.
J. Phys. B 15 (1982) L677-680
Ionization and charge exchange in collisions between Li^+ ions at intermediate energies
Li^+ + Li^+ -> Li^0 + Li^{2+}; Li^+ + Li^{2+} + e
first Born approximation
5 - 1000 keV/amu

10
82T 8 Ermolaev,A.M. Noble,C.J. Bransden,B.H.
J. Phys. B 15 (1982) 457-470
Charge exchange between Cs^+ ions and related studies
Cs^+ + Cs^+ -> Cs($5p^6$, nl) + Cs^{2+}($5p^5$) (nl=5d, 6s, 6p)
Li^+ + Li^+ -> Li($1s^2$, nl) + Li^{2+} (n <= 3)
two-state AO close-coupling
4.5 - 75 keV/amu

11
82T36 Errea, L.F. Mendez, L. Riera, A.
J.Phys.B 15 (1982) 101 - 110
On the choice of translation factors for approximate molecular wave functions.
He^{2+} + H(1s) -> H^+(n=2) + H^+
MO with translation factor
0.25 - 25 keV/amu

12
82T10 Ford,A.L. Reading,J.F. Becker,R.L.
J. Phys. B 15 (1982) 3257-3274
Coupled-channel calculations of ionization and charge transfer in p+$Li^{+,2+}$ and transfer in $Li^{2+,3+}$ + H(1s)
Li^{2+}(1s) + H(1s) -> Li^+(1snl) + H^+ (n <= 3)
Li^{3+} + H(1s) -> Li^{2+}(nl) + H^+ (n <= 4)
perturbed one-and-a-half center
70, 86 - 400 keV/amu

13
82T13 Fritsch,W.
J. Phys. B 15 (1982) L389-392
Atomic orbital expansion description for slow ion-atom collisions; a curved-line trajectory study
C^{6+} + H -> C^{5+}
atomic expansion method
0.1 - 1.0 keV/amu
total cross section

14
82T11 Fritsch,W. Lin,C.D.
Phys. Rev. A 26 (1982) 762-769
Excitation and charge transfer to 2s and 2p states in 1 - 20 keV H^+ - H collisions
H^+ + H -> H(2s, 2p)
AO
1 - 20 keV/amu

15
82T12 Fritsch,W. Lin,C.D.
J. Phys. B 15 (1982) L281-288
Electron transfer in Li^{3+} + H collisions at low and intermediate energies
Li^{3+} + H -> Li^{2+}(nl) + H^+ (n <= 3)
AO close-coupling
0.2 - 20 keV/amu

16
82T14 Fritsch,W. Lin,C.D.
J. Phys. B 15 (1982) 1255-1268
Close-coupling calculations for inelastic processes in intermediate energy ion-atom collisions
H^+ + $A^{(z-1)+}$ -> H + A^{z+} (A = H, He)
two-center atomic orbital expansion method
1.5 - 100 keV/amu

17
82T10 Fritsch,W. Lin,C.D.
Phys. Scripta T3 (1982) 241-243
Atomic expansions for describing charge transfer in slow ion-atom collisions
H^+ + H -> H(2s) + H^+; Li^{3+}, C^{6+} + H -> Li^{2+}; C^{5+} + H^+
atomic expansion method
0.1 - 100 keV/amu
total cross section

18
82T37 Gargaud, M. McCarroll, R. Valion, P.
Astron.Astrophys. 106 (1982) 197 - 200
Charge transfer ionization of Si^+ by H^+ at thermal energies.
$Si^+(^2P)$ + H^+ -> $Si^{2+}(^1S)$ + H ; Si^{2+} + H -> Si^+ + H^+
MO
10 - 19^5 K

19
82T16 Green,T.A. Peek,J.M. Riley,M.E. Shipsey,E.J. Brown,J.C.
Phys. Rev. A 26 (1982) 1278-1282
Electron capture cross section for C^{6+} - H(1s) collisions at electron-volt energies; a test of the Landau-Zener formula
C^{6+} + H(1s) -> C^{5+}
Landau-Zener + close-coupling
$3x10^{-4}$ - $2x10^{-2}$ keV/amu
total cross section

20
82T17 Green,T.A. Riley,M.E. Shipsey,E.J. Brown,J.C.
Phys. Rev. A 26 (1982) 3668-3671
Semiclassical trajectory on C^{6+} - H charge exchange cross sections at low energy
C^{6+} + H -> C^{5+}
semiclassical approximation
$3x10^{-3}$ - 1.3 keV/amu
total cross section

21
82T15 Green,T.A. Shipsey,E.J. Brown,J.C.
Phys. Rev. A 25 (1982) 1364-1373
Modified method of perturbed stationary states. IV. Electron capture cross sections for the reaction C^{6+} + H(1s) -> C^{5+}(nl) + H^+
C^{6+} + H -> C^{5+}(nl) + H^+
Close coupling; PSS (MO) with variationally optimized ETF
$1x10^{-3}$ - 2.25 keV/amu

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82T18 Ho,T.S. Eichler,J. Lieber,M. Chan,F.T.
Phys. Rev. A 25 (1982) 1456-1461
Calculation of the differential cross section for electron capture in fast ion-atom collisions
$H^+ + H(1s) \to H(nlm) + H^+$
optical eikonal approximation
25 - 125 keV/amu
angular differential for 1s->nlm capture

23
82T19 Ishihara,T. Tsuji,A.
Phys. Rev. A 26 (1982) 2987-2989
Eikonal approximation for electron capture into partially stripped projectile ions
A^{q+} (q=1,2) + H -> $A^{(q-1)+}$(nl) (A = Li, C)
eikonal approximation
50 - 500 keV/amu
ratio to OBK

24
82T21 Kimura,M. Olson,R.E. Pascale,J.
Phys. Rev. A 26 (1982) 3113-3124
Molecular treatments of electron capture by protons from the ground and excited states of alkali-metal atoms
H^+ + B -> H^0(total; 2s, 2p) (B = Na, K, Rb, Cs)
MO
0.01 - 10.0 keV/amu
total, 2s, 2p cross sections

25
82T20 Kimura,M. Olson,R.E. Pascale,J.
Phys. Rev. A 26 (1982) 1138-1141
Electron capture collisions of H^+ with ground-and excited state Na
H^+ + Na(3s, 3p) -> H(2s, 2p)
pseudo potential molecular-structure calculation with ETF
0.1 - 10 keV/amu

26
82T22 Lin,C.D. Winter,T.G. Fritsch,W.
Phys. Rev. A 25 (1982) 2395-2398
Three-center atomic expansion method for ion-atom collisions
$H^+ + H(1s) \to H(1s) + H^+$
three-center atomic expansion
2 - 25 keV/amu
Charge transfer probability, no cross section except for
13.7, 9.90, 7.8, 3.03 A^2 at 2, 5, 10 and 25 keV, respectively.

27
82T23 Ludde,H.J. Dreizler,R.M.
J. Phys. B 15 (1982) 2703-2712
Direct and capture processes in proton-hydrogen scattering. II. Total cross sections for bombarding energies of 1 to 50 keV
H^+ + H(1s) -> H(nl) + H^+ (n <= 3)
pseudo state close-coupling
1 - 50 keV/amu

28
82T24 Ludde,H.J. Dreizler,R.M.
J. Phys. B 15 (1982) 2713-2720
Electron capture with He^{2+}, Li^{3+}, Be^{4+} and B^{5+} projectiles from atomic hydrogen
He^{2+} + H -> He^+(nl) + H^+ (n <= 3)
Li^{3+}, Be^{4+}, B^{5+} + H -> Li^{2+}, Be^{3+}, B^{4+} + H^+
pseudo state close-coupling
2 - 50 keV/amu

29
82T35 Macek,J. Alston,S.
Phys. Rev. A 26 (1982) 250-270
Theory of electron capture from a hydrogenlike ion by a bare ion
$A^{z+} + B^{(z-1)+} \to A^{(z-1)+} + B^{z+}$
strong potential Born approximation

30
82T25 Moiseiwitsch,B.L.
J. Phys. B 15 (1982) 3103-3110
Second Born approximation for electron capture at ultrahigh relativistic impact energies
$A^{z+} + B^{(z-1)+} \to A^{(z-1)+}$
relativistic second Born approximation
asymptotic formula (E^{-1})

31
82T26 Ohyama-Yamaguchi,T. Itikawa,Y.
J. Phys. Soc. Japan 51 (1982) 2982-2988
Charge transfer in collisions of Li^{3+} and Be^{4+} ions with atomic hydrogen at low impact energy
Li^{3+}, Be^{4+} + H -> Li^{2+}, Be^{3+}
PSS
0.1 - 20 keV/amu
total cross section

32
82T27 Olson,R.E.
J. Phys. B 15 (1982) L163-167
Electron capture and ionization in H^{+}, He^{2+} + Li collisions
H^{+}, He^{2+} + Li -> H^{0}, He^{+}, (He^{0}) + Li^{+}, (Li^{2+}); H^{+}, He^{2+} + Li^{+} + e
CTMC
50 - 400 keV/amu

33
82T28 Olson,R.E. Kimura,M.
J. Phys. B 15 (1982) 4231-4238
Angular scattering in slow multiply charged ion atom collisions
C^{6+} + H -> C^{5+}
quantal
0.25 - 225 keV/amu
Total cross section as a function of scattering angles

34
82T29 Reading,J.F. Ford,A.L. Becker,R.L.
J. Phys. B 15 (1982) 625
One and a half centered calculations of ionization and charge transfer in H^{+} + He^{+} and He^{2+} + H collisions
He^{2+} + H(1s) -> He^{+}(nl) + H^{+} (n <= 5)
H^{+} + He^{+}(1s, 2s, 2p) -> H(1s) + He^{2+}
perturbed one-and-a-half-center
75.5 (He^{2+}); 20 - 400 (H^{+}) keV/amu

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82E32 Rille,E. Olson,R.E. Peacher,J.L. Blankenship,D.M. Kvale,T.J. Redd,E. Park,J.T.
Phys. Rev. Letters 49 (1982) 1819-1821
Isotope effect in electron-capture differential cross sections at intermediate energies
H^{+}, D^{+} + H, D -> H^{0}, D^{0}
E. growth with high temperature oven; T. CTMC
40 keV/amu
projectile dependence at small angles; no target isotope dependence; scaling law

36
82T30 Rivarola,R.D. Miraglia,J.E.
J. Phys. B 15 (1982) 2221-2232
Comparison between the continuum distorted-wave and the second Born-Kramers approximations at high energies electron capture
$H^+ + H(1s) \rightarrow H(1s) + H^+$
CDW, second Born-Kramers approximations
10000; 50000 keV/amu

37
82T31 Ryufuku,H.
Phys. Rev. A 25 (1982) 720-736
Ionization, excitation and charge transfer for impact of H^+, Li^{3+}, B^{5+}, C^{6+} and Si^{14+} ions on atomic hydrogen
$H^+, Li^{3+}, B^{5+}, C^{6+}, Si^{14+} + H \rightarrow H^0, Li^{2+}, B^{4+}, C^{5+}, Si^{13+} + H^+$
UDWA
0.01 - 5000 keV/amu

38
82T32 Salin,A.
Phys. Letters 91A (1982) 61-63
Charge exchange in Li^{3+} - H collisions
$Li^{3+} + H \rightarrow Li^{2+} + H^+$
OEDM
1.29 - 50 keV/amu
total cross section

39
82T33 Simony,P.R. McGuire,J.H. Eichler,J.
Phys. Rev. A 26 (1982) 1337-1343
Exact second Born electron capture for P + He
$P + He(1s^2) \rightarrow H(1s)$
second Born approximation
1000 - 100000 keV/amu
angular differential cross sections

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82T34 West,B.W. Lane,N.F. Coben,J.S.
Phys. Rev. A 26 (1982) 3164-3169
Radiative charge transfer in collisions of He^{2+} ions and ground state H atoms
$He^{2+} + H(1s) \rightarrow He^+(1s) + H^+ + h\nu$
optical potential method
1×10^{-4} - 1 keV/amu

1
83T 1 Allan,R.J. Dickinson,A.S. McCarroll,R.
J. Phys. B 16 (1983) 467-480
Molecular treatment of charge exchange in H^+ + Li collisions
H^+ + Li -> H (n=2)
PSS
0.03 - 15 keV/amu

2
83T37 Alston,S.
Phys. Rev. A 27 (1983) 2342-2357
Theory of electron capture from a hydrogen-like ions by a bare ion; intermediate-state contributions to the amplitude
H^+ + B -> H + B^+ (B = C, Ne, Ar)
strong potential Born approximation
100 - 20000 keV/amu

3
83T 2 Barany,A. Brandas,E. Elander,N. Rittby,M.
Phys. Scripta T3 (1983) 233-235
Resonances in low energy charge transfer between multiply charged ions and neutral atoms described with dilated Titchmarsch-Weyle theory
Titchmarsch-Weyle theory
quasi-molecule with polarization force; no cross sections given

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83T 3 Bienstock,S. Heil,T.G. Dalgarno,A.
Phys. Rev. A 27 (1983) 2741-2743
Charge transfer of O^{3+} ions in collisions with atomic hydrogen
O^{3+} + H -> O^{2+} + H^+
CC (MO)
0.000006 - 0.312 keV/amu

5
83T38 Borondo,F. Macias,A. Riera,A.
Chem. Phys. Letters 100 (1983) 63
Asymmetry effect in H^+ + H^- neutralization application to the n=3 pseudo crossing
H^+ + H^- -> H + H(n=2, 3)
MO with pseudo-crossing
0.05 - 5 keV/amu

6
83T39 Brandt,D.
Phys. Rev. A 27 (1983) 1314-1318
Resonant transfer and excitation in ion-atom collisions
Si^{11+} + He -> Si^{10+}; S^{13+} + He, Ar -> S^{12+}
IA

7
83T 4 Bransden,B.H. Noble,C.J. Chandler,J.
J. Phys. B 16 (1983) 4191-4201
Theoretical studies of the interaction of He^{2+} with H(1s) and H^+ with He
He^{2+} + H -> He^+(nl) + H^+; He^+(1s) + H^+ -> He^{2+} + H(nl);
He^{2+} + H -> He^{2+} + H^*(2s, 2p)
CC (AO)
3.7 - 230 keV/amu

8
83T 5 Crothers,D.S.F.
Phys. Scripta T3 (1983) 236-240
Refined orthogonal variation-perturbation continuum-distorted-wave treatment of B^{Z+} + H(1s) -> $B^{(Z-1)+}$(nl) + H^+ at intermediate velocity for n, Z>>1
A^{Z+} + H(1s) -> $A^{(Z-1)+}$(n) + H^+ (A = 12-18, n = 9-16)
orthogonal variation-perturbation CDW
100 keV/amu
n-dependence

9
83T 6 Devi,K.R.S. Garcia,J.D.
J. Phys. B 16 (1983) 2837-2847
He^{2+} + He collisions in time-dependent Hartree-Fock theory
He^{2+} + $He(1s^2)$ -> He^+, He^0
time-dependent Hartree-Fock theory
7.5 - 37.5 keV/amu

10
83T 7 Dickinson,A.S. McCarroll,R.
J. Phys. B 16 (1983) 459-466
Adiabatic switching factors in slow atomic collisions
H^+ + Li
MO with adiabatic switching factors
transition probabilities only

11
83T43 Duman, E.L. Tishchenko, N.P. Shmatov, I.P.
Sov.Phys.- Dokl. 28 (1983) 641 - 643
Theory of charge-exchange transitions to excited states in ion-atom collisions.
He^+(1s) + Rb -> $He(1s^2)$ + Rb^{+*}(5p)
Landau-Zener model
rate coefficients at thermal energies

12
83T 8 Errea,L.F. Mendez,L. Riera,A.
Phys. Rev.A 27 (1983) 3357-3360
Excitation and charge transfer in He^+ + H collisions. A molecular approach including two electron translation factors
He^+ + H -> He^0
common-translation-factor method
2.5, 6.5 keV/amu

13
83T 9 Fritsch,W. Lin,C.D.
Phys. Rev. A 27 (1983) 3361-3364
Coupled-state calculations for excitation, charge transfer and ionization in 1 - 75 keV proton-hydrogen atom collisions
H^+ + H -> H(2s, 2p)
TSAE
1 - 75 keV/amu

14
83T11 Fritsch,W. Lin,C.D.
J. Phys. B 16 (1983) 1595-1603
Atomic orbital expansion study of electron capture in H^+ + Li and He^{2+} + Li collisions
He^{2+} + Li -> He^+(nl) + Li^+; H^+ + Li -> H(nl) + Li^+
CC (40-AO)
0.5 - 20 (H^+), 0.1 - 2.0 (He^{2+}) keV/amu

15
83T12 Gorriz,M. Briggs,J.S. Alston,S.
J. Phys. B 16 (1983) L665-670
Strong potential Born theory of radiative electron capture
Ne^{10+} + H -> Ne^{9+} + H^{+} + $h\nu$
strong potential Born approximation
5625 keV/amu

16
83T13 Grun,N. Scheid,W.
J. Phys. B 16 (1983) L425-428
Calculation of the impact parameter dependence of the charge exchange for Li^{3+} + H at 10.5 keV by the finite difference method
Li^{3+} + H -> Li^{2+}
finite difference method
1.5 keV/amu
P(b) dependent on magnetic substates (m=0, 1, 2)

17
83T14 Hardie,D.J.W. Olson,R.E.
J. Phys. B 16 (1983) 1983-1996
Charge transfer and ionization processes involving multiply charged ions in collision with atomic hydrogen
X^{q+} + H -> $X^{(q-1)+}$ + H^{+}; X^{q+} + H^{+} + e^{-} (X^{q+} = H^{+}, He^{2+}, C^{6+}, O^{8+})
CTMC
25, 50, 100 keV/amu
total (E=25-200 keV/amu); partial (E=25-50 keV/amu)

18
83T15 Harel,C. Salin,A.
J. Phys. B 16 (1983) 55-70
Application of OEDM orbitals to many electron systems; He^{+} - H collisions
He^{+} + H(1s) -> He($1s^2$, 1s2p)
OEDM
0.19 - 7.5 keV/amu
total cross sections included

19
83T16 Heil,T.G. Butler,S.E. Dalgarno,A.
Phys. Rev. A 27 (1983) 2365-2383
Charge transfer of doubly charged and triply charged ions with atomic hydrogen at thermal energies
A^{2+}, A^{3+} + H-> A^{+}, A^{2+} (A = C, N, O, Ne)
MO
10^{-5} - 10^{-4} keV/amu

20
83T18 Janev,R.K.
Phys. Scripta T3 (1983) 208-221
Excited states created in charge transfer collisions between atoms and highly charged ions
A^{z+} + H -> $A^{(q-1)+}$(n,l) + H^{+}
(A = He, Li, Be, C, N, F, Ne, Na, Mg, Al, Si, S, Ar, Ca, Cr, Ni, Sr)
Landau-Zener model with rotational transitions
1 - 100 keV/amu
review; general scaling for n and l distribution

21
83T19 Janev,R.K. Belic,D.S.
Physica Scripta T3 (1983) 246-248
Electron capture into excited states in H + Ar^{18+}, Kr^{36+} and Xe^{54+} charge transfer collisions
Ar^{18+}, Kr^{36+}, Xe^{54+} + H -> Ar^{17+}(n), Kr^{35+}(n), Xe^{53+}(n) + H^{+}
MLZ
10^{-2} - 10^{2} keV/amu

22
83T17 Janev,R.K. Belic,D.S. Bransden,B.H.
Phys. Rev. A 28 (1983) 1293-1302
Total and partial cross sections for electron capture in collisions of hydrogen atoms with fully stripped ions
A^{z+} + H -> $A^{(z-1)+}$(nl) + H^+ (z = 5-54, A^{z+} fully stripped ion)
0.03 - 80 keV/amu
Multichannel Landau-Zener theory with rotational coupling included.

23
83T20 Kazanskii,A.K. Komarov,I.V.
Sov. J.-Tech. Phys. 27 (1983) 1064-1067
Charge exchange of C^{6+} and O^{8+} ions with hydrogen atoms; strong coupling calculation
C^{6+}, O^{8+} + H -> C^{5+}, O^{7+}
strong coupling
0.25 - 4.0 keV/amu
total cross section

24
83T22 Kimura,M. Sato,H. Olson,R.E.
Phys. Rev. A 28 (1983) 2085-2090
Molecular treatment of charge transfer in Li^+ + Ca collisions
Li^+ + Ca -> Li(2s, 2p) + Ca^+
PSS with ETF
0.1 - 20 keV/amu

25
83T21 Kimura,M. Thorson,W.R.
J. Phys. B 16 (1983) 1471-1480
Molecular-state studies of charge transfer in Li^{3+} - H, Be^{4+} - H and B^{5+} - H collisions
Li^{3+}, Be^{4+}, B^{5+} + H -> Li^{2+}, Be^{3+}, B^{4+}
MO switching function
1 - 15 keV/amu
total cross section

26
83T23 Ludde,H.J. Dreizler,R.M.
J. Phys. B 16 (1983) 1009-1015
Direct and capture processes in proton-hydrogen scattering III. differential cross sections and charge exchange probabilities
H^+ + H -> H^0 (1s, 2l)
time-dependent Schroedinger equation
1 - 2 keV/amu

27
83T24 Ludde,H.J. Dreizler,R.M.
J. Phys. B 16 (1983) 3971-3981
Method for the calculation of global probabilities for many electron systems
He^{2+} + He -> He^+, He^0
IP

28
83T25 Macias,A. Riera,A. Yanez,M.
Phys. Rev. A 27 (1983) 213-219
Excitation and charge transfer in He^+ + H collisions. A study of the origin dependence of calculated cross sections
He^+(1s) + H(1s) -> He(1s2p ^{1,3}P)
Impact parameter formalism
0.125 - 7.5 keV/amu

29
83T26 McCarroll,R. Valiron,P.
Phys. Scripta T3 (1983) 226-232
Charge exchange of highly charged ions at low energy
C^{4+} + H -> C^{3+}(nl) + H^+; N^{3+} + H -> N^{2+}(nl) + H^+
CC (MO)
8×10^{-7} - 4×10^{-2} (C^{4+}); 7×10^{-7} - 3.5×10^{-2} (N^{3+}) keV/amu

30
83T27 McGuire,J.H. Eichler,J. Simony,P.R.
Phys. Rev. A 28 (1983) 2104-2112
Exact second Born calculations for electron capture for systems with various projectile and target charges
H^+ + H, Be, C, O, Ne -> H^0; He^{2+} + He -> He^+; Be^{4+} + Be -> Be^{3+};
C^{6+} + C -> C^{5+}; O^{8+} + O -> O^{7+}; Ne^{10+} + Ne -> Ne^{9+}
second Born approximation
10000 - 200000 keV/amu
angular distribution

31
83T28 Opradolce,L. Valiron,P. McCarroll,R.
J. Phys. B 16 (1983) 2017-2028
Single charge exchange in Ar^{6+} - He collisions
Ar^{6+} + He -> $Ar^{5+}(3s^2nl)$ + He^+
MO close-coupling (model potential)
0.12 - 1.2656 (4 states); 0.025 - 1.2656 (6 states) keV/amu

32
83T44 Ostrovskii, V.N.
Sov.Phys.- JETP 57 (1983) 766 - 769
Charge excange involving ion excitation.
He^+ + Hg($6s^2$) -> He + Hg^{+*}(7p)
asymptotic theory

33
83T45 Ostrovskii, V.N. Tolmachev, Yu.A.
Opt.Spectrosc.(USSR) 55 (1983) 646 - 647
Calculation of cross sections for charge-exchange with ion excitation.
He^+ + Hg($6s^2$) -> He($2s^2$) + Hg^{+*}(7P $^2P_{3/2}$)
asymptotic theory
rate coefficients at thermal energies

34
83T29 Presnyakov,L.P. Uskov,D.B. Janev,R.K.
Soviet J.-JETP 56 (1983) 525-531
Charge exchange in slow collisions of multiply charged ions with atoms
A^{q+} + H_2 -> $A^{(q-1)+}$ + H_2 (A = C^{6+}, N^{7+}, O^{8+}, Ne^{10+}, Ar^{18+})
C^{6+} + H -> C^{5+}
decay model
0.1 - 20 keV/amu

35
83T30 Salin,A.
J. Phys. B 16 (1983) L661-664
Comments on adiabatic switching factors in slow atomic collisions

36
83T40 Sato, H. Kimura, M.
Phys.Letters 96A (1983) 286 - 289
Molecular state calculations of charge transfer in H^+ + Li and He^{2+} + Li collisions.
H^+,He^{2+} + Li -> H,He^+(total)
MO
0.1 - 20 keV/amu

37
83T31 Sato,H. Kimura,M. Wetmore,A.E. Olson,R.E.
J. Phys. B 16 (1983) 3037-3044
Electron capture cross sections for TiH^{4+}
Ti^{4+} + H -> Ti^{3+}(nl) + H^+; Ti^{3+} + H^+ -> Ti^{4+} + H(nl)
Impact parameter PSS (MO) with ETF
0.1 - 10 keV/amu

38
83T32 Shields,G.A. Dalgarno,A. Sternberg,A.
Phys. Rev. A 28 (1983) 2137-2140
Line emission from charge transfer with atomic hydrogen at thermal energies
O^{3+}(2p) + H -> O^{2+}(2p3p, ^1P, $^3D_1$)
modelling
$6.25x10^{-5}$ keV/amu
evaluation from astrophysical data

39
83T33 Shipsey,E.J. Green,T.A. Brown,J.C.
Phys. Rev. A 27 (1983) 821-832
Modified method of perturbed stationary states. V.
Electron-capture cross sections for the reaction O^{8+} + H(1s) -> O^{7+}(n, l) + H^+
O^{8+} + H -> O^{7+}(nl) + H^+ (n=4, 5, 6, 7, l=0 - n-1)
close coupling; PSS (MO) with variationally optimized ETF
$13x10^{-3}$ - 34 keV/amu

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83T36 Sidis,V. Kubach,C. Fussen,D.
Phys. Rev. A 27 (1983) 2431-2446
Ionic-covalent problem in the H^+ + H^- <-> H^* + H collisional system
H^+ + H^- -><- H(nl) + H
MO model
0.02 - 10 keV/amu

41
83T35 Taulbjerg,K. Briggs,J.S.
J. Phys. B 16 (1983) 3811-3824
Multiple scattering theory of electron capture in intermediate-to high-velocity collisions
CDW method
formulation only

42
83T41 Wang, T.S. Delos, J.B.
J.Chem.Phys. 79 (1983) 4306 - 4309
Electron detachment for $H^-(D^-)$ in collisions with Ne.
H^-,D^- + Ne -> H(D)

43
83T42 Yoshida, J. O-Ohata, K.
J.Phys.Soc.Japan 52 (1983) 417 - 423
Charge transfer reaction of O^{3+} + H -> O^{2+} + H^+ in low energy collision.
O^{3+} + H -> O^{2+} + H^+
PSS.
2 - 240 keV/amu

1
84T 1 Aberg,T. Blomberg,A. Tulkke,J. Goscinski,O.
Phys. Rev. Letters 52 (1984) 1207-1210
Maximum entropy theory of recoil charge distributions in electron capture collisions
maximum entropy theory

2
84T 2 Amundsen,P.A. Jakubassa-Amundsen,D.H.
Phys. Rev. Letters 53 (1984) 222-225
Charge transfer to a fast projectile in the presence of a nuclear resonance
H^{+} + Ni, C -> H^{0}
strong potential Born approximation
3110 - 3200 keV/amu (Ni); 350 - 550 keV/amu (C)

3
84T 3 Amundsen,P.A. Jakubassa-Amundsen,D.H.
J. Phys. B 17 (1984) 2671-2686
Charge transfer at large scattering angles in the strong-potential Born approximation
H^{+} + C, Ni -> H(1s)
strong-potential Born approximation
3×10^{3} - 20×10^{3} keV/amu
angular distribution

4
84T 4 Andriamonje,S. Chemin,J.F. Roturier,J. Saboya,B. Schuerer,J.N. Gayet,R. Salin,A. Laurent,H. Aguer,P. Briand,J.P.
Z. Phys. A 317 (1984) 251-265
Production of projectile and target KX-rays by single and multiple electron capture in collisions of Si^{14+} and Si^{13+} ions with argon atoms at 4.5 and 5.5 MeV/amu
Si^{q+} + Ar -> $Si^{(q-1)+}$, $Si^{(q-2)+}$, $Si^{(q-3)+}$ (q=14, 13)
T. molecular model ; E. x-ray coincidence
4000 - 5450 keV/amu

5
84T 5 Banyard,K.E. Shirtcliffe,G.W.
Phys. Rev. A 30 (1984) 604-606
Electron capture from hydrogen atoms by fast $Li^{+}(1s^{2})$, $Li^{2+}(1s)$ and Li^{3+} ions
$Li^{+}(1s^{2})$, $Li^{2+}(1s)$, Li^{3+} + H -> $Li(1s^{2}, nl)$, $Li^{+}(1s, nl)$, $Li^{2+}(nl)$
continuum intermediate state approximation
28 - 1428 keV/amu

6
84T60 Bienstock, S. Heil, T.G. Dalgarno, A.
Phys.Rev.A 29 (1984) 503 - 508
Distorted-wave theory of heavy-particle collisions at intermediate energies.
O^{2+} + He -> O^{+} ($2p^{3}$ $^{2}P^{0}$,$^{2}D^{0}$)
DWA
10^{-3}- 5 keV/amu

7
84T 7 Bienstock,S. Dalgarno,A. Heil,T.G.
Phys. Rev. A 29 (1984) 2239-2241
Charge transfer of N^{3+} ions in collisions with atomic hydrogen
N^{3+} + H -> N^{2+}(nl,n'l'n"l") + H^{+}
CC (MO) with unitarized, multichannel distorted-wave approximation
0.278×10^{-3} - 5 keV/amu

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84T 6 Bienstock,S. Heil,T.G. Dalgarno,A.
Phys. Rev. A 29 (1984) 503 - 508
Distorted-wave theory of heavy-particle collisions at intermediate energies
C^{3+} + H -> C^{2+}(nl) + H^+; O^{2+} + H -> O^+(nl) + H^+
CC (MO)
0 - 5 keV/amu
Quantum-mechanical treatment in close-coupling and unitarized distorted-wave approximation

9
84T 8 Bonnet,J.J.
Ann. Phys. Fr. 9 (1984) 629-639
Photon emission spectroscopy of lighly charged ions following low energy charge exchange collilsions
review
classical one electron model; Landau-Zener model

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84T 9 Bransden,B.H. Ermolaev,A.M. Shingal,R.
J. Phys. B 17 (1984) 4515-4521
One-and two-electron models for electron capture by He^+ ions from Li^0 at intermediate energies
He^+(1s) + Li(2s, 1s) -> He($1s^2$)
two-center AO
0.25 - 100 keV/amu

11
84T10 Burgdorfer,J. Dube,L.J.
Phys. Rev. Letters 52 (1984) 2225-2228
Multiple scattering approach to coherent excitation in electron-capture collisions
H^+ + He -> H(n=3) + He^+
first Born approximation; multiple scattering theory (CDW)
9.4 - 500 keV/amu

12
84T11 Casaubon,J.I. Piancetini,R.D.
J. Phys. B 17 (1984) 1623-1630
Charge exchange by fully stripped lithium ions on metastable and ground state hydrogen atoms at low energies
Li^{3+} + H(1s), H(2s) -> Li^{2+}(nl)
OEDM + Landau-Zener method
0.02 - 2.57 keV/amu

13
84T12 Crothers,D.S.F. McCann,J.M.
J. Phys. B 17 (1984) L177-184
A second-order continuum distorted-wave theory of charge transfer at high energy
H^+ + H(1s) -> H(1s)
second-order CDW
10000, 50000 keV/amu
angular differential cross sections

14
84T59 Datta,S. Mandal,C.R. Mukherjee,S.C.
Can. J. Phys. 62 (1984) 307-311
Charge transfer in H^+ - He^+(1s) collisions
H^+ + He^+(1s) -> H(1s, 2s, 2p, 3s, 3p, 3d) + He^{2+}
CIS
50 - 10000 keV/amu

15
84T13 Deco,G.R. Maidagan,J.M. Rivarola,R.D.
J. Phys. B 17 (1984) L707-711
Electron capture by proton and alpha particle impact on helium atoms
H^+, He^{2+} + $He(1s^2)$ -> H(nl), He^+(nl)
symmetric eikonal approximation
25 - 1000 keV/amu (H); 25 - 2500 keV/amu (He)

16
84T14 Devi,K.R.S. Garcia,J.D.
Phys. Rev. A 30 (1984) 600-603
Coriolis coupling effects in time-dependent Hartree-Fock calculations of ion-atom collisions
He^{2+} + He -> He^+, He^0
time-dependent Hartree-Fock calculation
7.5, 62.5 keV/amu

17
84T61 Dube,L.J.
J.Phys.B 641 - 658 (1984) 641 - 658
Multiple scattering approaches to the electron transfer process : I. some calculable approximations.
general hydrogenic states
strong potential Born, Impulse Approx. continuum-distorted-wave approximation.

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84T15 Ermolaev,A.M.
J. Phys. B 17 (1984) 1069-1081
Charge transfer in collisions between protons and lithium atoms
H^+ + H -> H(nlm); H^+ + Li -> H(nl)
TCAE with translational factors
15 - 145 keV/amu (H); 0.5 - 109 keV/amu (Li)

19
84T16 Ermolaev,A.M. Bransden,B.H.
J. Phys. B 17 (1984) 1083-1092
Charge transfer in He^{2+} + Li collisions
He^{2+} + Li -> He^+(nl) + Li^+
CC (24-AO)
0.475 - 400 keV/amu

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84T17 Feagin,J.M. Briggs,J.S. Reeves,T.M.
J. Phys. B 17 (1984) 1057-1068
Simultaneous charge transfer and excitation
$A^{(z-1)+}$ + $B^{(z-1)+}$ -> $A^{(z-2)+}$(nl, n'l') + B^{z+}
strong-potential Born approximation

21
84T64 Feickert, C.A. Blint, R.J. Surratt, G.T. Watson, W.D.
Astrophys.J. 286 (1984) 371 - 376
Quantal calculations of charge transfer in collisions between N V and atomic hydrogen.
N^{4+} + H -> N^{3+}(3p,3d) + H^+
Quantal calculation
10^{-3} - 10^{-1} keV/amu
3d capture is dominant at low energies.

22
84T19 Fritsch,W.
Phys. Rev. A 30 (1984) 1135-1138
Atomic-basis study of electron transfer in H^+ + Na and H^+ + K collisions
H^+ + Na, K -> H^0(nl)
atomic-orbital expansion method
0.2 - 20 keV/amu
total and partial cross section

23
84T20 Fritsch,W.
Phys. Rev. A 30 (1984) 3324-3327
Determination of high-n partial transfer cross sections in bare-nucleus-hydrogen-atom collisions
C^{6+}, N^{7+}, O^{8+} + H -> C^{5+}, N^{6+}, O^{7+} (n, l)
semi-classical close-coupling with AO basis
4 - 25 keV/amu
partial cross section (n, l)

24
84T18 Fritsch,W. Lin,C.D.
Phys. Rev. A 29 (1984) 3039-3051
Atomic-orbital-expansion studies of electron transfer in bare-nucleus Z (Z=2, 4-8)-hydrogen-atom collisions
Z^{z+} + H -> $Z^{(z-1)+}$(nl) + H^{+} (Z=2, 4-8)
CC (AO)
0.133 - 25 keV/amu

25
84T21 Fritsch,W. Lin,C.D.
J. Phys. B 17 (1984) 3271-3278
Atomic-basis study of electron transfer into C^{3+}(nl) orbitals in C^{4+} + H and C^{4+} + Li collisions
C^{4+} + H -> C^{3+}(nl) + H^{+}; C^{4+} + Li -> C^{3+}(nl) + Li^{+}
CC (AO)
0.1 - 20 keV/amu

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84T22 Gerrat,J.
Phys. Rev. A 30 (1984) 1643-1660
R-matrix theory of charge transfer
R-matrix theory
formalisms

27
84T23 Ghosh,M. Datta,S. Mukherjee,S.C.
Phys. Rev. A 30 (1984) 1307-1310
Calculation of cross sections for electron capture between arbitrary hydrogenic states of target and projectile
H^{+} + H(2l) -> H(3l') + H^{+}
continuum intermediate state approximation
25 - 1000 keV/amu
arbitrary (nlm)->(n'l'm')

28
84T24 Gonzales,A.D. Miraglia,J.E.
Phys. Rev. A 30 (1984) 2292-2296
Comparison between the mechanical and radiative electron capture processes at high energies
H^{+} + H(1s), C^{5+}(1s), He(1s^{2}) -> H^{0}
CDW
1000 - 200000 keV/amu

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84T25 Grozdanov,T.P.
Phys. Scripta 30 (1984) 194-197
A model for final-state mixing following electron capture in slow collisions of fully stripped, multicharged ions and hydrogen atoms
C^{6+} + H(1s) -> C^{5+}(4l) + H^{+}
MO with Stark mixing
0.05 - 20 keV/amu

30
84T26 Hanssen,J. Gayet,R. Hartel,C. Salin,A.
J. Phys. B 17 (1984) L323-328
Electron capture by C^{4+}, N^{5+} and O^{6+} from atomic hydrogen in the keV/amu energy range
C^{4+}, N^{5+}, $O^{6+}(1s^2)$ + H -> C^{3+}, N^{4+}, O^{5+} + H^+
Molecular approximation
0.25 - 25 keV/amu
total cross section

31
84T27 Humphries,W.J. Moiseiwitsch,B.L.
J. Phys. B 17 (1984) 2655-2669
Relativistic second Born approximation for electron capture
H^+ + H(1s) -> H(1s) + H^+
relativistic second Born approximation
$1x10^3$ - $1x10^8$ keV/amu

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84T28 Jakubassa-Amundsen,D.H. Hoppler,R. Betz,H.D.
J. Phys. B 17 (1984) 3943-3949
Radiative electron capture in fast ion-atom collisions
S^{16+} + C -> $S^{15+}(1s)$
E. x-ray spectroscopy; T. strong-potential Born approximation
3900 keV/amu

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84T30 Janev,R.K. Joachain,C.J. Nedelkovic,N.N.
Phys. Rev. A 29 (1984) 2463-2478
Resonant electron transfer in slow collisions of protons with Rydberg hydrogen atoms
H^+ + H(n) -> H(n) + H^+ (n=10-50)
under-and over-barrier model
10^{-5} - 10^{-2} keV/amu

34
84T29 Janev,R.K. McDowell,M.R.C.
Phys. Letters 102A (1984) 405-408
Electron removal from H and He atoms in collisions with C^{q+}, N^{q+} and O^{q+} ions
A^{q+} + H, He -> $A^{(q-1)+}$ + H^+, He^+; A^{q+} + H^+, He^+ + e
CTMC
50, 100 keV/amu
scaling for electron removal; total cross section

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84T62 Karbovanets, M.I. Lazur, V.Yu. Chibisov, M.I.
Sov.Phys.-JETP 59 (1984) 47 - 52
Non-resonant exchange between two electrons.
C^{4+} + He -> C^{3+} + He^+
quasi-classical approximation

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84T31 Kimura,M. Iwai,T. Kaneko,Y. Kobayashi,N. Matsumoto,A. Ohtani,S. Okuno,K. Takagi,S. Tawara,H. Tsurubuchi,S.
J. Phys. Soc. Japan 53 (1984) 2224-2232
Landau-Zener model calculations of one-electron capture from He atoms by highly stripped ions at low energies
C^{q+}, N^{q+}, O^{q+}, F^{q+}, Ne^{q+} (q=4-9), Kr^{q+} (q=10-25) + He -> $A^{(q-1)+}$ (n)
multichannel Landau-Zener
1xq/M keV/amu
total and partial(n) cross sections

37
84T32 Kimura,M. Olson,R.E.
J. Phys. B 17 (1984) L713-719
Electron capture to (nl) states in collisions of C^{4+} and C^{6+} with He
C^{4+} + He -> C^{3+}, C^{2+} + He; C^{6+} + He -> C^{5+}, C^{4+} + He
PSS with ETF
20 keV/amu

38
84T33 Kocbach,L. Briggs,J.S.
J. Phys. B 17 (1984) 3255-3270
Theory of electron capture by fast projectiles scattered through large angles
H^{+} + Ne -> H^{0}
IP
200 - 550 keV/amu
capture probabilities as a function of scattering angle

39
84T34 Larsen,O.G. Taulbjerg,K.
J. Phys. B 17 (1984) 4523-4542
Theory of electron capture by partially stripped ions in slow collisions with atomic hydrogen
A^{6+} + H(1s) -> A^{5+} (A = Ar, Cr, Mg)
CC with ETF
0.015 - 4 keV/amu

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84T35 Maidagan,J.M. Rivarola,R.D.
J. Phys. B 17 (1984) 2477-2487
A symmetric eikonal-type approximation for electron capture in ion-atom collisions
H^{+} + H(1s), He(1s) -> H(1s); H^{+} + He^{+}(1s) -> H(1s)
symmetric eikonal approximation
500 - 100000 keV/amu
K-K total and partial (in angle) cross sections

41
84T36 Mandal,C.R. Datta,S. Mukherjee,S.C.
Phys. Rev. A 30 (1984) 1104-1106
Electron capture from atomic hydrogen by fully stripped ions of Be^{4+}, B^{5+}, C^{6+}, N^{7+} and O^{8+} in the continuum intermediate-sate approximation
A^{z+} + H -> $A^{(z-1)+}$ + H^{+} (A = Be, B, C, N, O)
continuum-intermediate state approximation
47 - 1111 keV/amu
total cross sections

42
84T37 McDowell,M.R.C. Janev,R.K.
J. Phys. B 17 (1984) 2295-2305
Electron capture, ionisation and transfer-ionisation in fast Au^{q+} + He collisions
Au^{q+} + He -> $Au^{(q-1)+}$ + He^{+}; $Au^{(q-1)+}$ + He^{2+} + e^{-} (q = 6-25)
CTMC
20 - 300 keV/amu
n-distribution

43
84T38 McGuire,J.H. Stockli,M. Cocke,C.L. Pedersen,E.H. Sil,N.C.
Phys. Rev. A 30 (1984) 89-94
Study of the Thomas peak in electron capture
H^{+} + H, He -> H^{0}
T. strong potential Born approximation; E. growth
2820 - 3000 keV/amu
H_2 instead of H in experiment; angular differential cross sections

44
84T39 Miraglia,J.E.
Phys. Rev. A 30 (1984) 1721-1726
Electron capture in asymmetric collisions
H^{+} + C(1s), O(1s) -> H(1s)
peaking impluse approximation
200 - 4000 keV/amu

45
84T40 Morrison,H.G. Opik,U.
J. Phys. B 17 (1984) 857-865
An impact-parameter method for heavy-particle collisions involving one elctron, II. Attempts to improve the accuracy, and results on He^{2+} - H collisions
H^{+} + H, He -> H(2s, 2p) + H^{+}, He^{2+}; He^{2+} + H -> He^{+}(total, 2s, 2p) + H^{+}
new impact-parameter method
25 (H^{+}), 19.4, 25, 41,7, 50 (He^{2+}) keV/amu

46
84T41 Olson,R.E. Kimura,M. Sato,H.
Phys. Rev. A 30 (1984) 1692-1696
Molecular-state cross section calculations for H + Cs -> <- H^{-} + Cs^{+}
H + Cs(6s, 6p, 5d) -> H^{-} + Cs^{+}
pseudo-potential molecular-structure calculation
0.1 - 10 keV/amu

47
84T42 Presnyakov,L.P. Uskov,D.B.
Sov. Phys. JETP 59 (1984) 515-522
Ionization and charge exchange in atom collision with multicharged ion
A^{q+} + H -> $A^{(q-1)+}$(nl) + H^{+}; A^{q+} + H^{+} + e ($q \geq 3$)
Keldysh quasi-classical method
10 - 400 keV/amu
analytic expression for (n, l) distribution

48
84T63 Riera, A.
Phys.Rev.A 30 (1984) 2304 - 2310
Practical criterion for the determination of translational factors.
translation factor in MO model

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84T43 Rittby,M. Elander,N. Brandas,E. Barany,A.
J. Phys. B 17 (1984) L677-681
Resonance structure in charge transfer cross sections;
an application to the N^{3+} + H -> N^{2+} + H^{+} reaction
N^{3+} + H -> N^{2+}(3s) + H^{+}
10^{-8} - 10^{-3} keV/amu
rich resonance

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84T44 Rivarola,R.D.
Phys. Rev. A 30 (1984) 1122-1124
Resonant electron capture in H^{+} + H(1s) collisions
H^{+} + H(1s) -> H(1s)
CDW
10000 keV/amu

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84T45 Rivarola,R.D. Salin,A.
J. Phys. B 17 (1984) 659-669
K-shell one-electron capture in asymmetric collisions at intermediate and high energies
H^{+} + He^{+}, Ne^{9+}, Ar^{17+} -> H(1s); H^{+} + He, C, Ne, -> H(1s)
CDW
400 - 20000 keV/amu
differential (in angle) cross sections

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84T46 Rivarola,R.D. Salin,A. Stockli,M.P.
J. Physique Letters 45 (1984) L259-264
Differential electron-capture cross sections in high energy ion-atom collisions; comparison of experiment and theory for the Thomas peak
$H^+ + H_2, He \rightarrow H^0$
CDW
2820 - 7400 keV/amu

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84T47 Salin,A.
J. de Physique 45 (1984) 671-680
Intrashell mixing following electron capture from atomic hydrogen targets by slow ions. I - Fully stripped projectiles
$C^{6+} + H \rightarrow C^{5+}(4l) + H^+$; $O^{8+} + H \rightarrow O^{7+}(5l) + H^+$;
$Ne^{10+} + H \rightarrow Ne^{9+}(6l) + H^+$
PSS
1 - 16 keV/amu

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84T48 Shimakura,N. Inoue,H. Watanabe,T.
J. Phys. B 17 (1984) 2687-2694
Differential cross sections for Li^+ - Li collisions using molecular bases; quantum effect
$Li^+ + Li'2s) \rightarrow Li(2s) + Li^+$; $Li(2p) + Li^+$
JWKB
0.07 - 0.14 keV/amu
angular distribution

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84T58 Sidis,V. de Bruijn,D.P.
Chem. Phys. 85 (1984) 201-214
Theory of near-resonant charge exchange in atom-molecule collisions. dissociate NRCE in the H_2^+ + Mg collision
$H_2^+ + Mg \rightarrow H_2^*$
IPM
0.75 - 3.75 keV/amu

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84T50 Stollberg,M.T. Lee,H.W.
Phys. Rev. A 29 (1984) 2448-2452
Charge transfer in low-energy collisions of He^{2+} and Li^{3+} with various neutral atoms
He^{2+} + Li, Be, B, C, Na, Mg, K, Cs $\rightarrow He^+(n)$
Li^{3+} + H, He, Li, Be, B, C, Ne, Na, Mg, K, Ar, Cs $\rightarrow Li^{2+}(n)$
Landau-Zener model
0.05 - 5.18 keV/amu

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84T51 Suzuki,H. Kajikawa,Y. Toshima,N. Ryufuku,H. Watanabe,T.
Phys. Rev. A 29 (1984) 525-528
Electron-capture cross sections from He in collision with bare nuclear ions
$A^{q+} + He \rightarrow A^{(q-1)+} + He^+$ ($A = H^+, Li^{3+}, Be^{4+}, C^{6+}, O^{8+}$)
UDWA
1 - 10^3 keV/amu
total cross section

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84T52 Suzuki,H. Toshima,N. Watanabe,T. Ryufuku,H.
Phys. Rev. A 29 (1984) 529-535
Exponential distorted-wave approximation for charge transfer in collisions of multicharged ions with atomic hydrogen
$A^{q+} + H \rightarrow A^{(q-1)+} + H^+$ ($A = He^{2+}, Li^{3+}, Be^{4+}, B^{5+}, C^{6+}$)
exponential UDWA
0.1 - 1000 keV/amu
total cross section

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84T53 Suzuki,R. Nakamura,H. Ishiguro,E.
Phys. Rev. A 29 (1984) 3060-3070
Semiclassical scattering theory based on the dynamical state representation; application to the Li^+ + Na and Li + Na^+ collisions
Na^+ + Li(2s) -> Na(3s); Li^+ + Na(3s) -> Li(2s, 2p) + Na^+
semiclassical theory
0.25 - 5 keV/amu

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84T54 Thorson,W.R. Choi,J.H.
Phys. Rev. A 30 (1984) 743-749
Long-range secondary couplings in X^{+z} - H(1s) charge transfer collisions
A^{z+} + H(1s) -> $A^{(z-1)+}$(nl)
molecular state CC + long-range dipole and quadruple coupling
15 - 20 keV/amu
no cross section given

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84T55 Wada,K. Murai,T.
J. Phys. B 17 (1984) L363-367
Close-coupling calculation for charge transfer in Be^{4+} + H(1s) collisions at low energies
Be^{4+} + H(1s) -> Be^{3+}
CC (11)
0.1 - 25 keV/amu

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84T56 Winter,T.G. Lin,C.D.
Phys. Rev. A 29 (1984) 567-582
Triple-center treatment of electron transfer and excitation in p - H collisions
H^+ + H -> H^0(2s, 2p) + H^+
triple-center AO
1.5 - 15 keV/amu

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84T57 Yenen,O. Jaecks,D.H. Macek,J.
Phys. Rev. A 30 (1984) 597-599
Two-state charge transfer calculation in H^+ - H_2 collisions
H^+ + H_2 -> H^0
Demkov model
1 - 50 keV/amu

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85T56 van Hemert,M.C. van Dishoeck,E.F. van der Hart,J.A. Koike,F.
Phys. Rev. A 31 (1985) 2227-2243
Quantum-mechanical and impact-parameter treatment of He^{2+} - H collisions
He^{2+} + H -> He^{+}(ln) + H^{+}
CC (20-MO)
5×10^{-3} - 1.25×10^{-1} (quantum), 2.5×10^{-2} - 2.5 (semiclassical) keV/amu

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85T59 Abramov,V.A. Lisitsa,V.S. Pigarov,A.Yu.
JETP Letters 42 (1985) 356-358
Changes in effective charge-exchange cross sections in a plasma
enhancement of cross sections due to excited atoms in a plasma

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85T 1 Allan,R.J. Hanssen,J.
J. Phys. B 18 (1985) 1981-1997
Quasimolecular treatment of Na - Na^{+}, Li - Li^{+}, Li - Na^{+} and Na - Li^{+} collisions with a common translation factor
Li^{+} + Li(2s), Na(3s) -> Li^{0}; Na^{+} + Li(2s), Na(3s) -> Na^{+}
CC with ETF
0.06 - 3.4 keV/amu

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85T60 Anholt,R.
Phys.Rev.A 31 (1985) 3579 - 3592
Atomic collisions with relativistic heavy ions II. light-ion charge states.
C^{6+},Ne^{10+},Ar^{18+} + B -> C^{5+},Ne^{9+},Ar^{17+} (non-radiative)
(B = Al,Ni,Cu,Ag,Ta,Au)
four state model
1.4×10^{5} - 2.1×10^{6} keV/amu

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85T 2 Anholt,R. Eichler,I.
Phys. Rev. A 31 (1985) 3505-3508
Eikonal calculations of electron capture by relativistic projectiles
C^{6+}, Ne^{10+}, Ar^{18+} + B -> C^{5+}, Ne^{9+}, Ar^{17+} (B = Al-U)
eikonal
140000 - 2100000 keV/amu

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85T64 Bendahman,M. Bliman,S. Dousson,S. Hitz,D. Gayet,R. Hanssen,J. Harel,C. Salin,A.
J. de Phys. 46 (1985) 561-572
Electron capture from atomic hydrogen by multiply charged ions in low energy collisions
A^{q+} + H -> $A^{(q-1)+}$ + H^{+} (A = B, C, N, O, F, Ne; q= 4-10)
0.25 - 50 keV/amu
molecular calculation with translational factor

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85T 4 Burgdorfer,J.
Nucl. Instr. Meth. in Phys. Res. A240 (1985) 519-526
Final state angular momentum distributions in charge transfer collisions at high energies
A^{z+} + B(1s) -> $A^{(z-1)+}$(nlm) + B^{+}
Born, CDW, PCI, quasi-resonant over barrier model
30 - 500 keV/amu

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85T 3 Burgdorfer,J. Dube,L.J.
Phys. Rev. A 31 (1985) 634-640
Population of Rydberg states by electron capture in fast-ion-atom collisions
H^+ + H(1s) -> H(n=10, l, m) + H^+
CDW
25 - 10000 keV/amu

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85T 5 Chatterjee,L. Bhattacharyya,B.
Phys. Scripta 32 (1985) 504-506
Quantum electrodynamic study of electron capture by light stripped ions
Li^{3+} + H -> Li^{2+}
relativistic QED
14 - 285 keV/amu

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85T 6 Chatterjee,S.N. Roy,B.N.
J. Phys. B 18 (1985) 4283-4293
Modified BEA calculations of He^{2+} impact double electron capture cross sections of atoms
He^{2+} + He, Li, Ar, Kr -> He^0
BEA
10 - 250 keV/amu

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85T 9 Crother,D.S.F. McCann,J.F.
J. Phys. B 18 (1985) 2907-2913
Exact two-channel variational continuum distorted-wave theory; results for symmetric resonant exchange
H^+ + H(1s) -> H(1s) + H^+
CDW, travelling AO
1 - 500 keV/amu

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85T 7 Crothers,D.S.F.
J. Phys. B 18 (1985) 2879-2892
First-order continuum-distorted-wave double-scattering nlm transitions
A^{z+} + $B^{(z-1)+}$(1s) -> $A^{(z-1)+}$(nlm)
first-order CDW double scattering

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85T 8 Crothers,D.S.F.
J. Phys. B 18 (1985) 2893-2906
Second-order continuum-distorted-wave double scattering nlm transitions
A^{z+} + $B^{(z-1)+}$(1s) -> $A^{(z-1)+}$(nlm)
second-order CDW double scattering

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85T10 Deco,G.R. Rivarola,R.D.
J. Phys. B 18 (1985) 2283-2293
A second-order symmetric eikonal approximaion for electron capture at high energies
H^+ + H(1s) -> H(1s)
symmetric eikonal approximation, CDW
500 - 200000 keV/amu

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85T11 Dewangan,D.P. Eichler,J.
J. Phys. B 18 (1985) L65-69
Boundary conditions and the strong potential Born approximation for electron capture
strong potential Born approximation

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85T13 Dube,L.J. Burgdorfer,J.
Nucl. Instr. Meth. in Phys. Res. B 9 (1985) 392-396
Electron capture into Rydberg states in collisions between multiply charged ions and hydrogen
C^{6+} + H(1s) -> C^{5+}(nlm) + H^{+}
CDW, CDW-PCI
25 - 900 keV/amu
multiple scattering effect; partial cross section

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85T12 Dube,L.J. Eichler,J.
J. Phys. B 18 (1985) 2467-2483
Structural and asymptotic properties of the eikonal approximation for electron capture
eikonal approximation
formulation

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85T14 Dube,L.J. Will,U. Bruch,R. Trabert,E. Heckmann,P.H.
Nucl. Instr. Meth. in Phys. Res. B 9 (1985) 408-412
Theory and experiment of electron capture in collisions of multiply charged projectiles with light targets
C^{4+} + H_2, He -> C^{3+}($1s^2$ nl)
T. CDW, B1; E. photon spectroscopy
166 - 417 keV/amu

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85T15 Eicher,J.
Phys. Rev. A 32 (1985) 112-121
Relativistic eikonal theory of electron capture
Ne^{10+} + $B^{(z-1)+}$ -> Ne^{9+}(1s) + B^{z+}
relativistic eikonal
10000 - 100000000 keV/amu
analytic expression

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85T16 Errea,L.F. Gomez-Llorente,J.M. Mendez,L. Riera,A.
Phys. Rev. A 32 (1985) 2158-2165
Practical criterion for the determination of translation factors. II. Application to He^{2+} + H(1s) collisions
He^{2+} + H -> He^{+}(nl) + H^{+}
CC (MO) with ETF
0.25 - 25 keV/amu

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85T17 Errea,L.F. Mendez,L. Riera,A. Yonez,M. Hansen,J. Harel,C. Salin,A.
J. de Physique 46 (1985) 719-726
Charge exchange in Li^{2+}(1s) + H(1s) collisions. A molecular approach including two-electron translation factors
Li^{2+}(1s) + H(1s) -> Li^{+}(1s2s), Li^{+}(1s2p), Li^{+}(total)
8 MO expansion method with ETF
0.5 - 25 keV/amu

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85T18 Fritsch,W. Lin,C.D.
Phys. Rev. A 31 (1985) 1164-1167
Close-coupling study of K-shell vacancy production in near-symmetric collisions
F^{8+} + Ne -> F^{7+} + $Ne^{+}(1s^{-1})$; S^{15+} + Ar -> S^{14+} + $Ar^{+}(1s^{-1})$
modified AO
231 - 520 keV/amu (F); 500 - 2800 keV/amu (S)

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85T19 Gargaud,M. McCarroll,R.
J. Phys. B 18 (1985) 463-477
Charge transfer in low-energy collisions of N^{3+}, C^{4+} and N^{5+} with H and H_2
N^{3+}, C^{4+}, N^{5+} + H, H_2 -> N^{2+}, C^{3+}, N^{4+} + H^+, H_2^+
CC (MO)
1.0 keV/amu

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85T20 Gayet,R. Hanssen,J. Harel,C. Salin,A.
Nucl. Instr. Meth. in Phys. Res. B 9 (1985) 413-414
Electron capture from atomic hydrogen in the keV/amu energy range
C^{4+}, N^{5+}, O^{6+} + H -> C^{3+}, N^{4+}, O^{5+} + H^+
Molecular calculation
0.25 - 25 keV/amu

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85T21 Ghosh,M. Mandal,C.R. Mukherjee,S.C.
J. Phys. B 18 (1985) 3797-3804
Single and double electron capture from lithium by fast alpha particles
He^{2+} + Li -> $He^+(nl)$ + Li; He^0 + Li^{2+}
CDW approximation
200 - 500 keV/amu

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85T22 Gorzdanov,T.P. Janev,R.K. Lazur,V.Yu.
Phys. Scripta 32 (1985) 64-68
Two-electron exchange in slow ion-atom collisions
A^{2+} + A -> A + A^{2+} (A = Ne, Ar, Kr, Xe)
asymptotic expansion
3.8×10^{-3} - 0.25 keV/amu
total cross section

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85T61 Horbatsch, M. Dreizler, R.M.
Phys.Letters 113A (1985) 251 - 253
Semiclassical description of electron loss in fast $U^{65+/75+}$ - Ar collisions.
U^{65+},U^{75+} + Ar -> Ar^{i+}
quantum statistical,semiclassical,independent particle model
3600 - 15000 keV/amu
total cross sections.

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85T23 Humphries,W.J. Moiseiwitsch,B.L.
J. Phys. B 18 (1985) 1209-1222
Third Born approximation for electron capture at relativistic energies
A^{z+} + $B^{(z-1)+}$ -> $A^{(z-1)+}$ + B^{z+1}
third Born approximation
analytic expression; no cross sections given

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85T24 Humphries,W.J. Moiseiwitsch,B.L.
J. Phys. B 18 (1985) 2295-2301
Total cross sections for electron capture at relativistic energies
A^{z+} + $B^{(z-1)+}(1s)$ -> $A^{(z-1)+}(1s)$ + B^{z+} (A = C, Ne, Ar; B = Al, Cu, Ag)
relativistic second Born approximation
140000 - 1050000 keV/amu

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85T26 Jakubassa-Amundsen,D.H.
Phys. Rev. A 32 (1985) 2166-2174
Nonadiabatic sliding model for rearrangement collisions
O^{8+} + C -> O^{7+} + C + $h\nu$; S^{16+} + Ne -> S^{15+} + Ne^+ + $h\nu$ (REC)
sliding model

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85T27 Jakubassa-Amundsen,D.H.
Z. Phys. A 322 (1985) 191-197
Radiative electron capture accompanying resonant nuclear scattering
$^{16}O^{8+}$, $^{20}Ne^{10+}$ + He -> O^{7+}, Ne^{9+}
1187 - 1250 keV/amu (O), 885 - 887 keV/amu (Ne)

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85T25 Jakubassa-Amundsen,D.H. Amundsen,P.A.
Phys. Rev. A 32 (1985) 3106-3108
Exact relativistic second Born approximation for electron capture
relativistic second Born approximation
scaling at asymptotic region, $(\ln E)^2/E$

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85T28 Jakubassa-Amundsen,D.H. Amundsen,P.A.
J. Phys. B 18 (1985) 757-774
Electron capture across a nuclear resonance in the strong potential Born approximation
H^+ + ^{22}Ne, ^{28}Si, ^{58}Ni -> H^0; He^{2+} + ^{16}O, ^{20}Ne, ^{28}Si -> He^+
strong potential Born approximation
1000 - 5500 keV/amu

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85T29 Janev,R.K. Nedeljkovic,N.N.
J. Phys. B 19 (1985) 1809-1825
Quasi-stationary spectrum of Rydberg atoms in the field of a highly charged ion
A^{z+} + B(n>>1) -> $A^{(z-1)+}$ + B^+ (A>>B)
Tunneling theory

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85T32 Kimura,M.
Phys. Rev. A 31 (1985) 2158-2161
Molecular-state treatment of excitation and charge transfer processes in H^+ + He($1s^2$) collisions
H^+ + He($1s^2$) -> H(nl) + He^+(1s); H^+ + He(1s, 2l)
MO expansion with IP
1 - 30 keV/amu

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85T33 Kimura,M.
Phys. Rev. A 32 (1985) 802-809
Charge transfer in ion-molecule collisions at keV energy region; Study of H^+ + H_2 collisions by the electron-traslational-factor-modified molecular-orbital-expansion method
H^+ + H_2 -> H(1s) + H_2
MO expansion with ETF
0.2 - 20 keV/amu
cross section ratios between H and H_2 targets

37
85T31 Kimura,M. Lin,C.D.
Phys. Rev. A 31 (1985) 590-592
Unified treatment of slow atom-atom and ion-atom collisions
H^+ + He^+ -> H + He^{2+}; H^+ + He^{2+} + e
MO (at inner region) + AO (at large nuclear distance)
2 - 5 keV/amu
no cross sections given for charge transfer

38
85T34 Kimura,M. Lin,C.D.
Phys. Rev. A 32 (1985) 357-1362
Unified treatment of slow atom-atom and ion-atom collisions. II.
Applications to H^+ + H and C^{6+} + H collisions
$H^+ + H \rightarrow H + H^+$; $C^{6+} + H \rightarrow C^{5+} + H^+$
unified treatment (matching method)
1 - 15 (H), 0.1 - 10 (C^{6+}) keV/amu

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85T30 Kimura,M. Olson,R.E.
Phys. Rev. A 31 (1985) 489-491
Electron capture in pseudo-two-electron systems;Ar^{8+} + He
$Ar^{8+} + He \rightarrow Ar^{7+}(nl) + He^+$
PSS (MO) with two electron ETF
0.02 - 10 keV/amu

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85T35 Kimura,M. Olson,R.E.
J. Phys. B 18 (1985) 2729-2735
Electron capture in O^{8+} - He collisions
$O^{8+} + He \rightarrow O^{7+} + He^+$
MO expansion with ETF
0.2 - 50 keV/amu
total cross section

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85T36 Kimura,M. Olson,R.E.
Nucl. Instr. Meth. in Phys. Res. B 10/11 (1985) 207-213
Slow ion-atom collisions
$H^+ + H \rightarrow H^0$; $He^{2+} + Li \rightarrow He^+$; $Ti^{4+} + H \rightarrow Ti^{3+}$; $C^{4+} + He \rightarrow C^{3+}, C^{2+}$;
$C^{6+} + He \rightarrow C^{5+}(nl)$; $H^+ + Cs \rightarrow H^0$
MO
review; partial cross section for $C^{6+} + He \rightarrow C^{5+}(nl)$; total
cross section for others

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85T37 Kobayashi,K. Toshima,N. Ishihara,T.
Phys. Rev. A 32 (1985) 1363-1368
Eikonal approximation for proton-helium electron capture processes
$H^+ + He \rightarrow H + He^+$
eikonal approximation
10^2 - 10^4 keV/amu
total and angle-differential cross sections

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85T38 Kocbach,L. Taulbjerg,K.
J. Phys. B 18 (1985) L79-83
On the theory of electron capture from innershells in intermediate and
high-energy collisions
IA
no absolute cross sections given

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85T39 Macek,J.
J. Phys. B 18 (1985) L71-74
Treatment of divergent terms in the strong potential Born approximation
strong potential Born approximation
modified Coulomb Green's function to avoid divergence

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85T40 Martiarena,M.L. Garibott,C.R.
Phys. Letters 113A (1985) 307-310
Radiative electron capture to the continuum
radiative electron capture to continuum in H^+ + He; Ne^{10+} + He; Ar^{10+} + He
first Born
RECC spectra in Ne^{10+}, Ar^{17+} + He collisions

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85T41 McCann,J.F.
J. Phys. B 18 (1985) L569-573
Contunuum distorted-wave theory of relativistic electron capture
H^+ + H(1s) -> H(1s) + H^+; H^+ + B^{4+}(1s) -> H(1s) + B^{5+}
relativistic CDW theory
10^3 - 10^8 keV/amu

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85T42 McDowell,M.R.C. Janev,R.K.
J. Phys. B 18 (1985) L295-301
Charge exchange and ionisation in collisions of fast partially stripped ions of iron with hydrogen
Fe^{q+} + H -> $Fe^{(q-1)+}$ + H^+; Fe^{q+} + H^+ + e (q=12-18)
CTMC
10 - 400 keV/amu
Scaling laws for the cross sections as a function of q

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85T44 McGuire,J.H.
J. Phys. B 18 (1985) L75-77
Non-orhtogonality in the strong potential Born approximation
strong potential Born approximation

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85T43 McGuire,J.H. Kletke,R.E. Sil,N.C.
Phys. Rev. A 32 (1985) 815-821
Strong-potential Born calculations for 1s-1s electron capture from atoms by protons
H^+ + B -> H + $B^+(1s^{-1})$ (B = H, He, C, Ne, Ar, Xe)
strong potential Born approximation
200 - 100000 keV/amu
angle-differential cross sections

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85T46 Miraglia,J.E.
Phys. Rev. A 32 (1985) 2702-2706
Radiative electron capture in proton-hydrogen collisions
H^+ + H -> H^0 + H^+ + $h\nu$
Born, CDW
10 - 10^4 keV/amu

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85T45 Miraglia,J.E. Garibotti,C.R. Gonzalez,A.D.
Phys. Rev. A 32 (1985) 250-253
Photon spectrum associated with radiative electron capture processes
Ne^{10+} + He, Ne -> Ne^{9+}; Ar^{17+} + He -> Ar^{16+}
first Born approximation
7000 keV/amu (Ne), 7200 keV/amu (Ar)

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85T62 Newby, C.W.
J.Phys.B 18 (1985) 1781 - 1788
Charge transfer calculations using switching functions.
He^{2+} + H(1s) -> He^+(2s,n=2) + H^+
AO with translation factor
0.25 - 200 keV/amu

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85T47 Olson,R.E. Kimura,M.
Phys. Rev. A 32 (1985) 3092-3094
Molecular-state cross section calculations for H + Na -> <- H^- + Na^+
$H + Na \rightarrow H^- + Na^+$; $H^- + Na^+ \rightarrow H + Na$ (3s, 3p, 4s)
pseudo potential MO
0.1 - 5 keV/amu

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85T63 Opradolce, L. McCarroll, R. Valion, P.
Astron.Astrophys. 148 (1985) 229 - 233
Charge transfer of Si^{4+} with helium.
$Si^{4+} + He \rightarrow Si^{3+}(2p^6 3p)^2P$, $(2p^6 3s)^2S$ + He^+; $Si^{3+} + He^+ \rightarrow Si^{4+} + He$
molecular quantal treatment
4×10^{-7} - 3.5 keV/amu
rates given

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85T48 Peach,G. Willis,S.L. McDowell,M.R.C.
J. Phys. B 18 (1985) 3921-3937
The classical theory of charge transfer and ionization processes in collisions between complex atomic ions
classical theory
general theory

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85T49 Saha,G.C. Datta,S. Mukherjee,S.C.
Phys. Rev. A 31 (1985) 3633-3638
Electron capture from multielectron atoms by fast ions in the continuum intermediate-state approximation
H^+ + C, N, O, Ne, Ar -> H^0
continuum-intermediate-state approximation
500 - 20000 keV/amu

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85T50 Shingal,R. Bransden,B.H. Flower,D.R.
J. Phys. B 18 (1985) 2485-2491
Neutralization in $H^+ + H^-$ collisions
$H^+ + H^- \rightarrow H(1s) + H(nl)$
two-center AO expansion method
8 - 50 keV/amu

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85T51 Sidorovich,V.A. Nikolaev,V.S. McGuire,J.H.
Phys. Rev. A 31 (1985) 2193-2201
Calculation of charge-changing cross sections in collisions of H^+, He^{2+} and Li^{3+} with He atoms
$A^{z+} + He \rightarrow A^{(z-1)+}(1s)$, $A^{(z-2)+}(1s^2)$
independent-electron model
25 - 4000 keV/amu
also single and double ionization of He; ionization with electron capture into ground state

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85T52 Stallcop,J.R. Partridge,H.
Phys. Rev. A 32 (1985) 639-642
N^+ - N long-range interaction energies and resonance charge exchange
$N^+ + N \rightarrow N + N^+$
self-consistent field method
7×10^{-5} - 7×10^{-3} keV/amu

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85T53 Stich,W. Ludde,H.J. Dreizler,R.M.
J. Phys. B 18 (1985) 1195-1207
TDHF calculations for two-electron systems
H^{+} + He(1s^{2}) -> H; He^{2+} + He(1s^{2}) -> He^{+}, He^{0}; Li^{3+} + He(1s^{2}) -> Li^{2+};
He^{+}(2s) + H(1s), He^{+}(2s) -> He
TDHF
7×10^{-5} - 7×10^{-3} keV/amu

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85T54 Thylwe,K.E. Barany,A.
Nucl. Instr. Meth. in Phys. Res. B 9 (1985) 435-437
A semiclassical analysis of orbiting resonances in slow charge transfer processes
N^{3+} + H -> N^{2+}
semiclassical
10^{-5} - 10^{-2} keV/amu
total cross sections

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85T55 Toepfer,A. Ludde,H.J. Jacob,B. Dreizler,R.M.
J. Phys. B 18 (1985) 1969-1980
Many-electron aspects in ion-atom collisions; 2p-2s vacancy transfer in the Ne^{+} + Ne system
Ne^{+} + Ne -> Ne(2p) + Ne^{+}(2s)
IP
0.25 - 25 keV/amu

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85T57 Wada,K. Murai,T.
J. Phys. B 18 (1985) 4259-4269
Charge transfer in Be^{4+} + H(1s) collisions; convergence and oscillatory structure of the total cross sections
Be^{4+} + H(1s) -> Be^{3+}
MO close-coupling method
2.0 - 25.0 keV/amu

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85T58 Willis,S.L. Peach,G. McDowell,M.R.C. Banerji,J.
J. Phys. B 18 (1985) 3939-3950
Charge transfer and ionization processes in collisions involving atoms and ions of hydrogen and helium
He^{+} + H -> He + H^{+}; He^{+} + H^{+} + e
He^{+} + He^{+} -> He + He^{2+}; He^{+} + He^{2+} + e
classical theory

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Charge transfer in H^+ - Na^0 collisions; molecular orbital calculations
H^+ + Na(3s) -> H(nl) + Na^+
PSS with ETF

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86T14 Allan,R.J.
J.Phys.B 19 (1986) L 683 - 689
He^+(1s) + He^+(1s) charge transfer collisions
He^+(1s) + He^+(1s) -> He + He^{2+}
SCF/CI with translation factor
5 - 70 keV/amu

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86T 9 Allan,R.J. Shingal,R. Flower,D.R.
J. Phys. B 19 (1986) L251-256
Charge transfer in H^+ - Na(3p) collisions; a possible ultraviolet laser mechanism
H^+ + Na(3p) -> H(nl) + Na^+
AO (>0.2 keV/amu); MO (<0.4 keV/amu)
0.02 - 10 keV/amu

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86T64 Archirel, P. Levy, B.
Chem.Phys. 106 (1986) 51 - 68
A simple determination of the potential energy curves and couplings for long-range charge-transfer reactions; Application to the system $(ArN_2)^+$.
Ar + N_2^+ (X,A,v) -> Ar^+ + N_2 : $Ar^+(^2P_{1/2}, {}^2P_{3/2})$ + N_2 -> Ar + N_2^+
ab initio approach
$2x10^{-2}$ keV/amu

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86T65 Baer, M. Nakamura, H. Ohsaki, A.
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A quantum-mechanical study of chemical reaction and charge-transfer processes in the (Ar + H_2 $)^+$ system.
Ar^+ + H_2 (v_0 = 0,1) -> Ar + $H_2^+(v_f)$
reactive infinite-order sudden approx.
chemical reactions

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86T15 Barany,A. Danared,H. Cederquist,H. Hveplund,P. Knudsen,H
Pedersen,J.O.K. Cocke,C.L. Tunnell,L.N. Waggoner,W. Giese,J.P.
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Stueckelberg angular scattering oscillations in two electron capture by C^{4+} from He at low energies.
C^{4+} + He -> C^{2+} + He^{2+}
Two state curve crossing model
0.025 - 0.125 keV/amu
Angle differential cross sections

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Z.Phys.D 3 (1986) 59 - 67
Electron capture by protons from the K-shell of H and Ar.
H^+ + H(1s) -> H(nlm) + H^+; H^+ + Ar -> H(nl) + $Ar^+(K^{-1})$
T-matrix
25 - 125 keV/amu(H); 10^3 $-1.3x10^4$ keV/amu(Ar)
angular distribution

8
86T16 Belkic,Dz. Gayet,R. Hansen,J. Salin,A.
J.Phys.B 19 (1986) 2945 - 2953
The first Born approximation for charge transfer collisions
H^+, He^{2+}, Li^{3+} + C -> H(1s), He^+(1s), Li^{2+}(1s) + $C^+(K^{-1})$
He^{2+} + H -> He^+(1s)
H^+ + Ar -> H(1s) + $Ar^+(K^{-1})$
First Born approximation
100 - 2000 keV/amu
K-shell capture cross sections

9
86T 4 Bienstock,S. Dalgarno,A. Heil,T.G.
Phys. Rev. A 33 (1986) 2078-2080
Charge transfer in N^{2+} + H collisions at slow to intermediate velocities
N^{2+} + H -> N^+ + H^+
CC + UDWA
$5.4x10^{-3}$ - 5.36 keV/amu

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86T17 Blanco,S.A. Falcon,C.A. Piancetini,R.D.
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Electron capture from H(2s) by H^+ at low energies
H^+ + H(2s) -> H(n=2) + H^+
MO
0.06 - 2.25 keV/amu
The cross sections in table 1 should be multiplied by a factor of 10
(see J.Phys.B 21 (1988) L49)

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A theoretical study of the non-adiabatic charge transfer process
$Ar^{2+}(^3P)$ + $He(^1S)$ -> $Ar^+(^2P)$ + $He^+(^2S)$.
$Ar^{2+}(^3P)$ + $H(^1S)$ -> $Ar^+(^2P)$ + $He^+(^2S)$
close-coupling calculation with C.I.
$3x10^{-5}$ - $3x10^{-3}$ keV/amu
also angular differential cross sections; comparison with
Landau-Zener calculation

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86T68 Briggs, J.S.
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Critical second-order scattering in three-body rearrangement and
break-up processes.
second-order T-matrix

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Angular momentum distribution in the classical over-barrier model for
electron capture into highly charged slow projectiles.
O^{6+},N^{5+} + H,H_2 -> O^{5+},N^{4+}
Modified classical over-barrier model
average angular momentum.

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Phys. Rev. A 33 (1986) 2959-2969
Distorted-wave methods for electron capture in ion-atom collisions
A^{z+} + $B^{(z-1)+}$ -> $A^{(z-1)+}$ + B^{z+}
distorted-wave with strong potential Born ; CDW

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86T19 Cole,S.K. DePristo,A.E.
J.chem.phys. 85 (1986) 1389 - 1395
State-to-state differential cross sections from semiclassical energy conserving trajectory calculations;$H_2^+(v)$ + H_2(v=0) -> $H_2(v'')$ + $H_2^+(v')$
$H_2^+(v)$ + H_2(v=0) -> $H_2(v'')$ (v = 0,2,5,8)
semiclassical energy conserving trajectory calculation
$4x10^{-3}$ - $8x10^{-3}$ keV/amu

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Calculation of potential energy curves for the process
C^{3+}(2l) + H(1s) -> C^{2+} (nln'l';^{1}L) + H^+
C^{3+}(2L) + H(1s) -> C^{2+}(nln'l';^{1}L) + H^+
Spin-coupled valence-bond theory
potential energy curves only;no cross sections

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86T69 Dakhnovskii, Yu.I. Ovchinnikov, A.A.
Mol.Phys. 58 (1986) 237 - 252
Adiabatic electron transfer in polar media : Quantum transition stste theory.
general theory
transition state theory

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86T21 Danared,H. Barany,A.
J.Phys.B 19 (1986) 3109 - 3120
Semiclassical scattering effects in two electron capture by C^{4+} from He at low energies.
C^{4+} + He -> C^{2+}
Semiclassical/semiquantal methods
0.25 - 0.125 keV/amu
Angle-differential cross sections is oscillatory

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86T22 Deco, G.R. Hanssen, J.Rivarola, R.D.
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Application of a first-Born- type approximation for 2l electron capture in ion-atom colissions
H^+ + H(1s) -> H(2s,2p); H^+ + He($1s^2$) -> H(2s,2p)
First-Born-approximation
25 - 1000 keV/amu
Total cross sections

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86T23 Deco, G.R. Rivalora, R.D.
J.Phys.B 19 (1986) 1759 - 1770
Relativistic continuum distorted-wave model for electron capture
H^+ + H(1s) -> H(1s) + H^+
CDW model
$5x10^7$, $5x10^9$ keV/amu
Angular distribution

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86T24 Deco,G.R. Piancetini,R.D. Rivarola,R.D.
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Symmetric eikonal theory for $n_il_im_i$ -> $n_fl_fm_f$ electron capture in -atom collisions.
General system
Symmetric eikonal approximation

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Exothermic charge exchange with excitation of the ion :
extrapolation of cross sections into the region of thermal collisions
$He^+ + Cd \rightarrow He + Cd^{+*}$(4415,3250Å); $He^+ + Zn \rightarrow He + Zn^{+*}$(5894Å)
Landau-Zener
rate coefficients at thermal energies

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86T25 Dewangan,D.P. Eichler,J.
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A first-order Born approximation for charge exchange with Conlomb boundary conditions.
$H^+ + Ar \rightarrow H + Ar^+$ (K^{-1})
First order Born approximation
10^3 - $2x10^4$ keV/amu

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86T26 Eichler,J.
Electronic and Atomic collisions (Elsevier 1986) 257 - 262
Relativistic eikonal theory of electron capture
$Ne^{10} + A^{(Z-1)+}(1s) \rightarrow Ne^{9+}(1s) + A^{Z+}$
$Xe^{54+}, Xe^{52+} + B \rightarrow Xe^{53+}, Xe^{51+}$ (B = Be,Al,Cu,Au)
Eikonal approximation
10^4 - 10^8 keV/amu
Total cross sections

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86T28 Errea,L.F. Martin,F. Mendez,L. Riera,A. Yanez,M.
J.Chew.Phys. 84 (1986) 5422 - 5426
Molecular (Feshbach) treatment of charge exchange Li^{3+} + He collisions II cross sections
$Li^{3+} + He \rightarrow Li^{2+} + He$
MO with common translation factor approach
0.2 - 5 keV/amu

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86T 1 Errea,L.F. Mendez,L. Mo,O. Riera,A.
J. Chem. Phys. 84 (1986) 147-151
Nonadiabatic ionic-covalent transitions exponential-linear model for the charge exchange and neutralization reactions Na + H -> <- $Na^+ + H^-$
$Na(3s) + H(1s) \rightarrow Na^+ + H^-$; $Na^+ + H^- \rightarrow Na(3s, 3p, 4s) + H(1s)$
5 MO with ETF
0.16 - 5.0 keV/amu

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86T27 Errea,L.F. Mendez,L. Mo,O. Riera,A.
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Non-adiobatic ionic-covalent transitions:expontial linear model for the charge exchange and neutralization Na + H $\rightleftarrows$ $Na^+ + H^-$
$Na(3s) + H \rightarrow Na^+ + H^-$; $Na^+ + H^- \rightarrow Na(3s,3p,4s) + H$
MO
0.16 -5 keV/amu

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Dynamics of charge transfer $Ar^{2+}(^3P) + He(^1S) \rightarrow Ar^+(^2P)$ + He^+ (^2S) at low collision energies;comparison of experimental results with quasiclassical calculations of the differential cross sections.
$Ar^{2+}(^3P) + He(^1S) \rightarrow Ar^+(^2P) + He^+(^2S)$
LZ
$1.5x10^{-5}$ - $4x10^{-5}$ keV/amu
Angular distribution

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86T30 Fritsch,W. Lin,C.D.
J.Phys.B 19 (1986) 2683 - 2694
Atomic orbital expansion study for the (quasi) two electron collisions system O^{6+} + He and C^{6+} + He.
C^{6+} , O^{6+} + He -> C^{5+} , O^{5+} (n,l)
AO
0.5 -40 keV/amu
(n,l) partial cross sections given

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86T 7 Fussen,D. Kubach,C.
J. Phys. B 19 (1986) L31-34
Theoretical study of mutual neutralization in H^{+} - H^{-} collisions at low energy (0.02-20 eV)
H^{+} + H^{-} -> H + H(n=2, 3)
quantum close-coupling treatment
$2x10^{-5}$ - $2x10^{-2}$ keV/amu
n=3 dominant, particularly at low energies

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86T71 Godunov, A.L. Kunikeev, S.D. Senashenko, V.S.
Sov.J.Plasma Phys. 12 (1986) 784 - 788
Differential cross sections for electron capture by protons in hydrogen and helium.
H^{+} + He,H -> H + He^{+},H^{+}
Fadeev equation with final state interaction
$1x10^{2}$ - $7.4x10^{3}$ keV/amu

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86T31 Henne,A. Toepfer,A. Ludde,H.J. Dreizler,R.M.
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Time-dependent Hartree-Fock calculations for the He^{+} (1s) + He^{+}(1s) system
He^{+}(1s) + He^{+}(1s) -> He^{2+} + He
Time-dependent Hartree-Fock
1 - 20 keV/amu

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86T33 Horbatch,M.
Z.Phys.D 1 (1986) 337 - 345
Semiclassical descripton of multiple electron capture and ionization in fast bare-nucleus-rare gas collisions I. C^{6+} - Ca^{20} on Ne at 1 MeV/amu
A^{q+} + Ne -> Ne^{i+} (A = C-Ca ; i = 1-8)
Quantum statistical semiclassical methoed
1000 keV/amu

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86T11 Horbatsch,M.
J. Phys. B 19 (1986) L193-198
Calculation of transfer ionization processes in ion-atom collisions
C^{6+}, O^{8+} + Ne -> C^{5-3+}, O^{7-5+} + Ne^{i+} (i=1-8)
quantum statistical time-dependent mean-field theory
1000 keV/amu

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86T32 Horbatsch,M. Dreizler,R.M.
Z.Phys.D 2 (1986) 183 - 191
Semiclassical description of multiple electron capture and ionization in fast bare nucleus-rare gas collisions II. energy dependence of C^{6+},Mg^{12+},Ca^{20+} - Ne collisions.
A^{Z+} + Ne -> Ne^{i+} (A = C,Mg,Ca ; i = 1-10)
Semiclassical quantum statistical independent particle model
50 - 5000 keV/amu

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Phys.Rev.A 34 (1986) 1772 - 1778
Strong-potential Born approximation calculations of 1s - 2p electron capture.
$H^+ + H(1s) \rightarrow H(n,l,m) + H^+$ (n = 1,2)
Strong-potential Born approximation
1000 - 200000 keV/amu
Also angle-differential cross sections

37

86T35 Jain,A. Lin,C.D. Fritsch,W.
Phys.Rev.A 34 (1986) 3676 - 3683
Electron capture in C^{6+} + He and O^{8+} + He collisions at intermediate energies in the atomic orbital expantion method.
$A^{Z+} + He \rightarrow A^{(Z-1)+}(n,l,m)$ (A = C,O)
AO
10 - 2000 keV/amu

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Non-adiabatic transitions between two groups of intersecting energy levels.
Closed forms for transition probabilities.

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Dynamic autoionization widths for capture ionization in slow ion-atom collisions.
Analytic expressions for dynamic autoionization in transfer ionization

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Orbiting trajectories and the adiabatic approximation to the capture cross section.
average dipole orientation (ADO) theory; Monte Carlo calculation

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86T40 Kimura,M.
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Theoretial investigation of charge transfer in collisions of C^{6+} and N^{7+} ions with H and H_2 targets at low to intermediate energy
C^{6+} , N^{7+} + H, H_2 -> C^{5+} , N^{6+}
travelling MO
0.1 - 10 keV/amu
Total cross sections given

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86T 5 Kimura,M. Chapman,S. Lane,N.F.
Phys. Rev. A 33 (1986) 1619-1625
Electron capture in Ar^+ + H_2 collisions in the keV energy regime
$Ar^+ + H_2 \rightarrow Ar^0 + H_2^+$
MO with ETF
7.5×10^{-3} - 0.25 keV/amu

43

86T39 Kimura,M. Lane,N.F.
Phys.Rev.Letters 56 (1986) 2160 - 2163
Theoretial study of alignment and orientation in Li^+ + He collisions
$Li^+ + He \rightarrow Li(2^2P)$
MO expansin method
0.14 - 3 keV/amu
Alignment and orientation

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86T42 Kimura,M. Lane,N.F.
Phys.Rev.A 34 (1986) 4421 - 4423
Symmetric resonant charge transfer in H^+ + H and He^{2+} + He collisions at exfremely low energies.
H^+ + H -> H H^+ ; He^{2+} + He -> He + He^{2+}
MO
10^{-10} - 10^{-6} keV/amu

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86T41 Kimura,M. Lin,C.D.
Phys.Rev.A 34 (1986) 176 - 184
Charge transfer and excitation process in p-He collisions studied using a unified atomic orbital-molecular orbital matching method.
H^+ + He -> H (2s,2p,total) + He^+ ; H^+ He($2^1P,2^1S$)
MO - AO matching method
1 - 100 keV/amu
Impact parameter dependence

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86T43 Kirby,K. Heil,T.G.
J.Chem.Phys 85 (1986) 6220 - 6224
A molecular representation of Al^{3+} + H charge transfer reactions.
Al^{3+} + H -> Al^{2+}
MO expansion
0.014 - 14 keV/amu
Total cross section

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86T73 Kobayashi, K. Ishihara, T.
Phys.Rev.A. 34 (1986) 626 -628
Differential cross sections for electron capture in fast proton-hydrogen collisions.
H^+ + H -> H + H^+
eikonal approx. with distortion by internuclear interaction
25 - 125 keV/amu
angular distribution over 0 - 3 mrad

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86T74 Korsch, H.J. Möhlenkamp, R. Thylwe, K.E.
J.Phys.B. 19 (1986) 2151 - 2163
Semiclassical complex energy theory of orbiting resonances in curve crossing systems.
N^{3+} + H -> N^{2+} + H^+
semiclassical comlex energy theory

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Electron capture mechanisms
review

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86T46 Martin,F. Riera,A. Yanez,M.
J.Chem.Phys. 84 (1986) 5412 - 5421
Molecular (Feshbach) treatment of charge exchange Li^{3+} + He collisions I.energies and couplings.
Li^{3+} + He^+ -> Li^{2+} + He^+
Feshbach projection operator formalism
Energy,couplings

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86T45 Martin,F. Riera,A. Yanez,Z.
Phys.Rev.A 34 (1986) 4675 - 4681
Single and double charge transfer in Be^{4+} + He collisions :
a molecular (Feshbach) approach
Be^{4+} + He -> Be^{3+} , Be^{2+}
MO with translation factor
0.25 - 25 keV/amu
Total cross sections given

52
86T47 Men,F.K. Kimura,M. Olson,R.E.
Phys.Rev.A 33 (1986) 3800 - 3806
Resonant charge transfer in symmetric alkali-ion-alkali-atom collisions.
A^+ + A -> A + A^+ (A = Li,Na,K,Rb,Cs)
MO expansion method with translation factor
0.01 - 5 keV/amu
total cross sections

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86T48 Moiseiwitsch,B.L.
J.Phys.B 19 (1986) 3733 - 3738
Relativistic symmetric eikonal approximation for electron capture.
general formalism
eikonal approximation

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86T49 Niehaus,A.
J.Phys.B 19 (1986) 2825 - 2937
A classical model for multiple electron capture in slow collisions of highly charged ions with atoms.
general system
modified over-barrier model

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86T50 Nikitin,E.E. Rezmikov,A.I. Umanskii,S.Ya.
Sov.Phys-JETP 64 (1986) 937 - 941
Two-level model of charge exchange with Coulomb interaction in one of the channels; quantum and quasi- classical cross sections in the weak coupling limit.
Ar^{2+} + He -> Ar^+ + He^+
DWA
1×10^{-5} keV/amu

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86T 2 Ojha,P.C. Girardean,M.D. Gilbert,J.D. Straton,J.C.
Phys. Rev. A 33 (1986) 112-123
Fock-Tani transformation and a first-order theory of charge transfer
H^+ + H(1s) -> H(1s) + H^+
Fock-Tani transformation of second-quantized Hamiltonian
2 - 800 keV/amu
angular distribution

57
86T51 Olson,R.E. Wetmore,A.E. McKenzie,M.R.
J.Phys.B 19 (1986) L629 - 634
Double electron transitions in collisions between multiply charged ions and helium atoms.
A^{q+} + He -> A^{q+} + He^+ + e ; A^{q+} + He^{2+} + 2e ; $A^{(q-1)+}$ + He^+ ;
$A^{(q-1)+}$ + He^{2+} + e ; $A^{(q-2)+}$ + He^{2+} (q = 1 - 50)
classical trajectory Monte Carlo method
1000 keV/amu
total cross sections

58
86T52 Opradolce,L. Falcon,C. Casaubon,J.I.
J.Phys.B 19 (1986) 2319 - 2329
Single electron capture by Li^{3+} from He in low energy collisions
Li^{3+} + H -> Li^{2+}
close-coupling technique
$2x10^{-5}$- 6 keV/amu
Total cross sections

59
86T12 Reinhold,C.O. Falcon,C.A.
Phys.Rev.A 33 (1986) 3859 - 3866
Classical ionization and charge transfer cross sections for H^+ + He and H^+ + Li^+ collisions with consideration of model interactions
H^+ + He -> H + He^+ , H^+ + He^+ + e
H^+ + Li^+ -> H^+ + Li^{2+} , H^+ + Li^{2+} + e
Classical trajectory Monte Carlo
50 - 1000 keV/amu
total cross sections

60
86T76 Saha, G.C. Mukherjee, S.C.
Phys.Letters A 117 (1986) 23 - 26
X-ray cross section in helium for electron capture into excited states by C^{6+} and O^{8+} ions in the continuum distorted-wave approximation.
C^{6+},O^{8+} + He -> C^{5+}(n),O^{7+}(n) + hν
CDW
(0.42 - 2.1)$x10^3$ keV/amu(C); (0.625 - 2.5)$x10^3$ keV/amu(O)

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86T13 Saha,G.C. Datta,S. Mukherjee,S.C.
Phys.Rev.A 34 (1986) 2809 - 2821
Electron capture in collisions of He^{2+} with Li atoms and of Li^{3+},C^{6+},and O^{8+} with He in the high energy region.
He^{2+} + Li(1s,2s) -> He^+ (1s,2s,2p,3s,3p,3d) + Li^+
Li^{3+}, C^{6+}, O^{8+} + He -> Li^{2+}, C^{5+}, O^{7+} (nl) + He^+ (n = 1 - 5)
CDW
200 - 4000 keV/smu

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Convergence of coupled-state calculations for electron captur by bare ions from atomic hydrogens.
N^{7+} + H (1s) -> N^{6+} + H^+
MO (5,25 states)
0.1 - 10 keV/amu
Total cross sections

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J. Phys. B 19 (1986) 309-320
Charge transfer in H^+ - Na^0 collisions; atoms orbital calculations
H^+ + Na(3s) -> H(nl) + Na^+(n=1,2,3) ; Na^+ + H(1s) -> Na(3l) + H^+ (l=0,1,2)
two-center expansion in travelling AO
0.5 - 20 keV/amu

65
86T55 Shingal,R. Noble,C.J. Bransden,B.H. Flower,D.R.
J.Phys.B 19 (1986) 3951 - 3964
Semiclassical calculations of charge exchange and excitation in
Na^+ - Li and Li^+ - Na collisions using atomic orbital expansions.
Na^+ + Li -> Na(n,l) + Li ; Li^+ + Na -> Li(n,l) + Na^+
traveling AO
0.25 - 49 keV/amu
Partial cross sections (n,l)

66
86T77 Shurygina, Ya.A. Senashenho, V.S. Teplova, Ya.A.
Sov.Phys.-Tech.Phys. 31 (1986) 897 - 903
Calculation of the one-electron charge transfer cross sections of
H^+,He^{2+} and Li^{3+} nuclei in collisions with light atoms at medium
and high energies.
H^+,He^{2+},Li^{3+} + C,N -> H,He^+,Li^{2+}; H^+ + He -> H; He^{2+} + H -> He^+
strong coupling equations
0.2 - 2.5x10^3 keV/amu(C); 0.15 - 5x10^3 keV/amu(Ne);
20 - 5000 keV/amu(He); 50 - 500 keV/amu(H)
analytical expressions for K-shell electron transfer

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86T56 Sinha,C. Tripathi,S. Sil,N.C.
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Charge transfer in the eikonal approximation.
H^+ + H -> H(1s) + H^+
Eikonal approximation
40 - 5000 keV/amu

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On the validity of simple two-state electronic transition models.
general theory
Landau-Zener-Demkov model
locations and widths of transition zones calculated

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J.Phys.B 19 (1986) L367 - 372
Reaction windows for electron capture by highly charged ions
General system
Landau-Zener

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86T 3 Toshima,N. Watanabe,T.
Phys. Rev. A 33 (1986) 1382-1384
Simplified distorted-wave treatment for asymmetric electron capture
processes
A^{z+} + H(1s) -> $A^{(z-1)+}$ + H^+ (A = C, Ne)
DWBA
10^{-1} - 10^3 keV/amu

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86T58 Urbain,X. Giusti-Suzor,A. Fussen,D. Kubach,C.
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Theoretial study of associative ionization in H^+ - H^- collisions at low energy (0.001 - 5 eV)
$H^+ + H^- \rightarrow H_2^+ + e$
$1x10^{-6}$ - $5x10^{-3}$ kev/amu

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Theoretical study of population sharing between n=2 levels in the Li^+ + He collision.
Li^+ + He -> Li(n=2) + He^+ ; Li^+ + He(n=2)
Half-collision model
0.14 - 4.3 keV/amu

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86T60 Wetmore,A.E. Cole,H.R. Olson,R.E.
J.Phys.B 19 (1986) 1515 - 1525
Calculation of electron capture cross sections for collisions of Be^{2+} and B^{3+} on H.
Be^{2+} + H -> Be^+ , $Be^+(2s)$, $Be^+(2p)$; B^{3+} + H -> B^{2+}
PSS with translation factor
1 - 20 keV/amu

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86T61 Winter,T.G.
Phys.Rev.A 33 (1986) 3842 - 3852
Electron transfer and ionization in collisions between protons and the ions Li^{2+} and He^+ studied with the use of a Sturmian basis.
H^+ + Li^{2+}, He^+ -> H + Li^{3+}, He^{2+} ; H^+ + Li^{3+}, He^{2+} + e
Coupled state Sturmain approach
17.5 - 200 keV/amu
Total cross sections

75
86T62 Zaifman,D. Maor,D.
Phys.Rev.Letter 56 (1986) 320 - 323
Heisenberg core in classical trajectory Monte Carlo calculation of ionization and charge exchange.
H^+ + He -> H + He^+
Classical trajectory Monte Carlo method
20 - 200 keV/amu

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86T63 Zygelman,B. Dalgarno,A.
Phys.Rev.A 33 (1986) 3853 - 3858
Direct charge transfer of He^+ in neon.
He^+ + Ne -> He + Ne^+
Diabatic formulation
$7x10^{-5}$ - 2 keV/amu
Total cross sections

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87T 1 Aberg,T. Blomberg,A. MacAdam,K.B.
J.Phys. B 20 (1987) 4795-4814
Interpretation of final state distributions in charge transfer from Rydberg atoms
A^+ + Na(nl)->A(nl)+Na^+ (A=Ne,Na,Ar; n=23-35; l=0,2)
Maximum entropy principle
0.5 - 2 keV/amu

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87T58 Anholt,R. Becker,U.
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Atomic collisions with relativistic heavy ions IX. ultrarelativistic collisions.
REC and non-radiative electron capture cross sections based on scaling laws.also ionization cross sections given

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Ab initio potential-energy curves and radial and rotational couplings for the process N^{5+} + He -> N^{4+} + He^+
N^{5+} + He -> N^{4+} + He^+
ab initio calculation with configuration interaction
no cross section given

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Autoionization of diatomic quasi-molecules
N^{7+} + He -> N^{6+} + He^{2+} + e
quasi-molecular model
Auger ionization; transfer Penning ionization; two-electron capture followed by autoionization

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J.Chem.Phys. 87 (1987) 4651 - 4664
A three-dimensional quantum mechnical study of exchange and charge transfer processes in the (Ar + H_2 $)^+$ system.
H_2^+ + Ar
infinite order sudden approx.
$6x10^{-4}$ keV/amu

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Mol.Phys. 61 (1987) 1193 - 1198
Calculation of potential energy curves for electron capture by C^{3+} from neutral lithium using spin-coupled VB theory.
$C^{3+}(2s)$ + Li(2p) -> $C^{2+}(nln'l'; {}^1L)$ + $Li^+(1s^2)$
spin-coupled valence band method
potential energy curves

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87T 5 Belkic,D. Saini,S. Taylor,H.S.
Phys. Rev. A 36 (1987) 1601-1617
Critical test of first order theories for electron transfer in collisions between multi-charged ions and atomic hydrogen:
The boundary condition problem
A^{z+} + H -> $A^{(z-1)+}$(nl) + H^+ (A=H, He, Li, Be, B, C)
1st Born with/without correct boundary condition
20 - 300 keV/amu
(nl) distribution and total cross section

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87T 4 Belkic,D. Taylor,H.S.
Phys. Rev. A 35 (1987) 1991-2006
First-order theory for charge exchange with correct boundary conditions: general results for hydrogen like and multielectron target atoms
$^4He^{2+}$ + Li -> He^+(nlm) + $Li^+(1s^{-1}/2s^{-1})$
first Born with correct boundary condition
62.5-625 keV/amu
general theory

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Electron capture in low and intermediate energy collisions between completely stripped light ions and metastable H(2s) targets
A^{Z+} + H(2s) -> $A^{(Z-1)+}$ (A =H, He, Li, C)
MO with ETF , LZ, CTMC
0.06-0.5 keV/amu
total cross sections

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87T 7 Borondo,F. Martin,F. Yanez,M.
Phys. Rev. A 35 (1987) 60 - 65
Molecular treatment of the ion-pair formation reaction in H(1s) + H(1s) collision
H(1s) + H(1s) -> H^+ + $H^-(1s^2)$
MO
0.25 - 9.00 keV/amu

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87T 8 Cooper,I.L. Dickinson,A.S. Sur,S.K. Ta,C.T.
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Ab initio studies of collision between Li^+ ions
Li^+ + Li^+ -> $Li^{2+}(1s)$ + $Li(1s^22s;1s^22p)$
1.4 - 13 keV/amu

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87T10 Crothers,D.S.F. Dunseath,K.M.
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Target continuum distorted-wave theory for capture of innershell electron by fully stripped ions
H^+ + B -> H + $B^+(K^{-1})$ (B=C, Ne, Ar)
Target continuum distorted-wave, CDW
10^2 - $2x10^3$(C); $3x10^2$ - $6x10^3$ (Ne); 10^3 - $2X10^4$ (Ar) keV/amu
K-shell electron transfer cross sections

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87T 9 Crothers,D.S.F. McCarroll,R.
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Correlated continuum distorted-wave resonant double electron capture in He^{2+} - He collisions
He^{2+} + He -> He + He^{2+}
CDW
125 -350 keV/amu

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87T59 Deco,E.R. Rivarola,R.D.
J.Phys.B 20 (1987) 3853 - 3865
Relativistic electron capture in ion-atom collisions.
H^+ + H(1s) -> H(1s) + H^+ : C^{6+},Ne^{10+},Ar^{18+} + B -> C^{5+},Ne^{9+},Ar^{17+} (B = 15 - 92)
CDW model
$5x10^4$ - 10^8 keV/amu
K-K-electron transfer cross sections.

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87T12 Deco,G.R. and Rivarola,R.D.
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Relativistic continuum distorted-wave model for arbitrary initial and final shells -electron capture in ion-atom collisions
A^{z} + B -> $A^{(z-1)+}$ + B^{+} (A=C, Ne, Ar; B=12-92)
relativistic CDW
10^{6} keV/amu

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87T11 Deco,G.R. Rivarola,R.D.
J. Phys. B 20 (1987) 317-324
A theoretical model for charge transfer at relativistic energies
H^{+} + H(1s) -> H(1s)+ H^{+}; H^{+} + B^{4+}(1s) -> H(1s) + B^{5+}
Symmetric eikonal theory
5 x 10^{5} - 10^{8} keV/amu
Analytic expression for K-K transfer

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87T13 Deco,G.R. Rivarola,R.D.
Nucl.Instr.Meth.in Phys.Res.B 28 (1987) 154-156
On spin flip charge exchange in relativistic ion-atom collisions
CDW
K-K transfer cross sections equivalence between second Born and CDW for spin-flip asymptotic form at relativistic energies

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Com.At.Mol.Phys 21 (1987) 1 - 13
Electron capture and the long range of the Coulomb interaction.
a review

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J.Phys.B. 20 (1987) L499 - 502
Electron capture to Rydberg and low-lying continuum states.
O^{8+} + He -> O^{7+}(n = 2 - 10) + He^{+}
CDW
50 - 125 keV/amu
A^{Z+} + He (A = 1 - 6) at 800 - 1200 keV/amu

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87T14 Eichler,J.
Phys.Rev.A 35 (1987) 3248-3255
Theory of relativistic charge exchange with Coulomb boundary conditions
H^{+} + H -> H(1s) + H^{+}: Ne^{10+} + B -> Ne^{9+}(1s)+ $B^{+}(K^{-1})$ (B = Al - U)
relativistic first-order Born with Coulomb boundary condition
10^{4} - 10^{6} keV/amu (H^{+}); 10^{6} keV/amu (Ne^{10+})

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87T16 Ermolaev,A.M. Hewitt,R.N. McDowell,M.R.C.
J.Phys.B 20 (1987) 3125-3155
Quantal and classical calculations of He^{2+} + Li interactions at intermediate energies: I charge transfer
He^{2+} + Li($1s^{2}2s$) -> He^{+}(nl) + Li^{+}($1s^{2}$) (n=2,3,4,5,6)
He^{2+} + Li^{+}($1s^{2+}$) -> He^{+}(nl) + Li^{+}(1s) (nl = 1s,2s,3p,3s)
close coupled AO and CTMC
2-100 keV/amu

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87T15 Ermolaev,A.M. McDowell,M.R.C
J.Phys.B 20 (1987) L379-383
Quantal and classical calculations of interactions between p and Li^{2+} ions in the proton energy range from 17.5 keV to 3.0 MeV
H^{+} + Li^{2+} (1s) -> H(nlm) + Li^{3+} ; H^{+} + Li^{3+} ; H^{+} + Li^{2+}(nl)
close coupled AO , CTMC
17.5-3x10^{3} keV/amu

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87T17 Errea,L.F. Gomez-Llorente,J.M. Mendez,L. Riera,A.
J.Phys.B 20 (1987) 6089-6103
Convergence study of He^{2+} + H and He^{+} + H^{+} charge exchange cross sections using a molecular approach within an optimized common translation factor
He^{2+} + H -> He^{+} (total, 2s,2p,3s,3p,3d); He^{+} + H^{+} -> He^{2+} + H(total,1s)
MO with translation factor

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87T18 Errea,L.F. Gomez-Lloreute,J.M. Mendez,L. Riera,A.
Phys.Rev.A 35 (1987) 4060-4067
Practical criterion for the determination of translation factors III. a common translation factor with optimized asymptotic form
He^{2+} + H(1s) -> He^{+}(2s,2p) + H^{+}
5keV/amu

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87T19 Freire,F.L. Montenegro,E.C.
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On the calculation of the electron capture within the strong potential Born approximation
Strong potential Born approx.
analytical expressions for high energy limit

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87T20 Fritsch,W. Lin,C.D.
Phys.Letters A 123 (1987) 128-131
Two electron description of electron transfer in He^{+} + He^{+} collision
He^{+} + He^{+} -> He(all ,^{3}S) + He^{2+}
AO
3-80 keV/amu
significant contribution from ^{3}S state

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87T21 Gargaud,M. McCarroll,R. Valiron,P.
J.Phys.B 20 (1987) 1555-1564
Influence of rotational coupling on charge transfer in low-energy C^{4+}/H collisions
C^{4+} + H -> C^{3+}(3l), C^{3+} (total) + H^{+}
MO with translation effect + radial/rotational coupling
$9x10^{-4}$ - 1.178 keV/amu

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87T22 Gayet,R. Salin,A.
J.Phys.B 20 (1987) L 571-576
Simultaneous capture and ionization by fast ion impact on helium
A^{Z+} + He -> $A^{(Z-1)+}$ + He^{+} ; $A^{(Z-1)+}$ + He^{2+} + e (A = H,He,Li,O)
CDW
400 - 1500 keV/amu

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87T23 Gazdy,B. Micha,D.A.
Phys.Rev.A 36 (1987) 546-556
Electron transfer and spin-flip processes in atom-atom collisions from variationally improved time-dependent Hartree-Fock results
He^{2+} + He -> He^{2+} + He(elastic); He + He^{2+} ; He^{+} + He^{+}:
He^{+}(l) + He^{+}(l) -> He^{+}(l) + He^{+}(l)(elastic); He^{+}(l) + He^{+}(l)
time dependent Hartree-Fock
7.5-25 keV/amu
Impuct paramater dependence of pribabilities

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87T24 Ghosh,M. Mandal,C.R. Mukherjee,S.C.
Phys.Rev.A 35 (1987) 2815-2820
Charge transfer cross sections for asymmetric collisions of protons with carbon,nitrogen,oxgen,neon and argon
$H^+ + B \rightarrow H + B^+(K^-)$ (B=C,N,O,Ne,Ar)
DW with peaking-impulse approximation
150-20000 keV/amu

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87T25 Ghosh,M. Mandal,C.R. Mukherjee,S.C.
Phys.Rev.A 35 (1987) 5259-5261
Double electron capture from helium by ions of helium, carbon and oxygen
$A^{Z+} + He \rightarrow A^{(Z-2)+} + He^{2+}$ (A=He,Li,C,O)
CDW,continuum Intermediate State (CIS) approx.
125-500 keV/amu (He); 160-400 keV/amu (Li); 10^3-$2x10^3$ keV/amu (C); $1.88x10^3$-$2.6x10^3$ keV/amu (O)

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87T26 Graham,W.G. Bernstein,E.M. Clark,M.W. Tanis,J.A.
Phys.Letters A 125 (1987) 134-136
Predicted electron-correlation effects in U^{89+} collisions with light targets at GeV energies
$U^{89+} + B \rightarrow U^{88+}$ ($B=H_2$,C)
10^4-$2x10^4$ keV/amu
Non-radiative direct capture, REC, RTE

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87T27 Heil,T.G. Sharma,J.B.
Phys.Rev.A 36 (1987) 3669-3673
Differential cross sections for the charge transfer reaction O^{2+} + He -> O^+ + He^+ at low energies
$O^{2+} + He \rightarrow O^+(2p^3\ {}^2P,{}^2D) + He^+$
PSS
$3x10^{-4}$-0.03 keV/amu
Differential cross sections

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87T28 Henne,A. Ludde,H.J Toepfer,A. Dreizler,R.M.
Phys.Letters A 124 (1987) 508-509
Atomic basis calculations for the two-electron system Li^{2+}-H
$Li^{2+} + H \rightarrow Li^+ + H^+$
AO
1-36 keV/amu

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87T29 Hino,K. Watanabe,T.
Phys.Rev.A 36 (1987) 581-590
Cross sections of relativistic radiative electron capture by use of the strong-potential Born calculation
Xe^{54+} + Be; U^{92+} + Be
Relativistic strong-potential Born approx.
$197x10^3$ keV/amu (Xe); $4.22x10^3$ keV/amu (U)
Angular distribution

36
87T30 Hino,K. Watanabe,T.
Phys.Rev.A 36 (1987) 5862-5865
Angular-distribution and linear polarization correlation of photons induced by the relativistic radiative electron capture process
Born approx.
REC into K and L shells ; angular distribution

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87T31 Hsin,S.H. Lieber,M.
Phys.Rev.A 35 (1987) 4833-4835
Third-Born-approximation effects in electron capture
$H^+ + H \rightarrow H + H^+$
Strong potential Born approximation;DWBA
10^3-2×10^5 keV/amu
Angular distribution

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87T69 Ivakin, I.A. Karbovanets, M.I. Ostrovskii, V.N.
Opt.Sectrosc.(USSR) 63 (1987) 288 - 292
Charge exchange with ion excitation : asymptotic theory.
$He^+ + Cd \rightarrow He + Cd^{+*}$; $Ne^+ + Hg \rightarrow Ne + Mg^{+*}$
Semiclassial method
rate coefficients at thermal energies

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87T32 Jain,A. Lin,C.D. Fritsch,W.
Phys.Rev.A 35 (1987) 3180-3182
Density matrix for the H(n=3) atoms formed in electron capture process of H^+ - helium collisions at 25-100 keV
$H^+ + He \rightarrow H(n=3)$
Two-centered AO close-coupling expansion method
Density matrix ; time lag of electron after capture into n=3

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87T33 Jain,A. Lin,C.D. Fritsch,W.
Phys.Rev.A 36 (1987) 2041-2055
Density matrices of the excited H(n=2 and 3) atoms formed in 25-100 keV proton-helium charge transfer collisions
$H^+ + He \rightarrow H(n=2,3) + He^+$
Ab initio calculation
25-100 keV/amu
Capture cross sections for 1s,2s,2p,3s,3p and 3d

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87T34 Jakubassa-Amundsen,D.H.
J.Phys.B 20 (1987) L 705-709
Distorted-wave Born theory for electron capture during resonant nuclear scattering
$H^+ + C \rightarrow H + C^+(K^{-1})$
DWBA
10^3 keV/amu
Probabilities as a function of scattering angle

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87T35 Jakubassa-Amundsen,D.H.
J.Phys.B 20 (1987) 325-336
On the applicability of the impulse approximation for radiative electron capture into bound and continuum states
$A^{Z+} + He \rightarrow A^{(Z-1)+}$ (A=C,Ne)
Impulse approximation / strong potential Born approximation
Differential cross section

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87T62 Johnson, C.A.F. Parker, J.E.
Chem.Phys. 111 (1987) 307 - 312
The charge transfer reactions of protons with carbon dioxide; a two-state treatment.
$H^+ + CO_2 \rightarrow H + CO_2^+$
two-state model (Stueckelberg-Demkov)
0.1 - 5.0 keV/amu
relative branching ratios for CO_2^+,CO^+,O^+,C^+.

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87T36 Kartoshkikn,V.A.
JETP Letters 45 (1987) 154-156
Isotope effect in charge exchange of He^+ ions with helium atoms
$^3He + ^3He^+ ; ^4He^+ \rightarrow ^3He^+ + ^3He ; ^4He$
Rate constant at 300K (->10% Difference)

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87T37 Kimura,M. Lane,N.F.
Phys.Rev. 35 (1987) 70-78
Travelling-molecular-orbital-expansion studies of electron capture in collisions of fully stripped ions (Z=6-9) with H and He
A^{Z+} + H,He -> $A^{(Z-1)+}$ (n) (A=C,N,O,F)
Travelling MO
0.1-10 keV/amu

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87T61 Kimura,M. Lin,C.D.
Comm.At.Mol.Phys. 20 (1987) 35 - 49
A unified atomic-orbital and molecular-orbital matching method for ion-atom and atom-atom collisions.

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87T38 Lin,C.D. Macek,J.H.
Phys.Rev.A 35 (1987) 5005-5011
Theory of anisotropy transfer and calculations of alignment of np states populated in electron capture by highly charged ions
O^{8+} + He -> O^{7+}(Lyman alpha); Ne^{9+} + H_2 -> Ne^{8+} (Lyman alpha)
300 - 2200 keV/amu (O) ; 4 keV/amu (Ne)

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87T39 McGuire,J.H. Deb,N.C. Sil,N.C. Taulbjerg,K
Phys.Rev.A 35 (1987) 4830-4832
Third-Born-approximation calculation of electron capture
H^+ + H -> H + H^+
Symmetrized strong potential Born approximation with third Born term
10^3 - $2x10^5$ keV/amu
Angular distribution

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87T40 McKenzie,M.L. Olson,R.E
Phys.Rev.A 35 (1987) 2863-2868
Ionization and charge exchange in multiply charged ion-helium collisions at intermediate energies
A^{q+} + He -> $A^{(q-1)+}$ + He^+ ; A^{q+} + He^+ + e ; $A^{(q-2)+}$ + He^{2+} ;
A^{q+} + He^{2+} + 2e ; $A^{(q-1)+}$ + He^{2+} + e (q = 1 - 100)
Classical trajectory Monte Carlo method
1000 - 5000 keV/amu
Scaling law for q and E

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87T63 Mercier, E. Chamband, G.
J.Phys.B. 20 (1987) 4659 - 4671
Quasidiabatic potential energies and electronic couplings for $(ArH)^{++}$; mechanisms and threshold of excited hydrogen formation in low-energy collisions.
Ar^+ + H -> $Ar^*(3P^5 3d)$ + H^+
$2.5x10^{-4}$ keV/amu
potential energies and coupling; no cross sections given;
cross sections for Ar^+ + $H^*(2p\pi)$ process.

51
87T41 Moiseiwitsch,B.L.
J.Phys.B. 20 (1987) L 171-174
Symmetric eikonal approximation for electron capture at relativistic energies
$H^+ + B^{5+}$ -> H(1s) + B^{4+}(1s); A^{Z+} + H(1s) -> $A^{(Z-1)+}$(1s) (Z = 13 - 92)
Relativistic eikonal approximation
$5x10^5 - 10^8$ keV/amu

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87T42 Moiseiwitsch,B.L.
J.Phys.B 20 (1987) 4111-4114
Relativistic eikonal phase factors for electron capture
Relativistic eikonal approximation
Formalism

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87T43 Neufeld,D.A. Dalgarno,A.
Phys.Rev.A 35 (1987) 3142-3144
Charge transfer in collisions of doubly charged ions of iron and nickel with hydrogen atoms
Fe^{2+} ; Ni^{2+} + H -> Fe^+ ; Ni^+
Landau-Zener approximation
10^3 - 10^5 K rate coefficients Fe^{2+} -> Fe^+ (ground state);preferential.
Ni^{2+} -> Ni^+ (excited state) ; preferential.

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87T64 Nikitin, E.E. Reznikov, A.I. Umanskii, S.Y.
Sov.Phys.-JETP 64 (1987) 937
Two-level model of charge exchange with coulomb interaction in one of the channels; quantum and quasiclassical cross sections in the weak-coupling limit.
Ar^{2+} + He

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87T44 Ohyama-Yamaguchi,T
J.Phys.Soc.Japan 56 (1987) 1693-1702
Double-and single-charge transfer in collision of C^{6+} ion with He atom at low impact energies
C^{6+} + He -> C^{5+} + He^+ ; C^{4+} + He^{2+}
PSS with impact parameter approximation
0.1 - 10 keV/amu
Sigma (6,4) = 0.1 x sigma (6,5)

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87T45 Pacher,M.C. Gonzalez,A.D. Miraglia,J.E.
Phys.Rev.A 35 (1987) 4108-4113
Retardation effects in radiative electron capture
Xe^{54+} e -> Xe^{53+}(1s) + hv; H^+ + H(1s) -> H(1s) + H^+ + hv
$5.6x10^3$ - $5.1x10^4$ keV/amu
Retarding effects at high impact energy;total, double, triple differential cross sections

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87T46 Reinhold,C.O. Miraglia,J.E.
J.Phys.B 20 (1987) 541-549
Electron capture from H(2s) by protons at intermediate energies
H^+ + H(2s) -> H(n=1,2,3) + H^+
A close-coupling with ETF,classical trajectory Monte Carlo method
1-200 keV/amu

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87T47 Roberts,M.J.
J.Phys.B 20 (1987) 551-564
A comparative study of the second-order Born and Faddeev-Watson approximation:II charge transfer
$H^+ + He(1s^2) \rightarrow H(1s) + He^+(1s)$
Second Born approximation,Faddeev-Watson approximation
2820 - 20000 keV/amu
Angular differential cross sections

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87T48 Saha,G.C Datta,S. and Mukherjee,S.C.
Phys.Rev.A 36 (1987) 1656-1662
Charge transfer in collisions of atomic hydrogen with N^{7+} ions in the high energy region
$N^{7+} + H(1s) \rightarrow N^{6+}(nlm) + H^+$
CDW
710-2857 keV/amu
Arbitrary (nlm) -> arbitratry (n'l'm') transfer

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87T49 Shimakura,N. Sato,H. Kimura,M. Watanabe,T.
J.Phys.B 20 (1987) 1801-1810
Electron capture processes in collisions of O^{6+} with He using the travelling molecular orbital method
$O^{6+} + He \rightarrow O^{5+}(n,l) + He^+$
MO expansion method with ETF
0.14 - 7 keV/amu
(n,l) partial cross sections

61
87T51 Shingal,R. Bransden, B.H. Flower,D.R.
J.Phys.B 20 (1987) L 477 - 480
Formation of H(2s) and H(2p) in collisions between ground state hydorogen atoms
H(1s) + H(1s) -> H(1s) + H(2s,2p)
travelling AO model
1-100 keV/amu

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87T52 Shingal,R. Bransden,B.H.
J.Phys.B 20 (1987) L 533 - 535
Mutual neutralization in $H^+ + H^-$ collisions
$H^+ + H^- \rightarrow H(nl) + H(1s)$
Multistate impact parameter method
8 - 50 keV/amu

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87T53 Shingal,R. Bransden,B.H.
J.Phys.B 20 (1987) 4815 - 4825
Charge transfer, target excitation and ionzation in H^+ + Na(3s) collisions
$H^+ + Na(3s) \rightarrow H^+ + Na(nl)$; $H(nl) + Na^+$
Two-center expansion with travelling atomic orbitals
0.8 - 50 keV/amu

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87T50 Shingal,R. Noble,C.J. Bransden,B.H.
J.Phys.B 20 (1987) 793 - 799
A study of charge transfer and excitation processes in collisions of alpha particles with sodium atoms
$He^{2+} + Na(3s) \rightarrow He^+(nl) + Na^+$ (nl=1s,2s,2p,3s,3p,3d,4s,4p,4d,4f)
coupled state impact parameter method
2.5 - 67.5 keV/amu
Preferential capture into $He^+(3l)$ at low energy (<30 keV)

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87T54 Tan,J. Lin,C.D. Kimura,M.
J.Phys.B 20 (1987) L 91 -97
A quantal study of differential cross sections for double charge transfer in C^{4+} - He collisions
C^{4+} + He -> C^{2+}
Quantal two-channel MO close-coupling expansion method
0.04 - 0.13 keV/amu
Angular differential cross sections

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87T65 Tiwari, Y.N. Roy, D.N.
Ind.J.Pure Appl.Phys 25 (1987) 323 - 327
Electron capture cross sections in proton-lithium atom collisions.
H^{+} + Li -> H + Li^{+}

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87T55 Toshima,N. Ishihara,T. Eichler,J.
Phys.Rev.A 36 (1987) 2659 - 2666
Distorted-wave theories for electron capture and the associated high energy behavior of cross sections
H^{+} + He -> H^{0} + He^{+}
DW with Coulomb boundary conditions
50 - 10^{4} keV/amu

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87T56 Winter,T.G.
Phys.Rev.A 35 (1987) 3799 - 3809
Electron transfer and ionization in collisions between protons and the ions He^{+}, Li^{2+}, Be^{3+}, B^{4} and C^{5+} studied with the use of a Sturmian basis
H^{+} + $B^{(Z-1)+}$ -> H(1s,total) + B^{Z+} ; H^{+} + $B^{(Z+1)+}$ + e (B = He, Li, Be, B, C)
Coupled-Sturmian-pseudo state approach
75 - 937 keV/amu (B) ; 150 - 600 (C) ; 17.5 - 150 (He) ;
17.5 - 200 (Li) ; 50 - 400 (Be)

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Phys.Rev.A 36 (1987) 625 - 640
Differential cross sections for electron transfer and elastic scattering in collisions between alpha particles and hydrogen atoms
He^{2+} + H -> He^{+} + H^{+} ; He^{2+} + H(elastic)
MO
1 - 70 keV/amu
Angular distribution

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Phys.Rev.A 38 (1988) 3124 - 3127
Strong-potential Born-approximation electron capture cross sections for realistic atomic potentials
$H^+ + B \to H + B^+(K^{-1})$ (B = C,Ar)
strong-potential Born approx
150 - 2500 keV/amu(C); 1500 - 20000 keV/amu(Ar)

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Further contributions of the Thomas double-scattering mechanism to electron capture in the second Born approximation
$H^+ + H(1s),He(1s^2) \to H(1s) + H^+,He^+$
multiple-peaking approx., linearized-propagator approx.
10^2 - 5×10^4 keV/amu

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88T67 Ast, H. Lüddle, H.J. Dreizler, R.M.
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Optical potentials in ion-atom collisions I. Results for one-electron systems.
$H^+ + H \to H$; $He^{2+} + H \to He^+$; $Li^{3+} + H \to Li^{2+}$
$H^+ + He^+ \to H$; $H^+ + Li^{2+} \to H$
1 - 10^4 keV/amu
also ionization and excitation cross sections given

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J.Phys.B 21 (1988) 1403 - 1410
Introduction of short-range interactions in continuum distorted-wave theory of electron capture for ion-atom collisions
$H^+ + Ne(2s,2p^0,2p^1) \to H(1s) + Ne^+$
CDW
10^2 = 3×10^2 keV/amu

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A comparison between theoretical and experimental state-to-state charge transfer cross sections for $H^+ + H_2$ at 20 keV : Evidence for quantum effects
$H^+ + H_2(v=0) \to H + H_2^{+*}(v_f)$
infinite order sudden approx
2×10^{-2} keV/amu

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88T 5 Belkic, D.
Phys.Rev.A 37 (1988) 55 - 67
Electron capture by fast protons from helium, nitrogen and oxygen : the corrected first Born approximation
$H^+ + B \to H + B^+(K^{-1})$ (B = He,N,O)
corrected first Born approximation
50 - 5×10^4 keV/amu
K-electron capture

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J.Phys.B 21 (1988) 111 - 118
High energy electron capture by fully stripped ions from He atoms - a QED approach
$Li^{3+} + He \to Li^{2+} + He^+$; $Li^{2+} + He^{2+} + e$
second-order S-matrix method
10^2 - 10^3 keV/amu

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88T 7 Blanco, S.A. Piancetini, R.D.
J.Phys.B 21 (1988) L49 - 52
Charge exchange between H^+ and H(n=2) at low collision energies
H^+ + H(2s,$2p_0$,$2p_\pm$) -> H(total,2s,$2p_0$,$2p_{\pm 1}$)
OEDM
0.06 - 2.25 keV/amu
dominant contribution from resonance reactions

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88T 8 Boudjema, M. Benoit-Catin, P. Bordenave-Montesquieu, A. Gleizes, A.
J.Phys.B 21 (1988) 1603 - 1615
State-selective one-electron capture by multiply charged ions, investigated with a modified multichannel Landau-Zener model
$Ar^{8+}(2p^6)$ + He,Ne,Ar,Xe -> $Ar^{7+}(2p^6nl$:n=4-6)
$Ar^{8+}(2p^53s\ ^3P)$ + D_2,He,Ar,Xe -> $Ar^{6+}(2p^53snl$:n=4-6)
$N^{5+}(1s2s\ ^3S)$ + He -> N^{4+}(1s2s3l); $C^{4+}(1s2s^3S)$ + H_2 -> C^{3+}(1s2s3l)
modified multichannel Landau-Zener model
2.5×10^{-3} - 6.25 keV/amu

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J.Phys.B. 21 (1988) 1209 - 1217
Proton and alpha particle impact transfer ionization cross sections for He and Li
H^+ + B -> H + B^+; He^{2+} + B -> He^+ + B^+ (B = He,Li)
BEA
50 - 10^3 keV/amu(H^+); 125 - 750 keV/amu(He^{2+})
two successive collision-ionization in first and capture in second encounter

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88T10 Deb, N.C
Phys.Rev.A 38 (1988) 1202 - 1206
Evaluation of nlm -> n'l'm' capture amplitude in the target continuum distorted-wave theory
CDW

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Electron capture in the target following e^- - e^+ pair production in the simultaneous presence of the fields of the projectile and of the target
A^{Z+} + B^{40+} -> A^{Z+} + B^{39+} + e^+
CDW
energy spectra of ejected e^+ at relativistic collision energies

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Electron capture in collisions between bare heavy ions at ultrarelativistic impact energies
H^+ + H^+,U^{92+} -> H(1s) + H^+,U^{92+} + e^+
U^{92+} + U^{92+} -> U^{91+}(1s) + U^{92+} + e^+
PWBA
distribution of emitted positrons at gamma= 10,100

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88T13 Dewangan, D.P. Bransden, B.H.
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The boundary-corrected second Born (B2B) approximation : proton-hydrogen electron capture
H^+ + H -> H + H^+
B2B
125 keV/amu
angular distribution

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The first-corrected Born and target continuum distorted theories of electron capture : a comparison of differential and total cross sections
$H^+ + B \rightarrow H + B^+(K^{-1})$ (B = N,O,Ar)
200 - 6000 keV/amu(N,O) : 6000 keV/amu(Ar)
angle-differential cross sections for Ar

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88T15 Ermolaev, A.M.
J.Phys.B 21 (1988) 81 - 101
Neutralization and detachment in collisions between protons and negative hydrogen ions in the proton energy range from 0.62 to 80.0 keV
$H^+ + H^- \rightarrow$ H(total,1s,2s,2p,3s,3p,3d,4s,4p,4d) + H
semi-classical impact parameter approx.
0.62 - 80 keV/amu
also direct ionization and capture into projectile continuum
in $H^+ + H^- \rightarrow H^+ + H + e$

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J.Phys.B 21 (1988) 3941 - 3948
Total and differential cross sections for charge transfer in He^{2+} - He^+ collisions : trajectory effects
$He^{2+} + He^+ \rightarrow He^+ + He^{2+}$
AO
0.21 - 2.5 keV/amu (c.m.)
$\theta = 0 - 13^0$

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88T19 Fritsch, W.
Phys.Rev.A 38 (1988) 2664 - 2666
Calculation of partial electron-transfer cross sections in 1 - 84 keV/amu He^{2+} + H collions
$He^{2+} + H \rightarrow He^+(nl) + H^+$ (N = 2,3,4,5,6)
AD model
1 - 84 keV/amu

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88T18 Fritsch, W. Lin, C.D.
Phys.Rev.Letters 61 (1988) 690 - 693
Analysis of electron correlation in simultaneous electron transfer and excitation in atomic collision
$He^+ + H \rightarrow He^{**}(2l,2l') + H^+$
close-coupling AO method
20 - 150 keV/amu
transfer excitation impact parameter dependence

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88T17 Fritsch, W. Lin, C.D.
Phys.Letters A 127 (1988) 425 - 426
Comment on atomic basis calculations for two electron system Li^{2+} - H
$Li^{2+} + H \rightarrow Li^+ + H^+$
AO expansion method
1 - 40 keV/amu
total cross sections only

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88T20 Gao, R.S. Johnson, L.K. Schafer, D.A. Newman, J.H. Smith, K.A. Stebbings, R.F.
Phys.Rev.A 38 (1988) 2789 - 2793
Absolute differential cross sections for small-angle He^+ - He elastic and charge transfer scattering at keV energies
$He^+ + He \rightarrow He^+ + He$; $He + He^+$
0.06 - 1.25 keV/amu
$\theta = 0.04 - 1^0$. Integrated cross sections given

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J.Phys.B 21 (1988) 513 - 520
Charge transfer in low-energy O^{4+}-H and Si^{4+}-H collisions
O^{4+} + H -> O^{3+}(3s,3p,total); Si^{4+} + H -> Si^{3+}(3d,4s,total)
molecular model with ETF
10^{-3} - 1 keV/amu
significant core effect in even total cross sections

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J.Phys.B 21 (1988) 521 - 532
Charge transfer in low-energy Al^{3+}-H and Ti^{4+}-H collisions : effect of rotational coupling in three-state crossings
Al^{3+} + H -> Al^{2+}(3s,3p,4s,4p,total); Ti^{4+} + H -> Ti^{3+}(3s,3p,4s,4p,total)
MO with translation factor
$0.8x10^{-3}$ - 1.1 keV/amu

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Phys.Rev.A 38 (1988) 2284 - 2289
Electron detachment in low-energy $H^-(D^-)$-Na collisions
H^- + Na -> H + Na^-
effective range approx.
0.01 - 0.25 keV/amu

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Phys.Rev.A 38 (1988) 5034 - 5037
Electron capture in asymmetric collisions
H^+ + B -> H + $B^+(K^{-1})$ (B = H,O,Ne,Ar)
Impulse Approx.(IA), semigeneralized IA, eikonal IA, peaking IA, CDW, eikonal peaking IA
15 - 200(H); 150 - 4000(O); 200 - 5000(Ne); 1500 - 15000(Ar) keV/amu

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Excited impurity species and plasma transport
A^{q+} + $B^{r+}(n)$ -> $A^{(q-1)+}(n')$ + $B^{(r+1)+}$
classical-over barrier model

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Chem.Phys. 124 (1988) 187 - 204
Model potentials and related diabatic state for the H^+ + O_2 collisional system
H^+ + O_2
effective model-potential approach
potential curves for $(HO_2)^+$ molecular system

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88T27 Grozdanov, T.P. Kritic, P.S.
Phys.Scripta 38 (1988) 32 - 36
On a first order theory for charge exchange with Coulomb boundary conditions
H^+ + $B^{(Z-1)+}$ -> H + B^{Z+} (B = He,Li,Be,B,C)
first order Coulomb Born approx.
$(0.5-20)x25xZ^2$ keV/amu
analytical form for impact parameter dependence for K-K electron transfer

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J.Phys.B 21 (1988) 2459 - 2471
Electron capture in highly charged ion collisions and a theoretical analysis of the energy-gain spectrum
Ar^{6+} + D(1s) -> Ar^{5+}(4s,4p,4d,4f,5s,5p,5d,5f,5g) + D^+
2σ state AO

0.1 keV/amu

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88T30 Harel, C. Jouin, H.
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Electron capture by slow multicharged ions : core effect on final l distribution
$C^{4+}, N^{5+}, O^{6+}, O^{8+}, Ne^{8+}, Ar^{8+}$ + H -> $C^{3+}, N^{4+}, O^{5+}, O^{7+}, Ne^{7+}, Ar^{7+}$(nl) + H^+
MO expansion with OEDM
0.25 - 20 keV/amu

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Electronic and Atomic Collisions (H.B.Gilbody, W.R.Newell, F.H.Read and A.C.H.Smith, editors, North-Holland, 1988) (1988) 631 - 642
Theory of low energy charge transfer by multiply charged ions.
A^{8+} + H -> A^{7+}(nl) [A = O,Ne,Ar]; N^{7+} + He -> N^{6+}(4l)
OEDM
~ 1 keV/amu

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Second-order singularities in transfer ionization
H^+ + He -> H + He^{2+} + e
$5x10^3, 5x10^4$ keV/amu
Thomas peak in transfer ionization

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Phys.Rev.A 37 (1988) 3399 - 3402
Contribution of excited hydrogen atoms to charge-exchange excitation of impurities in fusion plasms
C^{6+}, O^{8+} + H(n) -> C^{5+}(n'),O^{7+}(n') + H^+ (n = 2,3; n' = 4-30)
classical-trajectory Monte Carlo method
13.3 - 40 keV/amu
effective emision cross sections also given

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88T33 Janev, R.K. Krstic, P.S.
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Dynamics of transfer-ionization processes in slow collisions of multi charged ions with atoms
General two electron transfer processes

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Single-and double-electron capture in He^{2+} + He collisions and single-electron capture in He^{2+} + He^+ collisions
He^{2+} + He -> He^+ + He^+(total); He + He^{2+} : He^+ + He^+ -> He^{2+}
travelling MO

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88T35 Koike, F.
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Continuous energy state model for charge transfer in collisions of fully stripped ions with hydrogen atoms
O^{8+} + H -> O^{7+}(total); Si^{14+} + H -> Si^{13+}(nl)
continuous energy state model
1 - 10^3 keV/amu

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88T36 Macek, J.
Phys.Rev.A 37 (1988) 1661
Perturbation approximation for scattering amplitudes in ion-atom collisions
general theory for perturbation expansion with Coulomb potential

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Phys.Rev.A 38 (1988) 3327 - 3332
Differential cross sections for electron capture : a comparison of three approximation
$H^+ + H(1s) \rightarrow H(1s) + H^+$
strong potential Born approx.; impulse approx.
$5x10^3, 10^4$ keV/amu
angular distribution of H(1s). closed forms given

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88T38 Maidagan, J.M.
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First-order calculation in charge transfer at large scattering angles
$H^+ + Ne \rightarrow H + Ne^+$
750 keV/amu
scattering angle : 0 - 180^0

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K-shell vacancy production in asymmetric collisions
$A^Z + B \rightarrow A^{(Z-1)+} + B^+(K^{-1})$ (A = H,He,Li: B = C,O,Ne)
CDW-eikonal initial state approximation
500 - 5000 keV/amu
also ionization cross section given

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A reaction window in double charge transfer mass spectroscopy
double electron transfer
Landau-Zener model

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Electron capture at high velocities
Strong potential Born approx.

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Phys.Rev.A 38 (1988) 3333 - 3338
Shake-over probability for electron capture
Shake-orver process in two electron capture
first Born approx.
asymptotic energy region

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Phys.Rev.A 37 (1988) 3587 - 3589
K-shell resonant-transfer-excitation cross sections for S^{13+} and Ca^{17+}
$Si^{13+} + He \rightarrow Si^{12+}(K^{-1})$; $Ca^{17+} + H_2,He \rightarrow Ca^{16+}(K^{-1})$
Impulse approx.
$1.56x10^3$ - $7.8x10^3$ keV/amu(S); $3.5x10^3$ - $8x10^3$ keV/amu(Ca)
dielectronic recombination cross section averaged over the momentum distribution

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88T44 McLaughlin, D.J. Hohn, Y.
Phys.Rev.A 38 (1988) 531 - 534
Cascade theory for double KX-ray emission in transfer and excitation collisions
$S^{15+} + H_2 \rightarrow S^{14++} \rightarrow S^{14+} + 2xhV$
$2.2x10^3$ - $5.9x10^3$ keV/amu
K_α-K_α, K_α-K_β, K_α-K_γ coincidence

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88T45 Miraglia, J.E. Gayet, R. Salin, A.

Europhys.Letters 6 (1988) 397 - 402
Radiative electron capture by ions channelled in crystals
O^{8+} + Ag -> O^{7+}(1s) + $Ag^{+}(N^{-1})$ + hV(REC)
$2.2X10^{3}$ keV/amu
REC comes mainly from N-shell electrons but not from valence electrons

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88T46 Mizushima, M.
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A note on the cross sections of the symmetric charge transfer between uranium ions
U^{+} + U -> U + U^{+}
time development operator formalism
$4x10^{-4}$ keV/amu
transfer of 6d,7s electrons

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88T47 Mo, O. Riera, A.
J.Phys.B 21 (1988) 119 - 124
Excitation and charge exchange in He^{+} + Na collisions
He^{+} + Na -> He(total)
two-state MO with common translation factor
$5x10^{-2}$ - 10 keV/amu
also He^{+} + Na(3s) -> He^{+} + Na(3p) excitation cross sections

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Relativistic second-order OBK approximation for electron capture
H^{+} + H(1s) -> H(1s) : Ne^{10+} + B -> Ne^{9+}(1s) + $B(K^{-1})$
(B = Al,Zn,Ag,Ta,U)
relastivistic second-order OBK
10^{5} - $5x10^{7}$ keV/amu

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Theoretical total cross section and branching ratio for $Kr^{+}(^{2}P_{3/2},^{2}P_{1/2})$ ions produced in low-energy charge exchange collisions of $Kr^{2+}(^{1}S_{0})$ with $He(^{1}S_{0})$
$Kr^{2+}(^{1}S_{0})$ + $He(^{1}S_{0})$ -> $Kr^{+}(^{2}P_{3/2},^{2}P_{1/2})$ + $He^{+}(^{2}S_{1/2})$
asymptotic approach
$1x10^{-6}$ - $2.4x10^{-5}$ keV/amu

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88T50 Opradolce, L. Benmeuraien, L. McCarroll, R. Piancetini, R.D.
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State-selective electron capture in slow C^{3+} - H collisions
C^{3+} + H -> C^{2+}(3s,3p,total)
molecular model with ETF
0.125 - 5 keV/amu

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Hidden crossings in ion-atom collisions.
review

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88T51 Reinhold, C.O. Falcon, C.A.
J.Phys.B 21 (1988) 2473 - 2483
Classical charge transfer and ionization cross sections for one-and three-dimensional collision processes
A^{Z+} + H -> $A^{(Z-1)+}$ + H^{+} (A = H,He,Li,C)
H^{+} + He^{+},Li^{2+}(1s) -> H + He^{2+},Li^{3+}
classical trajectory Monte Carlo method
3 - 250 keV/amu
total cross sections. ionization cross sections also given.

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88T52 Roueff, E. Dalgarno, A.
Phys.Rev.A 38 (1988) 93 - 97
Fine-structure excitation of O^{2+} by charge transfer of O^{3+} in H at low energies
$O^{3+}(^2P_{1/2,3/2})$ + H ->
$O^{2+}(^3S_1, ^3D_3, ^3D_2, ^3D_1, ^1P_1, ^1P^0_1, ^3P^0_2, ^3P^0_1, ^3P^0_0)$
multi-state MO expansion method.
1.9×10^{-5} - 1.7×10^{-3} keV/amu
also $O^{3+}(^2P_{3/2})$ + H -> $O^{3+}(^2P_{1/2})$ + H cross sections given

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88T56 Schultz, D.R. Olson, R.E
Phys.Rev.A 38 (1988) 1866 - 1876
Single-electron-removal processes in collisions of positrons and protons with helium at intermediate velocities
H^+ + He -> H + He^+
CTMC
1 - 500 keV/amu
angular distribution; ionization cross sections by H^+ and e^+

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J.Phys.B 21 (1988) 2485 - 2496
Electron capture cross sections in Be^{3+} + H collisions using the travelling-molecular-orbital method
Be^{3+} + H(1s) -> Be^{2+}(2s,2p,3s,3p) + H^+
Travelling MO
0.39 - 6.25 keV/amu

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88T54 Shingal, R.
J.Phys.B 21 (1988) 125 - 135
Charge transfer, target excitation and ionization in Li^+ + Li collisions
Li^+ + Li(2s) -> Li(2s,2p,3s,3p,3d,total) + Li^+
multi-state semi-classical impact parameter model

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88T55 Shingal, R.
J.Phys.B 21 (1988) 2065 - 2076
Charge transfer target extitation and ionization in Be^{2+} + Li and Li^+ + Be^+ collisions
Be^{2+} + Li(2s) -> Be^+(nl) + Li^+(nl=2s,2p,3s,3p,3d)
Li^+ + Be^+(2s) -> Li(nl) + Be^{2+}(nl=2s,2p,3s,3p,3d)
multistate semi-classical impact parameter model.
1 - 90 keV/amu
also Be^{2+} + Li(2s) -> Be^{2+} + Li(2p,3s,3p,3d) and then alignment factor A_{20} ; Be^{2+} + Li -> Be^{2+} + Li^+ + e :
Li^+ + Be^+(2s) -> Li^+ + Be^+(nl) (nl=2p,3s,3p,3d) ; Li^+ + Be^{2+} + e

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Phys.Rev.A 37 (1988) 1469 - 1475
Inelastic cross sections and charge state for B,C,N, and O ions moving in metals
A^{Z+} + Al -> $A^{(Z-1)+}$; $A^{(Z-1)+}$ + Al -> A^{Z+} (A = B,C,N,O)
modified OBK
charge distributions calculated.

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88T58 Tan, J. Lin, C.D.
Phys.Rev.A 37 (1988) 1152 - 1160
Theoretical study of differential charge transfer cross sections for Ne^{4+} + He collisions at low energies
$Ne^{4+}(2p^2\ ^3P)$ + $He(1s^2)$ -> $Ne^{3+}(2p^23s\ ^2P, ^4P)$ + He^+(1s)
quantal two-channel calculation.

0.01 - 0.025 keV/amu
angular distribution

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Theoretical study of single-electron capture in He^{2+} - H^- collision
$He^{2+} + H^- \rightarrow He^+(n=4,5) + H(1s)$
OEDM model with ETF
$5x10^{-4}$ - 2.25 keV/amu

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88T60 Toshima, N. Eichler, J.
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Coupled-channels treatment of excitation and charge transfer in U^{92+} + U^{91+} collisions at 1 and 0.5 GeV/u
$U^{92+} + U^{91+} \rightarrow U^{91+}(nl) + U^{92+}$
fully-relativistic,two-center,coupled channel calculation
$5x10^5$ - 10^6 keV/amu
excitation cross sections

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Phys.Rev.A 38 (1988) 2305 - 2316
Coupled-channel theory of excitation and charge transfer in relativistic atomic collisions
$U^{92+} + U^{91+}(1s;2s) \rightarrow U^{91+}(1s;2l;3l)$; Xe^{54+} + Ag,Au -> $Xe^{53+}(1s;2l;3l)$
fully-relativistic, two-center, coupled channel theory
U ($5x10^5$ keV/amu; $8.2x10^4$) ; $1.97x10^5$ keV/amu(Xe)

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Quantal calculation of differential cross sections for H(1s) elastic scattering and H^- ion formation from interactions of H(1s) with caesium
H(1s) + Cs(6s) -> H^- + Cs; H(1s) + Cs
two-state curve-crossing model

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Photon emission processes induced by ion-atom collisions
radiative electron capture

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Triple-center treatment of electron transfer and ionization in He^{2+} - H and p-He^+ collisions
He^{2+} + H(1s) -> $He^+(total,2s,2p_0,2p_1)$: H^+ + He^+ -> H(1s,total) + He^{2+}
triple center coupled state approach
1.6 - 40 keV/amu
also ionization cross sections

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Phys.Rev.A 38 (1988) 1612 - 1615
Triple-center determination of differential cross sections for electron transfer and elastic scattering in α-H collisions
He^{2+} + H -> He^+ + H^+
Triple-center MO model
4 - 30 keV/amu
angular differential cross section for electron transfer.
also elastic scattering cross sections given.

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89T 1 Alston, S.
Nucl. Instr. Meth. in Phys. Res. B 43 (1989) 19 - 23
Faddeev approach to electron capture.
$H^+ + He,H \rightarrow H^0(1s)$
Faddeev-Watson-Lovelace formalism
$5x10^3$ keV/amu
Angular distribution of H^0

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89T 2 Altson, S.
Phys. Rev. A 40 (1989) 4907 - 4913
Closed-form expression for 1s -> 1s electron capture amplitude in second-order Faddeev approximation.
2nd-order Faddeev approx.

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89T 3 Bacchus-Montabonel, M.
Phys. Rev. A 40 (1989) 6088 - 6090
Calculated partial cross sections for the single-electron capture process in the N^{5+} + He collisions.
$N^{5+} + He \rightarrow N^{4+}(3s,3p,3d)$
semiclassical method
0.8 - 8 keV/amu

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89T 4 Badnell, N.R.
Pnys. Rev. A 40 (1989) 3579 - 3583
Fine-structure effects on resonant transfer excitation cross sections for Li-like ion collisions with H_2 and He.
$S^{13+},Ca^{17+},Ti^{19+},V^{20+},Ni^{25+},Ge^{29+} + B \rightarrow$
$S^{12+},Ca^{16+},Ti^{18+},V^{19+},Ni^{24+},Ge^{28+} + h\nu$ ($B = H_2,He$)
Impulse approx.(intermediate coupling; LS-coupling)

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89T 5 Baer, M. Niedner-Schatteburg, G. Toennies, J.P.
J. Chem. Phys. 91 (1989) 4169 - 4182
A three-dimentional quantum mechanical study of vibrationally resolved charge transfer process in $H^+ + H_2$ at E_{cm}=20eV.
$H^+ + H_2(v_i=0) \rightarrow H + H_2^+(v_f)$
Infinite order sudden approx.(IOSA)
$6x10^{-2}$ keV/amu
also $H^+ + H_2(v_f)$

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89T 6 Bardsley, J.N. Gangopadhyay, P. Penetrante, B.N.
Phys. Rev. A 40 (1989) 2724 - 2744
Symmetric charge transfer to multiply charged ions.
$He^{2+} + He^+ \rightarrow He^+ + He^{2+}$
$A^{(Z-2)+} + A^{(Z-3)+} \rightarrow A^{(Z-3)+} + A^{(Z-2)+}$ (A = Be,B,C,N,O)
$A^{(Z-10)+} + A^{(Z-9)+} \rightarrow A^{(Z-9)+} + A^{(Z-10)+}$ (A = Mg,Al,Si,P,S)
IP with curved trajectories
10^{-2} - 10 keV/amu

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89T10 Belkic, D.
Phys. Scripta 40 (1989) 610 - 624
State-selective and total single-capture cross sections for fast collisions of multiply charged ions with He and Li.
$A^{Z+} + B \rightarrow A^{(Z-1)+}(nl)$ (A = H,He;B = He,Li)
Corrected first Born approx.
10 - 2500 keV/amu

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89T 7 Belkic, D.
Phys. Scripta T28 (1989) 106 - 111
State-selective capture cross sections in proton-hydrogen and proton-helium collisions at intermediate and high energies.
H^{+}+ H,He -> H(2s,2p,3s,3p,3d,4s)
Corrected-first-Born approx.
20 - 1000 keV/amu

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89T 9 Belkic, D. Taylor, H.S.
Phys. Scripta 39 (1989) 436 - 441
A Schwinger-type variational principle for charge exchange at arbitary energies.
Schwinger type variational method

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89T 8 Belkic, D. Taylor, H.S.
Phys. Rev. A 39 (1989) 6134 - 6147
Nonperturbative treatments of charge exchange at arbitrary energies : an alternative variational principle.
H^{+} + H -> H + H^{+}
Schwinger-variational method
60,125,5000 keV/amu
Angular distribution

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89T11 Bhalla, C.P. Karim, K.R.
Phys. Rev. A 39 (1989) 6060 - 6063
Resonant transfer and excitation in collisions of Li-like F^{6+} and Ca^{17+*} with light targets.
F^{6+} + H_2 -> F^{5+*}; Ca^{17+} + H_2,He -> Ca^{15+*}
Impulse approx.
$6x10^2$ - $1.9x10^3$(F); $3.7x10^3$ - $9.5x10^3$ keV/amu(Ca)
radiative and non-radiative rates calculated.

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89T12 Clary, C.C. Sonnenfroh, D.M.
J. Chem. Phys. 90 (1989) 1086 - 1093
Quantum mechanical calculations on the Ar^{+} + N_2 charge transfer reaction.
$Ar^{+}(^2P_{3/2})$ + N_2(v=0,j) -> Ar + N_2^{+}(v'=1,j')
Coupled channel-DWBA
(4-10)$x10^{-6}$ keV/amu
cross sections for j'=0-28

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89T13 Cue, N. Poizat, J.C. Remillieux, J.
Europhys. Letters 8 (1989) 10 - 23
Exciting the nucleus by target electron capture into atomic orbitals.
Nuclear excitation by electron capture (NEEC), the inverse of the internal conversion.

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89T15 Decker, D. Eichler, J.
J. Phys. B 22 (1989) L95 - 100
Exact second-order Born calculations for charge exchange with Coulomb boundary conditions.
H^{+} + H,He(1s) -> H(1s) + H^{+} + He^{+}
second-order Born app. with Coulomb boundary conditions.
125(H),$5.4x10^3$(He) keV/amu

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89T14 Decker, F. Eichler, J.
Phys. Rev. A 39 (1989) 1530 - 1533
Consistent treatment of electron screening in charge transfer.
H^+ + He -> H + He^+; H^+ + C -> H + $C^+(K^{-1})$
He^{2+} + Li -> He^+ + $Li^+(K^{-1})$
screened first Born app. with Coulomb boundary condition(SB1S)
10^2 - 10^4 keV/amu(H); 10^2 - $6x10^2$ keV/amu(He)

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89T16 Decker, F. Eichler, J.
J. Phys. B 22 (1989) 3023 - 3036
Comparative study of the distorted-wave Born and boundary-corrected Born approximation for charge transfer up to the second order.
H^+ + H -> H + H^+
DWBA/boundary-corrected Born appr.
125 - 5000 keV/amu
angular distributions

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89T18 Deco, G.R. Rivarola, R.D.
Phys. Rev. A 39 (1989) 5451 - 5454
Two-center effects in relativistic radiative electron capture.
S^{16+} , U^{92+} + B -> S^{15+} , U^{91+} (B = 10 - 92)
Matrix-continuum distorted-wave model
$1.5x10^6$ keV/amu

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89T17 Deco, G.R. Rivarola, R.D.
J. Phys. B 22 (1989) 1043 - 1050
Pair productions with electron capture in relativistic heavy-ion collisions.
DWBA

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89T19 Dewangan, D.P. Chakraborty, H.S.
J. Phys. B 22 (1989) L415 - 418
Analytic evaluation of the B1B cross sections.
B1B(boundary-corrected first Born approx.)
closed form for B1B for 1s -> 1s electron transfer

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89T20 Dubois, A. Hansen, J.P. Nielsen, S.E.
J. Phys. B 22 (1989) L279 - 284
Orientation of P states in ion-atom collisions:propensity rules for excitation and capture.

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89T21 Errea, L.F. Mendez, L. Mo, O. Riera, A.
Phys. Scripta T28 (1989) 67 - 70
Molecular treatments of charge exchange in slow C^{3+}+ H collisions.
C^{3+} + H -> C^{2+} (total,$1s^22s3s$,$1s^22s3p$)
MO
0.25 - 6.25 keV/amu

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89T22 Errea, L.F. Mendez, L. Riera, A.
Z. Phys. D 14 (1989) 229 - 236
Excitation and charge transfer in He^+ + H collisions.
He^+ + H -> He($1s^2$; 1s2s; 1s2p) + H^+
MO + CTF
0.5 - 25 keV/amu
also H(2s;2p) excitation

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89T23 Gayet, R.
J. de Phys. 50 (1989) C1/53 - C1/70
Multiply capture and ionization in high energy ion-atom collisions.
a review

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89T24 Gramlich, K. Grün, N. Scheid, W.
J. Phys. B 22 (1989) 2567 - 2579
Coupled-channel calculations with Gausse-type orbitals for charge transfer and ionization in collisions of the $(He-He)^{2+}$ system.
He^{2+} + He -> He^{+},He; He^{+} + He^{+} -> He + He^{2+}
coupled-channel calculation (AO)
1 - 80 keV/amu(He^{2+}):4 - 120 keV/amu(He^{+})
also He^{2+} + He -> He^{2+} + He^{+} + e; He^{+} + He^{+} -> He^{+} + He^{2+} + e

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89T25 Grozdanov, T.P. Janev, R.K. Krstic, P.S.
Phys. Letters. A 141 (1989) 346 - 350
Two-state model for electron capture in H^{+} + H_2 collisions at keV impact energies.
H^{+} + H_2 -> H(total)
two state model
0.2 - 20 keV/amu

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89T26 Hahn, Y.
Phys. Rev. A 40 (1989) 2950 - 2957
Transfer excitation processes in ion-atom collisions at high energies.
Ca^{17+} + He -> Ca^{16+*} + He^{+}; Nb^{31+} + H_2 -> Nb^{30+**} + H_2^{+}
Resonant transfer excitation

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89T27 Hahn, Y. Ramadan, H.
Phys. Rev. A 40 (1989) 6206 - 6209
Uncorrelated transfer excitation collisions at high energies.
Ni^{31+} + H_2 -> Ni^{31+*}; F^{6+} + He,H_2 -> F^{5+*}
Uncorrelated transfer excitation at high energies

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89T28 Hansen, J.P. Andersson, L.R.
J. Phys. B 22 (1989) L285 - 288
A study of charge transfer and core excitation in the Ne^{6+} - He collisions at 2 keV projectile energy.
Ne^{6+} + He -> Ne^{5+} + He^{+}
AO-CC
0.1 kev/amu
energy-gain spectrum : impact parameter dependence

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89T29 Hansen, J.P. Kochbach, L. Taubjerg, K.
J. Phys. B 22 (1989) 885 - 891
Partial capture cross sections and energy gain spectra in Ar^{6+} - He($1s^2$) collisions.
Ar^{6+} + He($1s^2$) -> Ar^{7+}(3d,4s,4p) + He^{+}
AO
1.25×10^{-2} - 1 keV/amu

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89T30 Hansen, J.P. Taubjerg, K.
Phys. Rev. A 40 (1989) 4082 - 4084
Coupled-channel calculations of partial capture cross sections in multiply charegd ion collisions with hydrogen.
Ar^{6+} + H -> Ar^{5+}(4l;5l); Ar^{8+} + H -> Ar^{7+}(5l;6l)
AO
1 - 50 keV/amu

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89T31 Hino, K. Watanabe, T.
Phys. Rev. A 39 (1989) 3373 - 3387
Theory of the relativistic radiative electron capture incorporating effects of the internal conversion process.
A^{Z+} + Be -> $A^{(Z-1)+}$ + hv(K-REC) + Be^{+} (A = Ne,Ar,Kr,Xe,Ta,U)
relativistic impulse approx.
10^4 - 10^5 keV/amu

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89T32 Jain, A. Lin, C.D. Frisch, W.
Phys. Rev. A 39 (1989) 1741 - 1746
State-selective double-electron capture in He^{2+} + He collision at intermediate impact energies.
He^{2+} + He -> He($2s^2$ ^1S, 2s2p $^1P_0$, $2p^2$ $^1D_0$) + He^{2+}
AO
50 - 167 keV/amu

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89T54 Jakubassa-Amundsen, D.H.
J. Phys. B 22 (1989) 3989 - 3999
The forward peak for neutral projectiles.
He^{q+}(q = 2,1,0) + Ne -> (He^{q+} + e) + Ne^{+}
peak-impulse-approx.
10^3 keV/amu

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89T34 Macek, J. Dong, X.Y.
Phys. Rev. A 40 (1989) 95 - 100
Calculation of electro-capture cross sections in low energy collisions of C^{6+} with H.
C^{6+} + H -> C^{5+}(total;4l:l=0-3) + H^{+}
LZ with Stark effect coupling
1.3×10^{-2} - 1.3×10^{2} keV/amu

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89T33 Macek, J. Taubjerg, K.
Phys. Rev. A 39 (1989) 6064 - 6067
Strong potential wave functions with elastic channel distortion.
Channel-distorted wave approx.

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89T35 Martinez, A.E. Deco, G.R. Rivarola, R.D. Fainstein, P.D.
Nucl. Instr. Meth. in Phys. Res. B 43 (1989) 24 - 28
Electron capture and ionization in atomic collisions.
H^{+} + He^{+} -> H + He^{2+}; H^{+} + Ne -> H + Ne^{+}
Continuum distorted wave-eikonal Initial state method
10 - 10^3 keV/amu(He^{+})
differential cross sections. H^{+} + He^{+} -> H^{+} + He^{2+}+ e

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89T36 Marxer, H. Briggs, J.S.
Z. Phys. D 13 (1989) 75 - 76
The capture of innershell electrons in the strong potential Born(SPB) approximation.
p + C -> H + $C^{+}(K^{-1})$
Strong potential Born approx.
10^2 - 3×10^3 keV/amu

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89T37 Moiseiwitsch, B.L.
Phys. Rev. A 39 (1989) 5609 - 5612
Relativistic second-order Oppenheimer-Brinkman-Kramers cross sections for electron capture.
A^{Z+} + B -> $A^{(Z-1)+}$ (A = C,Ne,Ar; B =13-79)
relativistic OBK
1.4×10^5 - 2.1×10^6 keV/amu

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89T38 Nikulin, V.K. Samoylov, A.V.
J. Phys. B 22 (1989) L201 - 205
On the role of correlated double-electron capture in slow multiply charged N^{7+} collisions with He.
N^{7+} + He -> N^{5+}(3l3l';3l4l') + He^{2+}
multichannel Landau-Zener-Nikitin model
$6x10^{-2}$ - 25 keV/amu
also N^{7+} + He -> N^{6+}(n=3;n=4) + He^{+}; double capture dominant over single capture at low energies

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89T39 Olson, R.E. Schultz, D.R.
Phys. Scripta T28 (1989) 71 - 76
n,l distributions for electron capture from H(1s) by C^{6+} and O^{8+}.
C^{6+} + O^{8+} + H -> C^{5+}(nl),O^{7+}(nl)
CTMC
40 - 140 keV/amu

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89T40 Olson, R.E. Ullrich, J. Schmidt-Böcking, H.
Phys. Rev. A 39 (1989) 5572 - 5583
Multiple-ionization collisions dynamics.
U^{32+} + Ne -> U^{32+} + Ne^{i+}; U^{31+}(n) + Ne^{i+}
CTMC
$1.4x10^{3}$ keV/amu
n-distribution; impact parameter; electron spectrum;
angular distribution of scattered projectile;
angular distribution of recoil ions; stopping power

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89T52 Omar, G. Moussa, A.H. Hahn, Y.
Phys. Rev. A 40 (1989) 6709 - 6710
Strong electron correlation and anomalous electron capture.
Ca^{+},Sc^{2+},Ti^{3+},Fe^{7+} + B -> Ca,Sc^{+},Ti^{2+},Fe^{6+}

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89T41 Opradolce, L. Casaubon, J.I. Piancetini, R.D.
J. Phys. B 22 (1989) 1809 - 1916
Molecular treatment of single-electron capture in Li^{3+} + Li collisions.
Li^{3+} + Li(2s) -> Li^{2+}(n) + Li^{+}
MO/Landau-Zener model
$2x10^{-4}$ - 1 keV/amu
n=4 dominant

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89T42 Parker, J.E. Johnson, C.A.F.
Int. J. Mass Spectro. Ion Proc. 94 (1989) 87 - 99
A two-state treatment of the electron transfer reactions from carbon dioxide to helium ions.
He^{+} + CO_2 -> He
two-state approx
0.025 - 1.25 keV/amu
branching ratios for CO_2^{+},CO^{+},O^{+},C^{+},CO_2^{2+}

45
89T53 Parlant, G. Gislason, E.A.
J. Chem. Phys. 91 (1989) 5359 - 5364
Theoretical state-to-state cross sections for collisions of N_2^{+}(v) + Ar:II results at higher energies.
N_2^{+} (v) + Ar -> N_2 (v) + Ar^{+} ($^2P_{3/2,1/2}$) (v = 0,1,2)
1.2 - 320 eV

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89T43 Rhoades-Brown, M.J. Bottcher, C. Strayer, M.R.
Phys. Rev. A 40 (1989) 2831 - 2834
Feyman-Monte Carlo calculations of electron capture at relativistic collider energies.
$A^{Z+} + A^{Z+} \rightarrow A^{(Z-1)+} + A^{Z+} + e^{+}$ (A = Si,Cu,I,Au,U)
Feyman-Monte Carlo method
electron capture associated with pair production

47
89T44 Senba, M.
J. Phys. B 22 (1989) 2027 - 2040
Charge exchange collisions in the presence of competing process : an integral equation approach.
$H + Ne \rightarrow H^{+}$
integral equation
0.2 - 2.8 keV/amu

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89T45 Shingal, R. Lin, C.D.
Phys. Rev. A 40 (1989) 1302 - 1309
Orientation-dependent atomic model for electron transfer in ion-molecular collisions:applications to $H^{+} + H_2$.
$H^{+},He^{2+} + H_2 \rightarrow H,He^{+}$
1 - 400 keV/amu(H); 12.5 - 500 keV/amu(He)
ratios $\sigma(H_2)/\sigma(H)$

49
89T55 Shingal, R. Lin, C.D.
J. Phys. B 22 (1989) L445 - 449
Ionization and electron transfer in $He^{2+} + H(1s)$ collisions.
$He^{2+} + H(1s) \rightarrow He^{+}$(total, 2s, 2p, 3s+3d, 3p)
semi-classical impact parameter method
2 - 500 keV/amu
also $He^{2+} + H \rightarrow He^{2+} + H^{+} + e$

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89T46 Shingal, R. Lin, C.D.
J. Phys. B 22 (1989) L659 - 664
Theoretical studies of electron capture in $H^{+} + H_2$ collisions.
$H^{+} + H_2 \rightarrow H$(total)
orientation-dependent AO
4 - 100 keV/amu
impact parameter dependence

51
89T47 Toshima, N. Eichler, J.
Phys. Rev. A 40 (1989) 125 - 132
Relativistic coupled-channel calculations including pseudostates.
$U^{92+} + U^{91+} \rightarrow U^{91+}$(1s,2s,2p,3s,3p) + U^{92+}
relativistic,coupled-channel calculation
$5x10^5$ keV/amu
also excitation cross sections

52
89T48 Toshima, N. Ishihara, T.
Phys. Rev. A 40 (1989) 638 - 641
Coulomb boundary conditions in high energy theories for electron capture processes.
$H^{+} + H \rightarrow H(\Theta) + H^{+}$
boundary corrected eikonal approx.
60 , 125 keV/amu
angular distributions

53
89T49 Toshima, N. Ishihara, T. Ohsaki, A. Watanabe, T.
Phys. Rev. A 40 (1989) 2192 - 2194
Impact-parameter treatment of classical trajectry Monte Carlo calculations for ion-atom collisions.
$H^+ + H \rightarrow H(\Theta) + H^+$
simplified CTMC
60 , 125 keV/amu
angular distributions

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89T50 Wang, Y.D. McGuire, J.H. Rivarola, R.D.
Phys. Rev. A 40 (1989) 3673 - 3680
Impact parameter treatment of high-velocity electron capture from diatomic molecules at fixed orientation.
$H^+ + H_2 \rightarrow H$; $He^{2+} + H_2 \rightarrow He^+$
IP
1 - 5 $\times 10^3$ keV/amu
orientation angle dependence

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89T51 Zygelman, B. Dalgarno, A. Kimura, M. Lane, N.
Phys. Rev. A 40 (1989) 2340 - 2345
Radiative and nonradiative charge transfer in $He^+ + H$ collisions at low energy.
$He^+ + H \rightarrow He + H^+$; $He + H^+ + h\nu$
quantum mechanical method
2.5×10^{-5} - 2.5×10^{-2}keV/amu
radiative association ($\rightarrow HeH^+ + h\nu$) is dominant at lowest energies;radiative capture is dominant above 10 MeV :
at higher energies non-radiative capture is dominant.

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90T 1 Allan, R.J. Courbin, C. Salas, P. Wahnon, P.
J. Phys. B 23 (1990) L461 - 466
State-selective effects in the differential cross section for electron capture from laser-excited sodium atoms by protons.
H^+ + Na(3p) -> H(nl=2p)
MO + CTMC
$5x10^{-2}$ - 1 keV/amu

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90T 2 Almeida, D.P. Langford, M.L.
Int. J. Mass Spectro. Ion Proc. 96 (1990) 331 - 339
Double electron capture in a Landau-Zener model : a reaction window.
F^+ + Ne,Ar -> F^- ; O^+ + Ar -> O^- ; I^+ + Mg -> I^- ;
C^{4+} + He -> C^{2+}
Landau-Zener model

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90T41 Ast, H. Ludde, H.J. Dreizler, R.M.
J. Phys. B 23 (1990) 2305 - 2320
Optical potentials in ion-atom collisions: II. effective one-electron systems.
H(1s) + B -> H(2s,2p),H^+ (B = He,Ne,Ar)
H(2s) + B -> H^+,H(nl)
truncated coupled-channel calculations
1 - 10^5 keV/amu

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90T 4 Avakov, G.U. Asharov, A.R. Blokhintsev, L.D. Kadyrov, A.S. Mukhamedzhanov, A.M. Poletayeva, M.V.
J. Phys. B 23 (1990) 4151 - 4164
Three-body approach to the atomic reactions of electron transfer II. calculation of total cross sections.
H^+ + H(1s),He($1s^2$) -> H(nlm) : He^{2+} + H(1s) -> He^+(nlm)
Fadeev three-body approach
0.1 - 10^3 keV/amu (H^+): 0.1 - 10^2 keV/amu (He^{2+})

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90T 3 Avakov, G.V. Ashurov, A.R. Blokhintsev, L.D. Mukhamedzhanov, A.M. Poletayeva, M.V.
J. Phys. B 23 (1990) 2309 - 2326
Three-body approach to the atomic reactions of electron transfer : I. theory.
Alt-Grassberger-Sandhas three-body equations

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90T 5 Badnell, N.R.
Phys. Rev. A 42 (1990) 204 - 208
L-shell resonant transfer and excitation in niobium ions.
Nb^{q+} + H_2 -> $Nb^{(q-1)+*}$ (q = 28 - 32)
impulse approx.
$1.5x10^3$ - $15x10^3$ keV/amu

7
90T 6 Badnell, N.R.
Phys. Rev. A 42 (1990) 209 - 213
K-shell resonant transfer excitation and excitation in calcium ions.
Ca^{q+}(q = 10 - 12, 16 - 19) + H_2 -> $Ca^{(q-1)+*}$
impulse approx.
$9x10^3$ - $19x10^3$ keV/amu

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90T 7 Badnell, N.R.
Phys. Rev. A 42 (1990) 3795 - 3800
Anisotropic radiative emission effects on deduced resonant-transfer-excitation cross sections.
hyperfine structure effect on anisotropic radiation

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90T 8 Baer, M. Ng, C.Y.
J. Chem. Phys. 93 (1990) 7787 - 7799
A three-dimensional quantum mechanical study of the H_2 + H_2^+ system : calculation of reactive and charge transfer cross sections.
$H_2^+(v=0)$ + $H_2(v=0)$ -> H_2 + H_2^+
Infinite order sudden approx. (IOSA)
$1.25x10^{-4}$ - $2.5x10^{-4}$ keV/amu

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90T42 Barrachina, R.O.
J. Phys. B 23 (1990) 2321 - 2332
Collisional electron capture to the continuum of neutral projectiles.
He + B -> (He + e) + B^+
ab initio calculation
75 keV/amu
narrower than He^+

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90T43 Bhalla, C.P.
Phys. Rev. Letters 64 (1990) 1103 - 1106
Angular distribution of Auger electrons and photons in resonant transfer and excitation in collisions of ions with light targets.
F^{8+} + H_2 -> $F^{7+}(2p^2\ {}^1D)$
$1x10^3$ keV/amu
non-isotropic distributions of Auger electrons and photons

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90T 9 Chen, M.H.
Phys. Rev. A 42 (1990) 5228 - 5231
Resonant transfer and excitation in collisions of Ca^{q+} with H_2 and He targets.
Ca^{q+}(q = 16 - 19) + B -> $Ca^{(q-1)+*}$ (B = H_2,He)
Impulse approximation with MCDF
$3.5x10^3$ - 10^4 keV/amu

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90T10 Courbin, C. Allan, R.J. Salas, P. Wahnon, P.
J. Phys. B 23 (1990) 3909 - 3924
Total and differential charge transfer cross sections in H^+ + Na(3s) or Na^*(3p) collisions.
H^+ + Na(3s,3p) -> H(n=2) + Na^+
MO
0.5 - 5 keV/amu

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90T11 Crothers, D.S.F. Kunseath, K.M.
J. Phys. B 23 (1990) L365 - 371
Target continuum distorted-wave theory for collisions of fast protons with atomic hydrogen.
H^+ + H -> H + H^+
$5x10^3$ keV/amu
differential cross sections

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90T12 Datta, S.K. Crothers, D.S.F. McCarroll, R.
J. Phys. B 23 (1990) 479 - 493
The relation between the Coulomb-Born and the boundary-corrected first-order Born approximations for electron capture.
H^+ + Ne -> H + $Ne^+(K^{-1})$
Coulomb-Born, boundary-corrected Born
10^3 - $6x10^3$ keV/amu

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90T13 Decker, F.

Phys. Rev. A 41 (1990) 6552 - 6554

Second Born approximation for relativistic electron capture : exact Monte Carlo calculations for C^{6+}-Au and Ar^{18+}-Ag collisions.

C^{6+} + Au -> $C^{5+}(1s)$ + $Au^{+}(K^{-})$; Ar^{18+} + Ag -> $Ar^{17+}(1s)$ + $Ag^{+}(K^{-})$

second OBK approx.

$4x10^{5}$, $1x10^{6}$ keV/amu (Ar)

17

90T14 Dube, L.J. Mensour, B. Dewangan, D.P. Chakraborty, H.S.

J. Phys. B 23 (1990) L711 - 714

Comment on the analytic evaluation of the B1B cross sections.

analytic evaluation of 1s-1s electron transfer

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90T15 Errea, L.F. Mendez, L. Riera, A.

Europhys. Letters 13 (1990) 43 - 48

Modified molecular treatment of He^{+} + H^{+} collisions up to v=2.5 a.u.

He^{+} + H^{+} -> He^{2+} + H ; He^{2+} + H^{+} + e

MO

5 - 150 keV/amu

19

90T16 Fritsch, W. Kimura, M. Lane, N.F.

Phys. Rev. A 41 (1990) 508 - 511

Comparative molecular-orbital and atomic-orbital study of electron transfer and excitation in He^{+} + Na(3s) collisions at energies of 0.05 to 20 keV/amu.

He^{+} + Na(3s) ->

AO, MO

0.05 - 20 keV/amu

also excitation to 3p state studied

20

90T17 Fritsch, W. Tawara, H.

Nucl. Fusion 30 (1990) 373 - 382

Calculation of electron transfer cross sections in Si^{q+} + H (q = 4 - 14) collisions at energies of 0.5 - 14 keV/amu.

Si^{q+} + H -> $Si^{(q-1)+}(nl)$ (q = 4,6,7-14)

AO

0.5 - 14 keV/amu

n=6 dominant

21

90T18 Furlan, R.J. Russek, A.

Phys. Rev. A 42 (1990) 6436 - 6442

Electron excitation in collisions of H_2^{+} on He.

$H_2^{+}(1\sigma_g)$ + $He(1s^2)$ -> $H_2(1\sigma_g^2)$ + $He^{+}(1s)$;

$H_2(1\sigma_g, 1\sigma_u)$ + $He^{+}(1s)$

MO

0.2 - 6 keV/amu

22

90T19 Gargaud, M. McCarroll, R. Lennon, M.A. Wilson, S.M. McCullough, R.W. Gilbody, H.B.

J. Phys. B 23 (1990) 505 - 511

One-electron capture by slow Al^{2+} ions in atomic and molecular hydrogen.

Al^{2+} + H,H_2 -> Al^{+}(total)

E: recoil ions from vapor; T: MO

0.01 - 2 keV/amu

23
90T20 Gianturco, F.A. Palma, A. Semprini, E. Stefani, F. Baer, M.
Phys. Rev. A 42 (1990) 3926 - 3939
Coupled quantum treatment of vibrationally inelastic and vibronic charge transfer in proton-O_2 collisions.
$H^+ + O_2 \rightarrow H + O_2^+(\nu)$
infinite-order sudden approx.
2.3×10^{-2} keV/amu

24
90T21 Grozdanov, T.P. Solovev, E.A.
Phys. Rev. A 42 (1990) 2703 - 2718
Charge exchange, excitation and ionization via hidden avoided crossings.
$He^{2+} + H(1s) \rightarrow He^+ + H^+$; $H^+ + He^+(1s) \rightarrow H + He^{2+}$
asymptotic theory (nonadiabatic transition)
0.2 - 2.5 keV/amu
also ionization, excitation cross sections given

25
90T22 Hahn, Y. Dalgarno, A.
Phys. Rev. A 41 (1990) 4783 - 4790
Production of negative hydrogen ions in neutral H + H collisions.
$H(1s) + H(1s) \rightarrow H^+ + H^-$; $H(2s) + H(1s) \rightarrow H^+ + H^-$
distorted wave theory
0.2 - 2×10^2 keV/amu

26
90T23 Hansen, J.P. Kocbach, L. Dubois, A. Nielsen, S.E.
Phys. Rev. Letters 64 (1990) 2491 - 2494
Orientation and alignment effects for capture in multiply charged ion-atom collisions.
$B^{3+}(1s^2) + He \rightarrow B^{2+}(1s^2 2p)$
coupled-channel calculation
0.25 - 625 keV/amu
capture probability, orientation parameter, alignment angle as a function of impact parameter and of velocity.

27
90T24 Harel, C. Jouin, H.
Europhys. Letters 11 (1990) 121 - 126
Autoionizing double capture in N^{7+} on helium collisions at low energies.
$N^{7+} + He(1s^2) \rightarrow N^{6+*}(nl) + He^+(1s)$; $N^{5+**}(n'l',n''l'') + He^{2+}$
MO
0.72 - 4.6 keV/amu

28
90T25 Jakubassa-Amundsen, D.H.
Phys. Rev. A 42 (1990) 653 - 654
Relativistic second-order Born theory for electron capture.
semiclassial theory

29
90T26 Kumar, A. Lane, N.F. Kimura, M.
Phys. Rev. A 42 (1990) 3861 - 3864
Selective-state charge transfer in a collision between an alpha particle and ground-state Na: a molecular-state approach.
$He^{2+} + Na \rightarrow He^+(\ n = 3\ ) + Na^+$
semiclassical IP with MO
0.1 - 10 keV/amu

30
90T27 Luc-Koenig, E. Bauche, J.
J. Phys. 23 (1990) 1763 - 1782
Radiative and non-radiative decays of doubly-excited configurations in Ar^{7+} spectrum.
Ar^{7+} -> $Ar^{5+}(1s^2 2s^2 2p^5 nln'l'$; $1s^2 2s 2p^6 nln'l'$)
configuration-average method
energy level, wave length, radiative, non-radiative transition probabilities

31
90T28 Mandal, C.R. Mandal, M. Mukherjee, S.C.
Phys. Rev. A 42 (1990) 1803 - 1805
K-shell capture by He^{2+} and Li^{3+} on carbon and neon.
He^{2+} + B -> He^{+}(1s,2s,2p,total) + $B^{+}(K^{-})$;
Li^{3+} + B -> Li^{2+}(1s,2s,2p,total) + $B^{+}(K^{-})$ (B=C,Ne)
peaking impulse approx.
25 - 10^3 keV/amu (He) : 1.1×10^3 - 3×10^3 keV/amu (Li)

32
90T29 Martinez, A.E. Rivarola, R.D.
J. Phys. B 23 (1990) 4165 - 4180
Second-order distorted-wave approximations for charge exchange.
H^+ + H(1s) -> H(1s) + H^+ : H^+ + Ar(1s) -> H(1s) + Ar^+
second-order CDW-EISA
5×10^3 keV/amu (H) ; 10^3-2×10^4 keV/amu (Ar)

33
90T30 Mendez, L. Cooper, I.L. Dickinson, A.S. Mo, O. Riera, A.
J. Phys. B 23 (1990) 2797 - 2810
Molecular treatment of mutual neutralization in slow Li^+ + H^- collisions.
Li^+ + H^- -> $Li(1s^2nl)$ + H(1s) (nl = 2s,2p,3s)
MO

34
90T31 Meng, L. Reinhold, C.O. Olson, R.E.
Phys. Rev. A 42 (1990) 5286 - 5291
Subshell electron capture in collisions of fully stripped ions with He and H_2 at intermediate energies.
A^{Z+} + He,H_2 -> $A^{(Z-1)+}$(nl) (A = H,He,Li,C,O,Ne,Si,P)
CTMC technique
20 - 2×10^3 keV/amu

35
90T32 Mo, O. Riera, A.
J. Phys. B 23 (1990) L373 - 377
Charge exchange in He^+ + Na(3p) collisions.
He^+ + Na(3p) -> He + Na^+
MO
0.2 - 1 keV/amu

36
90T33 Nielsen, S.E. Hansen, J.P. Dubois, A.
J. Phys. B 23 (1990) 2595 - 2612
Propensity rules for orientation in singly charged ion-atom collisions.
H^+ + Na(3s,3p) -> H(2s,2p)
AO + IP with ETF
0.25 - 225 keV/amu

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90T34 Pascale, I. Olson, R.E. Reinhold, C.O.
Phys. Rev. A 42 (1990) 5305 - 5314
State-selective capture in collisions between ions and ground- and excited state alkali metal atoms.
Na^+ + Na(28d) -> Na(nlm); N^{4+},Ar^{8+} + Cs(6s) -> N^{3+}(nlm),Ar^{7+}(nlm)
CTMC

38
90T35 Schmidt, A. Horbatsch, M. Dreizler, R.M.
J. Phys. B 23 (1990) 2327 - 2340
Semiclassical phase space description of ionization and capture for ions colliding with hydrogen-like targets.
$H^+ + B \rightarrow H + B^+$; $H^+ + B^+ + e$ (B = H,He^+,Li^{2+})
$A^Z + H \rightarrow A^{(Z-1)+} + H$; $A^{Z+} + H^+ + e$ (A = He,Li,C,Ne)
$Li^{3+} + Li^{2+} \rightarrow Li^{2+} + Li^{3+}$; $Li^{3+} + Li^{3+} + e$
semiclassical calculation
10 - 10^3 keV/amu

39
90T36 Shingal, R. Bransden, B.H.
J. Phys. B 23 (1990) 1203 - 1214
Neutralization in $H^+ + H^-$ and ion pair production in H + H collisions.
$H^+ + H^- \rightarrow H + H$; $H + H \rightarrow H^+ + H^-$
coupled-channel calculation
0.15 - 50 keV/amu

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90T37 Slim, H.A. Heck, E.L. Bransden, B.H. Flower, D.R.
J. Phys. B 23 (1990) L611 - 617
Calculated cross sections for electron capture by protons from helium into the H(n=3) level.
$H^+ + He \rightarrow H(n=3)$
semiclassical impact parameter method with AO
0.02 - 0.15 keV/amu

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90T38 Stoddeu, C.D. Monkhorst, H.J. Szalowicz, K.
Phys. Rev. A 41 (1990) 1281 - 1292
Muon reactivation in muon-catalyzed d-t fusion from accurate p-He^+ stripping and excitation cross sections.
$H^+ + He^+ \rightarrow H + He^{2+}$
Staumian method
70 - 3×10^3 keV/amu

42
90T44 Szoter, L.
Phys. Rev. Letters 64 (1990) 2835
Comment on observation of electron capture into continuum states of neutral atoms.
general comments

43
90T39 Taubjerg, K. Barrachina, R.O. Macek, J.H.
Phys. Rev. A 41 (1990) 207 - 219
Perturbation theory for strongly interacting atomic system.
$H^+ + Ar \rightarrow H^0 + Ar^+(K^-)$
Strong potential Born approx.
10^3 - 2×10^4 keV/amu

40
90T40 Toshima, N. Eichler, J.
Phys. Rev. A 41 (1990) 5221 - 5224
Distorted-wave approximations for relativistic atomic collisions.
$H^+ + H \rightarrow H(1s)$: $U^{92+} + U^{91+} \rightarrow U^{91+}(1s)$
distorted-wave approx.
10^2 keV/amu (H^+) ; 5×10^5 keV/amu (U^{92+})
spin flip cross sections given

1
91T 1 Alston, S.
Phys. Rev. A 43 (1991) 5874 - 5877
Generalized distorted-wave Born approximation for electron capture in ion-ion collisions.
distorted-wave Born approx.
general formalism

2
91T 2 Amezian, K. Bacchus-Montabonel, M.C.
Indian J. Phys. 65B (1991) 217 - 225
Ab-initio molecular treatment of single electron capture process for the O^{5+} + He collision.
O^{6+} + H -> O^{5+}(3s,3p,3d)
MO + semiclassical
0.5 - 7.1 keV/amu

3
91T 3 Andersson, L.R. Gargaud, M. McCarroll, R.
J. Phys. B 24 (1991) 2073 - 2082
Electron capture in slow O^{5+}/H collisions.
$O^{5+}(1s^2 2s)$ + H -> O^{4+}($1s^2 2snl$; nl = 4s,4p,4d)
(0.03 - 1.15)$\times 10^{-3}$ eV/amu

4
91T 4 Bacchus-Montabonel, M.C. Courbin, C. McCarroll, R.
J. Phys. B 24 (1991) 4409 - 4417
State-selective electron capture by O^{2+} from He.
$O^{2+}(2s^2 2p^2)^3P$ + He -> $O^{+}(2s^2 2p^3)^2P, ^2D$
MO ab-initio calculation
25×10^{-3} - 0.625 keV/amu

5
91T 5 Badnell, N.R.
Phys. Rev. A 44 (1991) 1554 - 1558
Double X-ray emission following resonant transfer and excitation in collisions of H-like ions with H_2.
S^{15+},Ge^{31+} + H_2 -> S^{14+}(nl,n'l'),Ge^{30+}(nl,n'l')
$K\alpha$-$K\alpha$, $K\alpha$-$K\beta$, $K\alpha$-$K\gamma$ coincidence

6
91T 6 Baur, G.
Phys. Rev. A 44 (1991) 4767 - 4768
Comment on "Feynman-Monte Carlo calculations of electron capture at relativistic collider energies".
general formulation

7
91T 7 Belkic, D.
Phys. Rev. A 43 (1991) 4751 - 4770
Exact second-order Born approximation with correct boundary conditions for symmetric charge exchange.
H^+ + H(1s) -> H + H^+
second-order Born approx. with correct boundary.
60,100,125,500 keV/amu
angular distribution

8
91T 8 Belkic, D.
Phys. Scripta 43 (1991) 561 - 571
Electron transfer from hydrogen like atoms to partially and completely stripped projectiles: CDW approximation.
A^{Z+} + H(1s) -> $A^{(Z-1)+}$(n) (A = H,He,Li,Be,B,C,N,O)
Li^{q+} + H -> $Li^{(q-1)+}$(total) (q = 3,2)
B^{q+} + H -> $B^{(q-1)+}$(total) (q = 5,4,3,2)
C^{q+} + H -> $C^{(q-1)+}$(total) (q = 6,5,4,3,2)
N^{q+} + H -> $N^{(q-1)+}$(total) (q = 7,6,5,4,3,2)
O^{q+} + H -> $O^{(q-1)+}$(total) (q = 8,7,6,5,4,3,2)
CDW approx.
10^2 - 10^4 keV/amu (H); 6 - $6x10^2$ keV/amu (O)
scaling as σ(total)/Z_p^3 - E(keV/amu)

9
91T 9 Bottcher, C. Rhoades-Brown, M.J. Strayer, M.R.
Phys. Rev. A 44 (1991) 4709 - 4770
Approximate analytic formula used to estimate electron capture cross sections at relativistic energies.
general discussions

10
91T10 Boudjema, M. Cornille, M. Dubau, J. Moretto-Capelle, P. Bordenave-Montesquieu, A. Benoit-Catin, P. Gleizes, A.
J. Phys. B 24 (1991) 1695 - 1712
Investigation of double capture in Ne^{8+} + He,H_2 by electron spectroscopy at 80 keV I Theory.
$Ne^{8+}(1s^2)$ + He,H_2 -> $Ne^{6+}(1s^2 3lnl'; 1s^2 4lnl')$
AUTOLSJ method
peak energy, autoionization probabilities, radiative probabilities
for $Ne^{6+}(1s^2 3l3l')$,$Ne^{6+}(1s^2 3l4l')$,$Ne^{6+}(1s^2 4l4l')$

11
91T11 Brown, G.J.N. Crothers, D.S.F.
J. Phys. B 24 (1991) 173 - 194
Phase-integral halfway-house variational continuum distorted waves.
H^+ + H(1s) -> H(1s) + H^+
CDW
10 - 10^3 keV/amu

12
91T12 Campbell, E.E.B. Hertel, I.V. Nielson, S.E.
J. Phys. B 24 (1991) 3825 - 3836
Electron translation factors in orienting charge transfer collisions.
Na^+ + Na(3p) -> Na(3p) + Na^+
semiclassical theory + ETF

13
91T14 Chen, Z. Lin, C.D.
J. Phys. B 24 (1991) 4231 - 4244
State-selective double capture in collisions with helium atoms at low energies II. ejected electron spectra.
C^{6+} + He -> $C^{4+}(2l3l')$; O^{8+} + He -> $O^{6+}(3l3l')$
IEA
5 keV/amu
Auger electron spectra

14
91T13 Chen, Z. Shingal, R. Lin, C.D.
J. Phys. B 24 (1991) 4215 - 4230
State-selective double capture in collisions of bare ions with helium atoms at low energies I. total cross sections.
C^{6+} + He -> $C^{4+}(2l3l,3l3l',3l4l')$; C^{6+} + He -> $C^{5+}(n=2,3,4)$;
O^{8+} + He -> $O^{6+}(n=3,n'=3; n=3,n'=4)$; O^{8+} + He -> O^{7+}
IEA for double capture / AO for single capture

5 keV/amu (C)

15
91T15 Decker, F. Eichler, J.
Phys. Rev. A 44 (1991) 377 - 387
Exact second-order Born calculations for relativistic electron capture.
C^{6+} + B -> C^{5+}(K) + B^{+}(K^{-}) (B = Au)
Ne^{10+},Ar^{18+} + B -> Ne^{9+}(K),Ar^{17+}(K) + B^{+}(K^{-}) (B = Cu,Ag,Ta,Au)
second-order Born approx.
$4x10^5$ - $10x10^7$ keV/amu
also angular distribution

16
91T16 Decker, F. Eichler, J.
Phys. Rev. A 44 (1991) 2195 - 2197
Second-order Born calculations for electron capture in relativistic U + U collisions.
U^{92+} + U^{91+} -> U^{91+} + U^{92+}
relativistic second-order OBK
$5x10^5$ - $10x10^7$ keV/amu

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91T17 Dubois, A. Hansen, J.P. Lundsgaard, M. Nielsen, S.E.
J. Phys. B 24 (1991) L269 - 274
Orientation and alignment effects in H^{+}-Na collisions.
H^{+} + Na(3s) -> H(1s,2s,2p,n=3,total)
AO impact parameter method
3, 20 keV/amu
also excitation to Na(3p)

18
91T18 Dunseath, K.M. Crothers, D.S.F.
J. Phys. B 24 (1991) 5003 - 5022
Transfer and ionization processes during the collision of fast H^{+},He^{2+} nuclei with helium.
H^{+},He^{2+} + He -> H,He^{+} + He^{+}; H,He^{+} + He^{2+} + e
He^{2+} + He -> He + He^{2+}
100 - 1600 keV/amu
also H^{+},He^{2+} + He -> He^{+}

19
91T20 Errea, L.F. Herrero, B. Mendez, L. Mo, O. Riera, A.
J. Phys. B 24 (1991) 4049 - 4060
Charge exchange and excitation in C^{3+} + H collisions I. molecular calculations.
C^{3+} + H -> C^{2+}
MO
no cross sections given

20
91T21 Errea, L.F. Herroro, B. Mendez, L. Riera, A.
J. Phys. B 24 (1991) 4061 - 4075
Charge exchange and excitation in C^{3+} + H collisions II. partial and total cross section calculations.
C^{3+} + H -> C^{2+}(total,$1s^22s3s$,$1s^22s3p$,$1s^22s3d$,$1s^22p^2$)
MO
0.04 - 9 keV/amu

21
91T19 Errea, L.F. Maidagan, J.M. Mendez, L. Riera, A.
J. Phys. B 24 (1991) L387 - 392
Use of plane-wave translational factors in the molecular approach to atomic collisions.
He^{2+} + H -> He^{+}(2s,2p,total) + H^{+}; He^{+} + H^{+} -> He^{2+} + H
MO + plane-wave TF

22
91T59 Errea, L.F. Mendez, L. Riera, A.
Phys. Rev. A 43 (1991) 3578 - 3586
Offsetting the Difficulties of the molecular model of atomic collisions in the intermediate velocity range.
$H^+ + He^+ \to H(1s) + He^{2+}$
MO + translation factor
1.75 - 40 keV/amu
also $H^+ + He^+(1s) \to H^+ + He^{2+} + e$

23
91T22 Foster, C. Cooper, I.L. Dickinson, A.S. Flower, D.R. Mendez, L.
J. Phys. B 24 (1991) 3433 - 3444
Charge transfer in slow collisions of Ne^{2+} with H.
$Ne^{2+} + H$
rate coefficients

24
91T23 Gayet, R. Hansen, J. Martinez, A. Rivarola, R.
Z. Phys. D 18 (1991) 345 - 350
CDW and CDW-EIS investigations in an independent electron approximation for the resonant double electron capture by swift He^{2+} in helium.
$He^{2+} + He \to He + He^{2+}$
CDW / CDW + EIS
25 - 750 keV/amu

25
91T24 Gravielle, M.S. Miraglia, J.E.
Phys. Rev. A 44 (1991) 7299 - 7306
Eikonal impulse approximation in electron capture processes.
$H^+ + H,He \to H^0(1s,2s,2p,3s)$
$H^+ + B \to H + B^+(K^-)$ (B = C,Ne,Ar)
eikonal impulse approx.

26
91T25 Hansen, J.P. Dubois, A. Niplsen, S.E.
Phys. Rev. A 44 (1991) 6130 - 6132
Orientation and alignment in H^+-H collisions.
$H^+ + H \to H^*$
50, 100 keV/amu
also $H^+ + H^*(2p)$

27
91T26 Harel, C. Jouin, H. Pons, B.
J. Phys. B 24 (1991) L425 - 436
Double capture in C^{6+}-He collisions at low impact energies.
$C^{6+} + He \to C^{5+}(nl), C^{4+}($ 2ln'l': n'=3,4,5; 3l3l')
OEDM
0.56 - 7.56 keV/amu
n^{-3}-scaling

28
91T27 Horbatsch, M.
Z. Phys. D 21 (1991) S63 - 67
Theory of multiple ionization and capture in energetic ion-atom collisions.
review

29
91T29 Jain, A. Shingal, R. Zouros, T.J.M.
Phys. Rev. A 43 (1991) 1621 - 1624
State-selective nonresonant transfer excitation in 50-400 keV $^3He^+ + H_2$ and He collisions.
$^3He^+(1s) + H_2,He \to He^{**}(2s^2\ ^1S;\ 2s2p\ ^1P;\ 2p^2\ ^1D)$
semi-classical IP
12.5 - 125 keV/amu

30
91T28 Jakubassa-Amundsen, D.H.
J. Phys. B 24 (1991) 3019 - 3044
The impulse approximation for electron transfer in reactive nucleus-atom collisions.
$H^+ + C \to H + C^+(K^-)$
IA
$5x10^2 - 1x10^3$ keV/amu
angular distribution

31
91T30 Janev, R.K.
Phys. Letters A 160 (1991) 67 - 70
Unified cross section scaling for electron capture from excited hydrogen atoms by multi-charged ions.
analytical scaling formula

32
91T31 Jouin, H. Harel, C.
J. Phys. B 24 (1991) 3219 - 3227
Electron capture in He^{2+}-metastable H(2s) low energy collisions.
$He^{2+} + H(2s) \to He^+(3l,4l) + H^+$
PSS with CTF

33
91T32 Katsonis, K. Maynard, G. Janev, R.K.
Phys. Scripta T37 (1991) 80 - 80
Charge transfer and ionization cross sections for collisions of Ti^{q+},Cr^{q+},Fe^{q+} and Ni^{q+} ions with atomic hydrogen.
Ti^{q+}(q = 4 - 11) + H -> $Ti^{(q-1)+}$
Cr^{q+}(q = 4,6,8,10,13) + H -> $Cr^{(q-1)+}$
Fe^{q+}(q = 4-6,8,10,12,15,20,26) + H -> $Fe^{(q-1)+}$
Ni^{q+}(q = 4-6,8,10,12,14,17) + H -> $Ni^{(q-1)+}$
CTMC
$10 - 10^3$ keV/amu
scaling $\sigma/q - E/q^{1/2}$; also ionization cross sections

34
91T34 Kimura, M.
Phys. Rev. A 44 (1991) R5339 - 5342
H(n=2 and 3) density matrices resulting from low- to intermediate-energy collisions of H^+ ions with He atoms : the atomic-orbital-molecular-orbital matching approach.
$H^+ + He \to H^*(n=2,3)$
AO+MO
1 - 100 keV/amu

35
91T33 Kimura, M. Lane, N.F.
Phys. Rev. A 44 (1991) 259 - 263
Theoretical study of charge transfer in $He^+ + H_2$ collisions in the milli-electron volt region.
$He^+ + H_2 \to He + H_2^+$; $He + H^+ + H$
MO
10 - 500 K
rate coefficient given

36
91T38 Kuang, Y.R.
Phys. Rev. A 44 (1991) 1613 - 1619
Model-potential OBK approximation for K-shell electron capture in asymmetric collisions.
$H^+ + B \to H + B^+(K^{-1})$ (B = C,N,O,Ne,Ar)
; $He^{2+} + Ne \to He^+ + Ne^+(K^{-1})$
OBK
$2x10^2 - 1x10^4$ keV/amu

37
91T35 Kuang, Y.R.
J. Phys. B 24 (1991) L103 - 108
Electron capture in collisions of H^+ and He^{2+} projectiles with hydrogen ions.
$H^+, He^{2+} + B \rightarrow H, He^+$ ($B = Be^{3+}, B^{4+}, C^{5+}, N^{6+}, O^{7+}$)
modified two orthogonal-state expansion method
50 - 500 keV/amu

38
91T36 Kuang, Y.R.
J. Phys. B 24 (1991) 1645 - 1653
Electron capture in collisions between protons and the ions He^+ and Li^{2+} calculated using a new united-atom model.
$H^+ + He^+, Li^{2+}, Li^+ \rightarrow H + He^{2+}, Li^{3+}, Li^{2+}$
united-atom model
30 - 200 keV/amu

39
91T37 Kuang, Y.R.
J. Phys. B 24 (1991) 4993 - 5001
Modified Oppenheimer-Brinkman-Kramers approximation for K-shell capture in asymmetric collisions.
$H^+ + B \rightarrow H + B^+(K^{-1})$ (B = N,O,Ne); $He^{2+} + Ne \rightarrow He^+ + Ne^+(K^{-1})$
modified OBK
100 - 4000 keV/amu (H); 200 - 2000 keV/amu (He)

40
91T39 Kunikeev, Sh.D. Senashenko, V.S. Sidorovich, V.A.
Nucl. Inst. Meth. B 53 (1991) 122 - 126
Production of autoionizing states of fast charged particles by double electron capture.
$He^{2+} + He \rightarrow He^{**}(2s^2\ {}^1S;\ 2p^2\ {}^1D,\ 2s2p\ {}^1P)$
Independent model + quantum mechanical calculation
37 - 125 keV/amu
e-e correlation effect included

41
91T60 Kurpick, P. Heinemann, D. Sepp, W.D. Fricke, B.
Z. Phys. D 22 (1991) 407 - 409
Influence of occupation number of single particle levels on K-K charge transfer in collisions of 90 keV Ne^{9+} on Ne.
$Ne^{9+} + Ne \rightarrow Ne^{5+} + Ne^{7+}$
coupled channel calculation
4.5 keV/amu

42
91T40 Liu, C.J. Dunford, R.W.
J. Phys. B 24 (1991) 2059 - 2071
Depolarization following electron capture by highly charged ions in a polarized target.
General theory

43
91T41 Macek, J.H.
J. Phys. B 24 (1991) 5121 - 5132
Some remarks on strong-potential-Born expansions for ion-atom collisions.
strong potential-Born approx.

44
91T42 Meyerhof, W.E. Hülskötter, H.P. Dai, Q. McGuire, J.H. Wang, Y.D.
Phys. Rev. A 43 (1991) 5907 - 5918
Projectile electron loss with a molecular hydrogen target.
$A^{(Z-1)+} + H_2 \rightarrow A^{Z+}$ (A = H,He,Li,C,O)
plane-wave Born approx.
$1\times10^2 - 3.5\times10^3$ keV/amu

45
91T43 Montenegro, E.C. Meyerhof, W.E.
Phys. Rev. A 44 (1991) 7229 - 7233
Target screening effect on the projectile electron loss probability.
C^{3+},C^{5+} + He -> C^{4+},C^{6+}
time-dependent SCA
$5x10^2$ - $4x10^3$ keV/amu

46
91T44 Nagy, O. Macek, J.H. Miraglia, J.E.
Phys. Rev. A 43 (1991) 5991 - 5996
Impulse approximation in proton-hydrogen collisions.
H^+ + H -> $H^*(nl)$ + H^+ (nl = 1s,2s,2p,3s)
peaked-impulse approximation
$5x10^3$ keV/amu
angular distribution

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91T45 Ostrovsky, V.N.
J. Phys. B 24 (1991) L507 - 512
On the mechanisms for creation of the electron orbital polarization in the charge exchange processes.
B^{3+} + He -> $B^{2+}(2p)$ + He^+
quasi-molecular approx.
polarization due to time lag between electron orbital momentum and internuclear axis.

48
91T46 Riesselmann, K. Anderson, L.W. Durand, L. Anderson, C.J.
Phys. Rev. A 43 (1991) 5934 - 5945
Classical impulse approximation for the electron loss from H(1s) or H^- projectile passing through various gas targets.
H + B -> H^+; H^- + B -> H,H^+ (B = He,Ne,Ar,Kr,Xe,H,N,O)
classical impulse approx.
$9x10^2$ - $1.4x10^6$ keV/amu

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91T47 Saha, B.C. Lane, N.F. Kimura, M.
Phys. Rev. A 44 (1991) R1 - 4
Molecular-state treatment of $He^+(2p)$ excitation through electron capture in He^{2+}-H_2 collisions at low energies.
He^{2+} + H_2 -> $He^+(2p)$
semi-classical MO
0.3 - 23 keV/amu

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91T48 Salin, A.
Comm. At. Mol. Phys. 26 (1991) 1 - 10
Some remarks on the theory of high energy electron capture in ion-atom collisions.

51
91T49 Shimakura, N. Kimura, M.
Phys. Rev. A 44 (1991) 1659 - 1667
Electron capture in collisions of N^{5+} ions with H atoms from the meV to keV energy regions.
N^{6+} + H -> N^{5+}
quantum-mechanical + semiclassical
10^{-5} - 10^1 keV/amu
nl=4s,4p the most dominant

52
91T50 Shingal, R. Lin, C.D.
J. Phys. B 24 (1991) 251 - 264
Calculation of two-electron transition cross sections between fully stripped ions and helium atoms.
A^{Z+} + He -> $A^{(Z-1)+}$ + He^{+}; $A^{(Z-1)+}$ + He^{2+} + e (A = He,Li,C,O,F)
coupled-channel semiclassical IP model with travelling AO
40 - 300 keV/amu (He); 40 - 400 keV/amu(Li); 10^2 - 10^3 keV/amu (C) ; 200 - 10^3 keV/amu (O); 250 - 1500 keV/amu (F)

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91T51 Shingal, R. Lin, C.D.
J. Phys. B 24 (1991) 963 - 975
H(n=2 and 3) density matrices produced in proton-helium collisions at intermediate energies.
H^{+} + He -> H(n=2,n=3lm) + He^{+}
multichannel semiclassical IP + travelling AO
15 - 100 keV/amu

54
91T52 Slim, H.A. Heck, E.L. Bransden, B.H. Flower, D.R.
J. Phys. B 24 (1991) L421 - 424
Ionization and charge transfer in proton-helium collisions.
H^{+} + He -> H + He^{+}
semiclassical impact parameter method
25 - 100 keV/amu
also ionization cross sections given

55
91T53 Slim, H.A. Heck, E.L. Bransden, B.H. Flower, D.R.
J. Phys. B 24 (1991) 1683 - 1694
Charge transfer and excitation in proton-helium collisions.
H^{+} + He -> H(nl = 1s,2s,2p,3s,3p,3d)
semiclassical impact parameter method
10 - 235 keV/amu

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91T54 Taulbjerg, K.
Z. Phys. D 21 (1991) 577 - 580
Status of the theory of electron capture in ion-atom collisions at low and intermediate energies.
review

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91T55 Toshima, N. Eichler, J.
Phys. Rev. Letters 66 (1991) 1050 - 1053
Identification of Thomas peaks in coupled channel calculations for charge transfer.
H^{+} + H(1s) -> H(1s) + H^{+}
coupled-channel calculation
$5x10^3$ keV/amu

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91T56 Wang, Y.D. McGuire, J.H.
Phys. Rev. A 44 (1991) 367 - 372
Orientation dependence in electron capture to arbitrary projectile n states from molecular hydrogen.
O^{8+} + H_2 -> $O^{7+}(n)$
two-center approx.
$5x10^2$ - $1.25x10^3$ keV/amu

59
91T57 Winter, T.G.
Phys. Rev. A 44 (1991) 4353 - 4367
Electron transfer and ionization in proton-helium collisions studied using a Sturmian basis.
$H^+ + He \to H(nl)$ (nl = 2s,2p,3s,3p,3d,total)
coupled-channel approx. with Sturmian basis
50 - 200 keV/amu
$H^+ + He \to H^+ + He^+$

60
91T58 Yu, R.K.
J. Phys. 24 (1991) 1645 - 1653
Electron capture in collisions between protons and the ions He^+ and $Li^{+,2+}$ calculated using a new united atom model.
$H^+ + He^+ \to H(total,1s)$; $H^+ + Li^+,Li^{2+} \to H(total,1s)$
impact parameter method + united-atom model
30 - 200 keV/amu

1
92T 1 Avakov, G.V. Blokhintsev, L.D. Kadyrov, A.S. Mukhamedzhanov, A.M.
J. Phys. B 25 (1992) 213 - 219
Electron capture in proton collisions with alkali atoms as a three-body problem.
$H^+ + Li \rightarrow H(nl: n=1-5, total)$; $H^+ + Na \rightarrow H(2s,2p:total)$
$H^+ + K,Rb \rightarrow H(total)$
Impact parameter method with Fadeev three-body approach
$5x10^{-2}$ - 5x10 keV/amu

2
92T26 Bacchus-Montabonel, M.C.
Phys. Rev. A 46 (1992) 217 - 221
Theoretical study of electron-capture processes in the collision of the metastable $N^{5+}(1s2s)$ multicharged ion on a He target.
$N^{5+}(1s2s) + He \rightarrow N^{4+}(1s2s\ nl=3s,3p,3d)$
$N^{5+}(1s^2) + He \rightarrow N^{4+}(1s^2\ nl=3s,3p,3d)$
MO
3.5 keV/amu

3
92T 3 Bachau, H. Gayet, R. Hanssen, J. Zerarka, A.
J. Phys. B 25 (1992) 839 - 852
Transfer and excitation in ion-atom collisions at high impact velocities ; a unified continuum distorted wave treatment of resonant and non-resonant modes in a four-body approach: II application to the collision $S^{15+}(1s) + H(1s)$.
$S^{15+} + H,Be^{3+},Ne^{9+},S^{15+} \rightarrow S^{14+}(nl,n'l')$
CDW-4B
$2x10^3$ - $2.3x10^4$ keV/amu

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92T 2 Bachau, H. Roncin, P. Harel, C.
J. Phys. B 25 (1992) L109 - 115
Stabilization of autoionizing states during ion-atom collisions.
$O^{8+} + H_2 \rightarrow O^{6+}(n,n')$

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92T53 Belkic, D. Gayet, R. Salin, A.
At. Data and Nucl. Data Tables 51 (1992) 59 - 150
Cross sections for electron capture by fully stripped ions from atomic hydrogen.
$A^{Z+} + H(1s) \rightarrow A^{(Z-1)+}(nlm) + H^+$ { A = H,He,Li,Be,B,C,O }
CDW method
40 - 10000 keV/amu

6
92T54 Belkic, D. Mancev, I.
Phys. Scripta 45 (1992) 35 - 42
Formation of H^- by double charge exchange in fast proton-helium collisions.
$H^+ + He \rightarrow H^- + He^{2+}$
CDW approx.
20 - 1000 keV/amu

7
92T 4 Chen, M.H.
Phys. Rev. A 45 (1992) 4604 - 4609
Resonant transfer and excitation in collisions of chlorine-like ions with H_2 targets.
$Fe^{9+},Nb^{24+},La^{40+} + H_2 \rightarrow Fe^{8+*},Nb^{23+*},La^{39+*}$
Impulse approx. + Multi-configuration Dirac-Fock method
535 - 2100 keV/amu (Fe); $1.4x10^3$ - $4.1x10^3$ keV/amu (Nb);
$2.9x10^3$ - $5.8x10^3$ keV/amu (La)

8
92T 5 Choudhury, K.S. Sural, D.P.
J. Phys. B 25 (1992) 853 - 867
Electron capture in ground and excited states in
proton-alkali-metal-atom collisions.
$H^+ + B \rightarrow H(1s,2s,2p) + B^+$ (B = Na,K,Rb,Cs)
Impulse approx.
50 - 500 keV/amu
angular differential cross sections

9
92T27 Crothers, D.S.F. O'Rourke, S.F.C.
J. Phys. B 25 (1992) 2351 - 2362
Half-way house variational continuum distorted waves and anisotropy in
electron capture to the continuum : The Thomas double scattering limit.
CDW approx.
analytical expressions obtained

10
92T 6 Datta, S.
J. Phys. B 25 (1992) 1001 - 1008
Electron capture by fast protons from carbon,neon and argon in the
Coulomb Born approximation.
$H^+ + B \rightarrow H + B^+(K^-)$ (B = C,Ne,Ar)
Coulomb-Born approx.
10^2 - 2×10^3 keV/amu (C); 3×10^2 - 7×10^3 keV/amu (Ne)
1×10^3 - 2×10^4 keV/amu (Ar)

11
92T28 Dutta, C.M. Lane, N.F. Kimura, M.
Phys. Rev. A 46 (1992) 3889 - 3892
Theoretical study of non resonant $^3He^+ + {}^4He$ $^3He + {}^4He^+$
charge transfer in the threshold region.
$^3He^+ + {}^4He \rightarrow {}^3He + {}^4He^+$; $^4He^+ + {}^3He \rightarrow {}^4He + {}^3He^+$
quantum mechanical cal.
2.5×10^{-7} - 1×10^{-4} keV/amu

12
92T29 Ermalaev, A.M.
J. Phys. B 25 (1992) 3133 - 3144
Mutual neutralization in collisions between negative hydrogen ions and
singly-charged positive ions II : He^+ and Li^+ projectile at low-keV
energies.
$He^+(1s) + H^- \rightarrow He(1snl$: n=2,3,4)
$Li^+(1s^2) + H^- \rightarrow Li(1s^2nl$: n=2,3,4)
two-center AO
0.25 - 25 keV/amu (He^+); 0.07 - 25 keV/amu (Li^+)

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92T55 Errea, L.F. Harel, C. Jouin, H. Maidagan, J.M. Mendez, L. Pons, B.
Riera, A.
Phys. Rev. A 46 (1992) 5617 - 5630
Plane-wave and common-translation-factor treatments of $He^{2+} + H$
collisions at high velocities.
$He^{2+} + H \rightarrow He^+$ (n = 1,2,3)
MO + Plane-wave + Common translation factor method
also excitation to H(n=2,3)

14
92T 7 Errea, L.F. Lopez, A. Mendez, L. Riera, A.
J. Phys. B 25 (1992) 811 - 824
Elastic, inelastic and charge exchange differential cross sections in
$He^+ + H$ collisions.
$He^+ + H \rightarrow He + H^+$
MO with translation factor
0.4 - 6 keV/amu

angle-differential cross sections

15
92T30 Fritsch, W.
Phys. Letters A 166 (1992) 238 - 242
An improved model description for single electron capture processes from H_2 molecules.
$H^+ + H_2 \to H$(total,2s,2p)
close-coupling AO calculation with one-electron potential + two-electron wave function
1.5 - 100 keV/amu

16
92T31 Fritsch, W.
Phys. Rev. A 46 (1992) 3910 - 3917
Model description for single-electron transfer in slow-ion-H_2-molecule collisions : studies for H^+, He^{2+} and C^{4+} projectiles.
$H^+ + H_2 \to H(2p)$; $He^{2+} + H_2 \to He^+, He^+(2s)$
$C^{4+} + H_2 \to C^{3+}$(n=3, 3s,3p,3d)
one-electron potential model + close-coupling calculation
1 - 50 keV/amu (H); 1 - 10^2 keV/amu (He); 4 - 30 keV/amu (C)

17
92T32 Fritsch, W. Lin, C.D.
Phys. Rev. A 45 (1992) 6411 - 6416
One- and two-electron capture in collisions of slow B^{4+} and Be^{4+} ions with helium.
B^{4+} + He -> B^{3+}(2s,2p), B^{2+}(2l2l')
Be^{4+} + He -> Be^{3+}(2s,2p), Be^{2+}(2l,2l')
two-center AO
1.5 - 30 keV/amu

18
92T56 Fukuda, H. Ishihara, T.
Phys. Rev. A 46 (1992) 5531 - 5538
Distorted atomic-orbital expansion for slow ion-atom collisions.
He^{2+} + H -> He^+(n=2,2s,2p) + H^+
distorted AO model
(5 - 50)x10^{-3} keV/amu

19
92T10 Gayet, R. Hanssen, J.
J. Phys. B 25 (1992) 825 - 837
Transfer and excitation in ion-atom collisions at high impact velocities; a unified continuum distorted wave treatment of resonant and non-resonant modes in a four body approach.
general theory
CDW-4B method

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92T57 Glass, J.T. McCann, J.F. Crothers, D.S.F.
J. Phys. B 25 (1992) L541 - 544
Electron capture at semi-relativistic energies: distorted wave models.
general discussion
DW approx.

21
92T 8 Gravielle, M.S. Miraglia, J.E.
Phys. Rev. A 45 (1992) 2965 - 2973
Double-electron capture as a two-step process.
He^{2+} + He($1s^2$) -> He($1s^2$) + He^{2+}; Li^{3+} + He($1s^2$) -> Li^+($1s^2$)
B^{5+} + He($1s^2$) -> B^{3+}($1s^2$)
DW approx.
50 - 700 keV/amu
angular distributions also

22
92T 9 Hansen, J.P.
J. Phys. B 25 (1992) L17 - 22
Dynamics of single- and double-electron capture in C^{4+}-He collisions.
C^{4+} + He -> $C^{3+}(2s,2p,2s^2,2s2p,n=3)$; C^{2+}
two-center closed-coupling method
0.75 - 1.1×10^4 keV/amu

23
92T11 Hansen, J.P. Dubois, A. Nielsen, S.E.
Phys. Rev. A 45 (1992) 184 - 189
Partial cross sections and correlation effects in B^{3+}-He collisions.
B^{3+} + He -> $B^{2+}(2s;2p)$
one-electron model / two-electron model
1 - 500 keV/amu

24
92T58 Hansen, J.P. Nielsen, S.E. Dubois, A.
Phys. Rev. A 46 (1992) R5331 - 5333
Trajectory-interference effects in ion-atom collisions.
H^+ + H -> $H(^2P_{\pm1})$
He^{2+} + H -> $He^+(^2P_{\pm1})$ + H^+
eikonal approx.
50 keV/amu
angular distribution, orientation parameters

25
92T33 Hansen, J.P. Taulbjerg, K.
Phys. Rev. A 45 (1992) R4214 - 4217
Electron correlation in highly-charged ion collisions.
C^{5+} + He -> $C^{3+}(1s2l2l')$
coupled-channel method
2 - 6 keV/amu

26
92T12 Harel, C. Jouin, H.
J. Phys. B 25 (1992) 221 - 237
Double capture into autoionizing states in I^{q+} + He collisions at low impact energies.
N^{7+},O^{8+},Ne^{8+} + He -> N^{5+},O^{6+},Ne^{6+} (nl,n'l')
OEDM
0.8 - 9 keV/amu

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92T13 Jackson, D. Slim, H.A. Bransden, B.H. Flower, D.R.
J. Phys. B 25 (1992) L127 - 130
Excitation and charge transfer in He^+-H collisions.
$^3He^+$ + H -> He + H^+
AO
7 - 300 keV
He^+ + H -> He^+ + $H^*(2p)$

28
92T34 Kahn, Y.
Phys. Letters A 169 (1992) 458 - 462
Transfer excitation with shake-up and target charge effects.
F^{6+} + H_2 -> F^{5+*}
inclusion of shake-up and target charge
7×10^2 - 2.4×10^4 keV/amu

29
92T35 Kazansky, A.K.
J. Phys. B 25 (1992) L381 - 387
The rotation-Stark mechanism of creating large-L Rydberg states in double charge exchange.
production of large L Rydberg states

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92T59 Krstic, P.S. Radmilovic, M. Janev, R.K.
Supplement to Nucl. Fusion 3 (1992) 113 - 125
Charge exchange, excitation and ionization in slow Be^{4+} + H and
B^{5+} + H collisions.
Be^{4+},B^{5+} + H(n=1,2) -> Be^{3+}(total,n)
super promotion model
0.2 - 100 keV/amu

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92T60 Kürpick, P. Ludde, H.J. Sepp, W.D. Fricke, B.
Z. Phys. D 25 (1992) 17 - 21
Application of inclusive probability theory to heavy ion-atom collisions.
Ne^{9+} + Ne -> $Ne^{8+}(1s^2)$ + $Ne^{+}(K^-)$
inclusive probability theory + Independent particle model
130 keV/amu

32
92T14 Kuang, Y.R.
J. Phys. B 25 (1992) 199 - 221
Electron capture by protons and alpha particles from two-electron
targets.
H^{+},He^{2+} + $B^{(Z-2)+}(1s^2)$ -> H(1s),He^{+}(1s) (B = He,Be,B,C,N,O)
He^{2+} + $Li(1s^2)$ -> He^{+}(1s) + $Li^{+}(K^{-1})$
two-orthogonal state expansion method
20 - 2000 keV/amu
scaling $\sigma * Z_t^2/Z_p^5$ - $E/25*Z_p^2$

33
92T36 Kunikeev, Sh.D. Senashenko, U.S.
Sov. Phys. -JETP 75 (1992) 452 - 446
Effect of the target core on electron capture into the continuum of a fast
neutral atom.
He + He -> He + He^{+}
target ion core model
25 - 125 keV/amu

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92T61 Kurpick, P. Sepp, W.D. Fricke, B.
J. Phys. B 25 (1992) 5431 - 5437
Inclusive probability calculations for the K-vacancy transfer in
collisions of S^{15+} on Ar.
S^{15+}(1s) + Ar -> $S^{14+}(1s^2)$ + $Ar^{+}(K^-)$
CC with relativistic HFS
146 - 500 keV/amu

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92T15 Lewartowski, E. Coubin, C.
J. Phys. B 25 (1992) L63 - 68
Classical model of electron capture from oriented sodium atoms.
H^{+} + Na^{*}(3pm) ->
CTMC
1 - 3 keV/amu

36
92T37 Lundsgaard, M.F.V. Lin, C.D.
J. Phys. B 25 (1992) L429 - 434
Reduced close-coupling calculations for electron capture processes in
collisions of multiply charged ions with atoms.
C^{6+} + H -> C^{5+}(n=4,5)
semiclassical IP
0.1 - 30 keV/amu

37
92T38 Macek, J. Ovchinnikov, S.Y.
Phys. Rev. Letters 69 (1992) 2357 - 2359
Anomalous n dependence of low energy electron capture from atomic hydrogen by multicharged ions.
O^{5+} + H(n) -> O^{4+} + H^{+}
(8 - 800)x10^{-3} keV/amu
$\sigma \sim n^{7}$

38
92T39 Martinez, A.E. Bullrich, J.A. Maidagan, J.M. Rivarola, R.D.
J. Phys. B 25 (1992) 1883 - 1891
The continuum distorted-wave-eikonal initial state model for single electron capture in ion-atom collisions.
H^{+} + H,He -> H(2s,2p)
continuum CDW-eikonal approx.
20 - 10^{3} keV/amu

39
92T40 Marxer, H. Briggs, J.S.
J. Phys. B 25 (1992) 3823 - 3848
Total cross sections for K-K electron transfer in fast ion-atom collisions ; the impulse and strong potential Born approximations.
H^{+} + B -> H(1s) + $B^{+}(K^{-1})$ (B = C,Ne,Ar)
He^{2+} + Ne -> He^{+}(1s) + $Ne^{+}(K^{-1})$
Li^{3+} + C -> Li^{2+}(1s) + $C^{+}(K^{-1})$
C^{6+} + Ar -> C^{5+}(1s) + $Ar^{+}(K^{-1})$
strong potential Born , IP approx.
300 - 15000 keV/amu

40
92T16 Maynard, G. Janev, R.K. Katsonis, K.
J. Phys. B 25 (1992) 437 - 444
Electron capture and ionization in collisions of multicharged neon ions with atomic hydrogen.
Ne^{q+} + H -> $Ne^{(q-1)+}$ + H^{+} (q = 3 - 10)
CTMC
10 - 10^{3} keV/amu
also Ne^{q+} + H -> Ne^{q+} + H^{+} + e; scaling over q / energy

41
92T17 McCann, J.F.
J. Phys. B 25 (1992) 449 - 461
The distorted-wave impulse approximation for electron capture processes at intermediate collision energies.
H^{+} + H -> H + H^{+}; Li^{3+} + Ne -> Li^{2+} + $Na^{+}(K^{-1})$
DW-Impulse approx.
50 - 800 keV/amu (H); 2x10^{2} - 6x10^{3} keV/amu (Li)

42
92T41 Moiseiwitsch, B.L.
J. Phys. B 25 (1992) L487 - 489
Ultra-high relativistic energy limit for electron capture.
3rd order OBK approx.

43
92T42 Moiseiwitsch, B.L.
J. Phys. B 25 (1992) 3015 - 3020
Fine structure constant expansions for electron capture.
H^{+} + H -> H + H^{+}; C^{6+} + Au -> C^{5+}(1s) + $Au^{+}(K^{-1})$
Ne^{10+} + B -> Ne^{9+}(1s) + $B^{+}(K^{-1})$ (B = Al,Zn,Ag,Ta,Au)
Ar^{18+} + B -> Ar^{17+}(1s) + $B^{+}(K^{-1})$ (B = Cu,Ag,Ta,Au)
1st and 2nd Born + eikonal approx.
10^{4} - 10^{6} keV/amu (H); 4x10^{5} - 10x10^{5} keV/amu

44

92T43 O'Rourke, S.F.C. Crothers, D.S.F.

Z. Phys. D 24 (1992) 165 - 169

Half way house variational continuum distorted wave theory : high energy cross sections in the distorted wave perturbation approximation.

$H^{+} + H \rightarrow H(1s) + H^{+}$

CDW approx. + perturbation theory

45

92T44 Pieksman, M. Ovchinnikov, S.Yu.

J. Phys. B 25 (1992) L373 - 380

Asymptotic dependence of the electron capture cross section on the n quantum number in slow He^{2+}-H collisions.

$He^{2+} + H \rightarrow He^{+}(n \leq 30)$

superpromotion model

1 - 25 keV/amu

46

92T18 Sakabe, S. Izawa, Y.

Phys. Rev. A 46 (1992) 1704

Simple formula for the cross sections of resonant charge transfer between atoms and their positive ions at low impact velocity.

$A^{+} + A \rightarrow A + A^{+}$

impact parameter method

$4.7x10^{-5}$ - 46 keV/amu

correction to Phys. Rev. A 45 (1992) 2086

47

92T19 Salin, A.

J. Phys. B 25 (1992) L137 - 143

Comments on strong potential Born expansions for ion-atom collisions.

strong potential Born approx.

48

92T45 Schultz, D.R. Reinhold, C.O. Olson, R.E. Seely, D.G.

Phys. Rev. A 46 (1992) 275 - 283

Differential cross sections for state-selective electron capture in 25 - 100 keV proton-helium collisions.

$H^{+} + He \rightarrow H(2s,2p,3s,3p,4s,4p)$

CTMC

25 - 100 keV/amu

49

92T46 Schultz, D.R. Reinhold, C.O. Olson, R.E.

Phys. Rev. A 46 (1992) 666 - 669

Classical calculation of high-energy electron capture in 5 MeV proton-hydrogen collisions.

$H^{+} + H \rightarrow H$

CTMC

$5x10^{3}$ keV /amu

angular distribution

50

92T20 Shimakura, N. Itoh, M. Kimura, M.

Phys. Rev. A 45 (1992) 267 - 275

Molecular treatment of electron capture in collisions of N^{4+} ions with H atoms.

$N^{4+} + H \rightarrow N^{3+}(2s3s;2s3p;2s3d;2p3s)$

MO

$1x10^{-3}$ - 10 keV/amu

51
92T47 Shimakura, N. Koizumi, S. Suzaki, S. Kimura, M.
Phys. Rev. A 45 (1992) 7876 - 7882
Molecular treatment of electron capture in atomic collisions in the meV- to keV-energy regime : collsions of C^{5+} ions with H atoms and the effect of core electrons.
$C^{5+}(1s)$ + H -> $C^{4+}(1snl)$
quantum mechanical + MO methods
1×10^{-5} - 0.8 keV/amu

52
92T21 Sizun, M. Grimbert, D. Sidis, V. Baer, M.
J. Chem. Phys. 96 (1992) 307 - 325
Vibrational state-to-state calculations of H^+ + O_2 charge tarnsfer collisions.
$H^+ + O_2(X^3\Sigma_g^-;v)$ -> H + $O_2^+(X^2\Pi_g,v'')$
quantal infinite order sudden approx. + vibronic semiclassical approx.
2×10^{-2} keV/amu
also $H^+ + O_2(X^3\Sigma_g^-,v')$

53
92T23 Toshima, N.
Phys. Rev. A 45 (1992) R2663 -
Absence of the Thomas peak in the classical-trajectory Monte Carlo calculations for proton-hydrogen collisions in the MeV region.
H^+ + H -> H + H^+
CTMC
2.8×10^3,5×10^3 keV/amu

54
92T48 Toshima, N. Eichler, J.
Phys. Rev. A 46 (1992) 2564 - 2571
Nonperturbative treatment of the Thomas mechanism in electron capture.
H^+ + H -> H + H^+
nonperturbative coupled-channel calculation
(1 - 5)$\times10^3$ keV/amu
angular distributions

55
92T49 Toshima, N. Igarashi, A.
Phys. Rev. A 45 (1992) 6313 - 6317
Second Born approximation differential cross sections for p + H and p + He charge exchange collisions.
H^+ + H -> H + H^+; H^+ + He -> H + He^+
exact 2nd Born approx.
1×10^3 - 2.8×10^3 keV/amu (H); 2.8×10^3 - 7.4×10^3 keV/amu (He)

56
92T22 Toshima, N. Shingal, R. Lin, C.D.
J. Phys. B 25 (1992) L11 - 15
Orientation parameters and dipole moments of $He^+(n=2)$ states in He^{2+} + H collisions : comparison of CTMC and close-coupling results.
He^{2+} + H -> $He^+(n=2)$
CTMC + closed-coupling expansion
10,25,50 keV/amu

57
92T50 Vaeck, N. Hansen, J.E.
J. Phys. B 25 (1992) 3267 - 3282
Competition between radiative and non-radiative decay processes in triply-excited 3l3l'nl'' and doubly-excited 2lnl' states in nitrogen ions.
N^{7+} + Ar -> $N^{4+}(3l3l'nl'')$, $N^{5+}(2lnl')$
CI approx.
radiative and non-radiative decay rates

58
92T51 Vaeck, N. Hansen, J.E.
J. Phys. B 25 (1992) 3613 - 3619
Calculations of autoionization rates for double-Auger decay of multiply-excited states in nitrogen.
double-Auger rates for $N(K^{-2})$ states

59
92T24 Vitanov, N. Panev, G.
J. Phys. B 25 (1992) 239 - 248
Generalization of the Demkov formula in near-resonant charge transfer.
Li^{+} + Na -> Li; K^{+} + Rb -> K
generalized Demkov formula

60
92T25 Winter, T.G.
Phys. Rev. A 45 (1992) 1562 - 1568
Coupled-Sturmian and perturbative treatments of electron transfer and ionization in high energy p-He^{+} collisions.
H^{+} + He^{+} -> H + He^{2+}; H^{+} + He^{2+} + e
coupled-Sturmian approx.
225 - 2000 keV/amu

61
92T52 Zygelman, B. Cooper, D.L. Ford, M.J. Dalgarmo, A. Gerratt, J. Raimondi, M.
Phys. Rev. A 46 (1992) 3846 - 3854
Charge transfer of N^{4+} with atomic hydrogen.
N^{4+} + H -> $N^{3+}(2s3l)$ (l = 0,1,2)
close-coupling MO calculation
0.007 - 0.6 keV/amu
also rate coefficient

List of finding references for particular collision partners

an example :

H <--- projectile ion

q = -1 : 77E12(He)

charge ↓ reference number ↓ (target) ↘

(the first two numbers indicate the year of publication)

(E:experiment, T:theory)

Atomic ion species

H

q = -1 : 77E12(He,Ar,Xe,N_2), 81E21(H,He,Ne,Ar,H_2,N_2), 81E24(Na), 83E54(H_2), 84E52(He,Ne,Ar), 85E74(Na,H_2), 86E62(He,Ar,Xe), 87E2(He,Ne,Ar), 87E23(H,H_2), 87E75(Na,K), 87E76(Cs), 88E51(Li,Na,Mg,Ca,Sr,Cs), 90E19(N_2), 90E20(H), 91E17(Na(3s),Na^*(3p)), 91E50(H^-)
; 83T41(Ne), 84T42(Cs^+), 88T23(Na), 91T46(He,Ne,Ar,Kr,Xe,H,N,O)

q = 0 : 79E15(Na,K,Cs), 79E24(H, H_2), 80E14(Na,K,Rb,Cs), 82E23(Cs,N_2), 83E31(Ca,Sr), 84E22(Na), 84E49(O,O_2), 85E1(Mg), 86E13(He,Ne,Ar,Kr,Xe, H_2), 87E2(He,Ne,Ar), 87E20(Na,K,Rb), 87E24(H,H_2), 88E28(H_2,N_2,O_2,CO, CH_4), 88E51(Li,Na,Mg,Ca,Sr,Cs), 88E54(N_2,O_2), 89E18(He), 89E43(Ar), 90E19(N_2), 91E37(Ne,Ar), 91E53(H_2,N_2,O_2,He,Ar)
; 79T4(H), 80T2(H), 85T48(Na), 86T5(Na), 86T27(Na), 87T51(H), 88T62(Cs), 89T44(Ne), 90T41(He,Ne,Ar), 90T22(H), 90T29(H,Ar), 91T42(H_2), 91T46(He,Ne,Ar,Kr,Xe,H,N,O)

q = 1^* : 79E6(He,Ne,Ar,Kr), 84E49(O,O_2)
; 90T41(He,Ne,Ar)

q = 1 : 69E1(N_2), 74E1(Ar), 77E1(N,O,Ne), 77E5(Cs), 78E14(He,Ne,Ar,Kr,Xe), 79E10(CO,CO_2,N_2O), 79E11(Mg,Ar,Ba), 79E12(Mg,Ar,Ba), 79E15(Na,K,Cs), 79E18(Cs), 79E19(Ne,Ar,CH_4), 80E12(Cs), 80E14(Na,K,Rb,Cs), 80E18(He, Ne,Ar,H_2,N_2,O_2), 80E23(Ar), 80E24(CH_4,C_2H_2,C_2H_4,C_2H_6,C_3H_6,C_3H_8), 82E2(CH_4,C_2H_2,C_3H_6,C_4H_8), 82E10(He), 82E25(Na,K,Rb,Cs), 82E28(C,Ne), 82E29(C,Ne,Ar), 82E30(C), 82E32(H,D), 82E40(H_2), 83E28(He,Ne,Ar,Kr,Xe, Hg,H_2,N_2,O_2,NO,CO_2,SO_2,NO_2,NH_3,CH_4,C_2H_2), 83E31(Ca,Sr), 83E35(C^+,N^+), 83E40(Ar), 83E41(He), 83E44(He,Ne,Ar,Kr,H_2,N_2,CO,CH_4,CO_2), 84E4(Li), 84E7(Na,K), 84E16(Ne,Ar,Kr), 84E17(Mg), 84E21(H_2), 84E42(H^-), 84E46(Li), 84E49(O,O_2), 84E54(He), 85E3(Kr), 85E4(Li), 85E5(Li), 85E7(Cs), 85E33(Li), 85E34(Li,Na,Mg), 85E37(Ar), 85E41(CO,CH_4,C_2H_6, C_3H_8), 85E44(H_2,D_2), 85E49(C), 85E55(H^-), 85E59(He^+), 85E63(C,N), 85E65(Li), 85E69(Hg), 85E71(Ne,CH_4,C_2H_2,C_2H_4,C_2H_6,C_3H_6,$(CH_2)_3$,C_3H_8, C_4H_8,O_2,CO,CO_2,CF_4,C_2F_6,SF_6), 86E18(Ne,Na,Mg), 86E19(K), 86E20(H_2,D_2), 86E23(He), 86E24(He,Ar), 86E27(Ne), 86E28(He), 86E37(H), 86E43(Na,K, Rb,Cs), 86E63(H), 86E68(H_2,D_2), 86E70(He), 86E78(O_2), 86E81(He,Ne,Ar, Kr,Xe), 87E2(He,Ne,Ar), 87E5(Na,Na(3p)), 87E6(Na), 87E11(Kr), 87E20(Na,K,Rb), 87E22(H_2O), 87E23(H,H_2), 87E26(He,Ne,Ar), 87E28(He,Ne, Ar), 87E29(He), 87E32(C^+,N^+), 87E34(Ne), 87E43(He), 87E53(He), 87E56(CO_2,N_2O), 87E57(H_2), 87E64(H^-), 87E65(H^-), 87E68(H,He,H_2), 87E73(He,Ne,Kr,Xe), 87E74(Li,CH_4,C_2H_2,C_2H_4,C_2H_6,C_3H_6,C_6H_{12},C_3H_8,C_4H_8, CO,CO_2), 87E83(Xe), 87E86(CH_4), 88E3(^{22}Ne), 88E7(CH_4), 88E13(Na), 88E51(Li,Na,Mg,Ca,Sr,Cs), 89E2(He), 89E13(He), 89E17(Cs), 89E33(He), 89E34(Ne,Ar,Kr,Xe), 89E40(Kr,Xe), 89E53(He), 89E57(H_2), 89E65(H_2), 90E2(He), 90E12(Na(3s),Na^*(3p)), 90E13(N_2,O_2,CO,CO_2,NO,CH_4), 90E22(Mg) 90E19(N_2), 90E36(Ar), 90E40(Na^*(3p)), 90E50(CO), 91E15(H), 91E13(He), 91E19(H_2), 91E21(K), 91E22(Na(3s),Na^*(3p)), 91E20(Li,Na,K), 91E24(Ne), 91E28(Sr^+,Ba^+), 91E29(Tl^+), 92E19(Na(Na^*(3p)), 91E34(Ar), 92E34(Na(3s),Na^*(3p)), 92E38(He,Ne,Ar), 92E39(He), 92E40(Mg), 92E50(He), 92E53(H^-)

; 62T1(H), 73T1(Ar), 74T1(H), 75T1(Ar), 75T4(H), 76T4(He,Ar), 77T1(H), 77T2(H), 77T3(He), 77T4(H), 77T8(H), 77T12(H), 77T13(H), 78T3(H), 78T8(C,N,O,Ne,Ar), 78T9(H^-), 78T10(H), 78T11(H), 78T13(H), 78T17(Cs), 78T19(He,Ar), 79T2(Li), 79T5(He), 79T9(H,He), 79T10(H(2s)), 79T15(Ar), 79T18(He), 79T19(Ar), 79T21(H), 79T22(H), 79T23(H), 79T24(He^+,Li^{2+}), 79T25(H,He,Ar), 79T26(H_2), 79T28(H), 79T29(H), 79T31(H), 79T35(H), 79T37(He^+,Li^{2+},C^{5+}), 80T1(C,Ne,Ar), 80T8(O), 80T17(C,N,O,Ne,Ar), 80T20(Ne,Ar,Kr), 80T21(Ne^{9+},Ca^{19+}), 80T23(H), 80T24(H,Cu^{28+}), 80T25(He^+,Li^{2+},Be^{3+},C^{5+}), 80T28(He), 80T29(H), 80T31(H), 81T1(H^-), 81T3(He^+), 81T4(Ar), 81T5(H,He), 81T8(H), 81T10(He), 81T12(H), 81T14(C,Ne), 81T19(H), 81T20(He,C,Ar,N_2,O_2), 81T21(H), 81T22(Ne,Ar), 81T23(H), 81T25(Na,K,Rb), 81T26(H), 81T27(Ar), 81T30(H), 81T34(H^-), 81T36(H), 81T37(H,He), 82T4(H,Ne), 82T7(H), 82T10(Li^+,Li^{2+}), 82T12(H), 82T13(H,He^+), 82T18(H), 82T20(Na), 82T21(Na,K,Rb,Cs), 82T22(H), 82T23(H), 82T28(Li), 82T30(He^+), 82T31(H), 82T32(H), 82T34(He), 83T1(Li), 83T2(C,Ne,Ar), 83T5(H^-), 83T10(Li), 83T12(Li), 83T13(H), 83T14(H), 83T17(H), 83T26(H), 83T30(H,Be,C,O,Ne), 83T37(H^-), 83T38(H,He), 83T40(Li), 84T2(C,Ni), 84T3(C,Ni), 84T10(He), 84T12(H), 84T13(He^+), 84T14(He), 84T19(Na,K), 84T24(H(2s,2p)), 84T25(H,He,C^{5+}), 84T2(H), 84T30(H), 84T34(Ne), 84T36(H,He,He^+), 84T39(H,He), 84T40(C,O), 84T41(H,He^+), 84T42(Cs), 84T45(H), 84T46(He,C,Ne,He^+,Ne^{9+}, Ar^{17+}), 84T47(He,H_2), 84T53(He), 84T58(H), 84T59(H_2), 85T5(H), 85T10(H), 85T11(H), 85T29(Ne,Si,Ni), 85T31(He), 85T32(H_2), 85T33(He^+), 85T34(H), 85T36(H,Cs), 85T38(He), 85T41(He), 85T42(H), 85T45(H,He,C, Ne,Ar,Xe), 85T46(H), 85T50(C,N,O,Ne,Ar), 85T51(H^-), 85T52(He), 85T54(He), 86T1(Na), 86T2(Na), 86T6(H^-), 86T9(H), 86T10(Na), 86T12(He), 86T16(C,Ar), 86T17(H(2s)), 86T22(H,He), 86T23(H), 86T25(Ar), 86T34(H), 86T41(He), 86T42(H), 86T56(H), 86T58(H^-), 86T61(He^+,Li^{2+}), 86T62(He), 86T66(H), 86T71(H,He), 86T73(H), 86T77(He,C,N), 87T5(H), 87T6(H(2s)), 87T7(H), 87T10(C,Ne,Ar), 87T11(H,B^{4+}), 87T14(H), 87T15(Li^{2+}), 87T22(He), 87T24(C,N,O,Ne,Ar), 87T31(H), 87T32(He), 87T33(He), 87T34(C), 87T39(H), 87T45(H), 87T46(H(2s)), 87T47(He), 87T52(H^-), 87T53(Na), 87T55(He), 87T56(He^+,Li^{2+},Be^{3+},B^{4+},C^{5+}), 87T59(H), 87T62(CO_2), 87T65(Li), 88T1(C,Ar), 88T2(H,He), 88T3(Ne), 88T4(H_2), 88T5(He,N,O), 88T7(H(2s)), 88T9(He,Li), 88T12(H^+,U^{92+}), 88T13(H), 88T14(N,O,Ar), 88T15(H^-), 88T24(H,O,Ne,Ar), 88T26(O_2), 88T27(He^+,Li^{2+},Be^{3+},B^{4+},C^{5+}), 88T31(He), 88T37(H), 88T38(Ne), 88T39(C,O,Ne), 88T48(H), 88T51(H,He^+, Li^{2+}), 88T56(He), 88T64(He^+), 88T67(H,He^+,Li^{2+}), 89T1(H,He), 89T5(H_2), 89T7(H,He), 89T8(H), 89T10(He,Li), 89T14(He,C,), 89T15(H,He), 89T16(H), 89T25(H_2), 89T35(Ne,He^+), 89T36(C), 89T45(H_2), 89T46(H_2), 89T48(H), 89T49(H), 89T50(H_2), 90T1(Na^*(3p)), 90T4(H,He), 90T10(Na(3s),Na^+(3p)), 90T11(H), 90T12(Ne), 90T20(O_2), 90T31(H_2,He), 90T33(Na(3s),Na^*(3p))), 90T35(H,He^+,Li^{2+}), 90T36(H^-), 90T37(He), 90T38(He^+), 90T39(Ar), 90T40(H), 91T7(H), 91T11(H), 91T17(Na), 91T24(H,He,C,Ne,Ar), 91T25(H), 91T28(C), 91T34(He), 91T35(Be^{2+},B^{4+},C^{5+},N^{6+},O^{7+}), 91T36(He^+,Li^+,Li^{2+}), 91T37(N,O,Ne), 91T38(C,N,O,Ne,Ar), 91T44(H), 91T50(He), 91T52(He), 91T53(He), 91T55(H), 91T57(He), 91T58(He^+,Li^+,Li^{2+}), 91T59(He^+), 92T1(Li,Na,K.Rb), 92T5(Na,K,Rb,Cs), 92T6(C,Ne,Ar), 92T14(He,Be^{2+},B^{3+},C^{4+},N^{5+},O^{6+}), 92T15(Na^*(3p)), 92T17(H), 92T21(O_2), 92T23(H), 92T25(He^+), 92T30(H_2), 92T31(H_2), 92T39(H,He), 92T40(C,Ne,Ar), 92T42(H), 92T43(H), 92T45(He), 92T46(H), 92T48(H), 92T49(H), 92T53(H), 92T54(He), 92T58(H)

D

q = -1 : 80E17(Na,Rb,Cs), 83E54(H_2), 87E14(Cs), 87E75(Na,K), 87E76(Cs), 90E20(H)
; 83T41(Ne)

q = 0 : 80E17(Na,Rb,Cs), 87E14(Cs),

q = 1 : 79E13(Mg,Ca,Sr,Ba), 80E17(Na,Rb,Cs), 82E32(H,D), 87E14(Cs), 91E20(Li,Na,K)

He

q = 0 : 82E37(H_2), 86E61(H_2), 89E66(He,Ar), 90E45(H_2,O_2,CH_4,CO,CO_2), 92E35(Zn)
; 89T54(Ne), 92T36(He)

q = 1 : 63E1(N_2,O_2), 65E1(N_2,O_2), 70E2(N_2), 76E2(He), 76E11(He,Ar,Kr,H_2,N_2, O_2), 76E12(He,Ar,Kr,H_2,N_2,O_2), 77E3(Ne,Ar), 77E5(Cs), 78E3(He), 78E14(He,Ne,Ar,Kr,Xe), 79E8(Ar), 79E20(He), 81E16(Na,K,Rb,Cs), 82E7(He,Ne,Ar,N_2), 82E22(Li), 82E37(Hg), 82E37(H_2), 83E19(Ne), 83E23(O_2), 83E33(Xe), 83E39(He^+), 83E47(Cs), 84E15(He,Ne,N_2,Sr), 84E16(Ne,Ar,Kr), 84E46(Li), 85E5(Li), 85E6(Li), 85E33(Li), 85E34(Li,Na,Mg), 85E62(H_2O), 85E76(Cd), 86E2(O_2), 86E18(Ne,Na,Mg), 86E66(He^+), 86E67(B^+), 87E11(Xe), 87E17(He,Ar,H_2), 87E18(Li,Na), 87E54(He^+), 87E93(He^+), 87E96(N_2), 88E9(He,Ne,Ar,Kr), 88E10(He,Ne,Ar, Kr), 88E11(H,D_2), 88E24(Xe), 88E33(Ne), 88E41(Na), 88E59(H_2), 89E29(Na), 89E34(Ne,Ar,Kr,Xe), 89E54(H_2), 90E13(H_2,N_2,O_2,CO,NO), 90E34(H_2,N_2,O_2,CO,CO_2,N_2O,CH_4,C_2H_2,C_2H_4,C_2H_6), 90E46(He^+), 91E2(He,Ne,Ar), 91E15(H), 91E16(H_2), 92E35(Zn)
; 62T1(He), 78T15(Ar,Cd,Cs), 78T16(Li), 79T4(H), 79T17(He,Ne,Ar,Kr,Xe), 81T24(He^+), 81T28(H), 81T35(Na,K,Rb,Cs), 83T11(H), 83T18(H), 83T28(H), 83T43(Rb), 83T44(Hg), 83T45(Hg), 84T9(Li), 85T59(H,He^+), 85E71(Ne,CH_4, C_2H_2,C_2H_4,C_2H_6,C_3H_6,$(CH_2)_3$,C_3H_8,C_4H_8,O_2,CO,CO_2,CF_4,C_2F_6,SF_6), 86T12(Li^+), 86T14(He^+), 86T31(He^+), 86T63(Ne), 86T70(Zn,Cd), 87T17(H^+), 87T20(He^+), 87T36(^3He), 87T69(Cd), 88T18(H), 88T20(He), 88T47(Na), 89T22(H), 89T24(He^+), 89T42(CO_2), 89T51(H), 89T54(Ne), 90T15(H^+), 90T16(Na), 90T32(Na^*(3p)), 91T29(H_2,He), 91T33(H_2), 91T42(H_2), 92T7(H), 92T28(He), 92T29(H^-)

q = 1^*: 85T54(H,He^+(2s)),

q = 2 : 75E1(He), 75E2(H), 75E3(He), 76E11(H,He,Ar,Kr,K,H_2,N_2,O_2), 78E4(He,Ne,

Kr), 78E5(H,H_2), 78E8(H,H_2), 79E7(He,Ne,Ar,Kr,Xe), 81E2(Li), 82E7(He,Ne,Ar,N_2), 82E9(Ne,Ar,Kr,Xe), 82E13(Li), 82E14(Li), 82E17(C), 82E19(Ne), 82E22(Li), 82E24(Li), 82E29(C,Ne,Ar), 82E40(H_2), 83E15(Ne, Ar,Kr,Xe,N_2), 83E23(O_2), 83E28(He,Ne,Ar,Kr,Xe,Hg,H_2,N_2,O_2,NO,CO_2,SO_2, NO_2,NH_3,CH_4,C_2H_2), 83E33(Xe), 83E53(Li), 84E8(Li), 84E15(He,Ne,N_2,Sr), 84E31(Ne,Ar,N_2), 84E46(Li), 85E20(H), 85E21(H,H_2), 85E26(Li), 85E33(Li), 85E61(He,Ne,Ar,H_2,N_2, O_2,CO,CO_2,CH_4,H_2O), 85E65(Li), 86E4(He,Ne,Ar,Kr), 86E18(Ne,Na,Mg), 86E19(K), 86E46(H^-), 86E51(Li), 86E60(H^-), 86E70(He), 87E19(He,Ne,Ar,Kr), 87E43(He), 87E53(He), 87E78(O_2), 87E79(He), 88E9(He,Ne,Ar,Kr), 88E10(He,Ne,Ar,Kr), 89E4(Li), 89E6(Ar,N_2), 89E28(H,H_2), 89E38(Ne,Ar), 89E53(He), 89E57(H_2), 90E10(Xe), 90E25(He,H_2), 90E49(Li,Na,K), 90E50(CO), 91E3(Na(3s),Na^*(3p)), 91E10(H^-), 91E11(H^-), 91E15(H), 91E16(H_2), 91E25(H), 91E38(D_2,N_2,O_2), 91E48(He), 92E1(Na^*(3p)), 92E11(He), 92E16(H,H_2), 92E17(He), 92E49(Na(3s),Na^*(3p)), 92E18(Li), 92E26(O,O_2), 92E30(H_2,He), 92E35(Zn), 92E37(Na), 92E40(Mg)
; 74T2(H), 77T3(He), 77T4(H), 77T5(H), 77T12(H), 77T13(H), 77T14(H), 78T2(H^-), 78T3(H), 78T10(H), 78T11(H), 78T13(H), 78T18(H), 79T3(He), 79T10(H(2s)), 79T16(H), 79T18(He), 79T25(H,He,Ar), 79T27(Cu), 79T31(H), 79T38(He), 80T3(Ar), 80T4(H), 80T11(H), 80T12(H), 80T15(He), 80T16(He), 80T31(H), 80T33(H), 81T2(Li), 81T3(H), 81T4(Ar), 81T8(H), 81T9(H), 81T12(H), 81T13(H), 81T14(C,Ne), 81T16(He), 81T20(He,C), 81T24(H), 81T30(H), 82T24(H), 82T28(Li), 82T30(H), 82T35(H), 82T36(H), 83T7(H), 83T9(He), 83T12(Li), 83T17(H), 83T20(H), 83T27(He), 83T30(He), 83T40(Li), 84T14(He), 84T15(He), 84T16(H,Li), 84T17(Li), 84T22(H), 84T41(H), 84T43(H), 84T52(Li,Be,B,C,Ne,Na,Mg,K,Ar,Cs), 84T54(H), 85T7(He,Li,Ar,Kr), 85T17(H), 85T22(Li), 85T29(O,Ne,Si), 85T36(Li), 85T52(He), 85T54(He), 85T57(H), 85T62(H), 86T13(Li,Li(2s)), 86T16(H,C), 86T42(He), 86T77(H,C,N), 87T4(Li), 87T5(H), 87T6(H(2s)), 87T9(He), 87T16(Li,Li(2P)), 87T17(H), 87T18(H), 87T22(He), 87T23(He), 87T25(He), 87T50(Na), 87T57(H), 88T16(He), 88T19(H), 88T34(He), 88T39(C,O,Ne), 88T51(H), 88T59(H^-), 88T64(H), 88T65(H), 88T67(H), 89T6(He^+), 89T10(He,Li), 89T14(Li), 89T24(He), 89T32(He), 89T45(H_2), 89T54(Ne), 89T55(H), 90T4(H), 90T21(H), 90T26(Na), 90T28(C,Ne), 90T31(H_2,He), 90T35(H), 91T18(He), 91T19(H), 91T23(He), 91T31(H^*(2s)), 91T35(Be^{2+},B^{4+},C^{5+},N^{6+},O^{7+}), 91T37(Ne), 91T38(Ne), 91T39(He), 91T47(H_2), 91T50(He), 92T8(He), 92T14(He,Li^+,Be^{2+},B^{3+},C^{4+},N^{5+},O^{6+}),

92T22(H), 92T31(H_2), 92T40(Ne), 92T44(H), 92T53(H), 92T55(H), 92T56(H), 92T58(H)

Li

q = -1 : 84E52(He,Ne,Ar)

q = 0 : 86E58(Cs)

q = 1 : 69E1(N_2), 76E5(He,Ar), 79E9(Li); 82E40(H_2), 84E48(Li^+), 85E24(Mg,Ca,Sr,Ba), 86E74(He), 87E59(H^-), 87E102(Ne), 88E52(Ar,Kr), 90E63(He,Ne,Ar), 91E52(H,H_2) ; 76T8(Li), 80T10(H), 81T32(Li), 82T8(Li^+), 82T9(Li^+), 82T19(H), 83T24(Ca), 84T5(H), 84T49(Li), 84T55(Na), 86T38(He), 86T55(Na), 86T59(He), 87T8(Li^+), 88T17(H), 88T54(Li), 88T55(Be^+), 90T30(H^-), 92T24(Na), 92T29(H^-)

q = 2 : 82T10(H), 82E40(H_2), 91E30(H_2,He), 91E52(H,H_2,He) ; 54T2(H), 80T10(H), 82T19(H), 84T5(H), 84T43(H), 85T18(H), 86T47(Li), 87T28(H), 91T8(H), 91T42(H_2)

q = 3 : 79E15(Na,K,Cs), 82E29(C,Ne,Ar), 82E40(H_2), 87E53(He) ; 77T5(H), 77T12(H), 77T13(H), 78T11(H), 78T20(He), 79T30(H), 79T31(H), 80T4(H), 80T10(H), 81T6(H), 81T8(H), 81T12(H), 81T14(C,N), 81T20(C,Ne), 81T29(H), 81T30(H), 82T3(H), 82T4(Ne^{9+}), 82T6(H), 82T10(H), 82T14(H), 82T24(H), 82T27(H), 82T32(H), 82T33(H), 83T13(H), 83T16(H), 83T20(H), 83T25(H), 84T5(H), 84T11(H,H(2s)), 84T43(H), 84T52(H,He,Li,Be,B,C,Ne, Na,Mg,K,Ar,Cs), 84T53(He), 84T54(H), 85T2(Li,Na), 85T6(H), 85T52(He), 85T54(He), 86T13(He), 86T16(C), 86T28(He), 86T46(He), 86T52(He), 86T77(C,N), 87T5(H), 87T6(H(2s)), 87T22(He), 87T25(He), 88T6(He), 88T39(C,O,Ne), 88T51(H), 88T67(H), 89T41(Li), 90T28(C,Ne), 90T31(H_2,He), 90T35(H,Li^{2+}), 91T8(H), 91T50(He), 92T8(He), 92T17(Ne), 92T40(C), 92T53(H)

Be

q = 1 : 79E17(He,Ne), 88E14(He), 92E54(H,H_2,He)

q = 2 : 90E53(H_2,Be), 92E54(H,H_2,He) ; 54T1(H), 86T60(H), 88T55(Li), 89T6(Be^+)

q = 3 : 92E54(H,H_2,He) ; 78T20(He), 88T53(H)

q = 4 : 92E54(H,H_2,He) ; 77T4(H), 77T5(H), 77T9(H), 77T12(H), 77T13(H), 78T3(H), 78T11(H), 79T10(H(2s)), 79T13(H), 79T30(H), 80T4(H), 81T8(H), 81T30(H), 82T2(H), 82T24(H), 82T27(H), 83T20(H), 83T25(H), 83T30(Be), 84T22(H), 84T37(H), 84T53(He), 84T54(H), 84T57(H), 85T58(H), 86T45(He), 87T5(H), 91T8(H), 92T32(He), 92T53(H), 92T59(H(1s),H^*(2s))

B

q = 1 : 83E23(O_2), 92E54(H,H_2,He)

q = 2 : 86E47(H^-), 92E54(H,H_2,He)
; 54T2(H), 80T9(H), 91T8(H)

q = 3 : 71E1(He), 77E2(He), 82E12(He), 83E29(He), 90E42(He), 92E54(H,H_2,He)
; 77T13(H), 77T16(He), 78T12(H), 78T20(He), 80T30(H), 86T60(H), 89T6(B^{2+}), 90T23(He), 91T8(H), 91T45(He), 92T11(He)

q = 4 : 82E12(He), 92E54(H,H_2,He)
; 77T13(H), 80T30(H), 91T8(H), 92T32(He)

q = 5 : 77E4(He), 82E12(He), 87E27(He), 92E54(H,H_2,He)
; 77T5(H), 77T9(H), 77T12(H), 77T13(H), 78T11(H), 79T30(H), 79T31(H), 79T32(H), 80T4(H), 80T30(H), 81T8(H), 81T12(H), 81T30(H), 82T2(H), 82T24(H), 82T32(H), 83T20(H), 83T25(H), 84T22(H), 84T37(H), 84T54(H), 85T64(H), 87T5(H), 88T57(Al), 91T8(H), 92T8(He), 92T53(H), 92T59(H(1s),H^*(2s))

C

q = -1 : 86E25(He,Ne,Ar,Kr,Xe)

q = 0 : 79E15(Na,K,Cs), 91E39(He)

q = 1 : 68E1(C), 78E16(Ar,H_2,N_2,O_2,CO,CO_2), 79E3(Ne), 79E15(Na,K,Cs), 83E53(Li,H_2), 87E18(Li,Na), 90E26(He,H_2), 90E58(H_2)
; 82T19(H), 84T31(H,He)

q = 2 : 76E15(He,Ne), 82E40(H_2), 83E27(He,Ne,Ar), 83E28(He,Ne,Ar,Kr,Xe,Hg,H_2, N_2,O_2,NO,CO_2,SO_2,NO_2,NH_3,CH_4,C_2H_2), 83E53(Li,H_2), 83E55(H), 84E33(H), 91E56(H_2,He,Ar)
; 75T3(H), 77T6(H), 78T20(H), 80T6(H,He), 82T19(H), 83T19(H), 84E11(Li), 84T31(H,He), 84T43(H), 91T8(H)

q = 3 : 76E3(He,Ne,Ar), 82E12(He), 82E18(He), 82E40(H_2), 83E27(He), 83E53(Li,H_2), 83E55(H), 84E12(Li), 84E33(H), 85E19(H,H_2), 86E11(H,H_2), 86E47(H^-), 88E2(He,Ne,Ar,Kr,Xe,H,N_2,O_2), 91E4(H), 92E29(H_2,He)
; 76T2(H), 77T6(H), 77T13(H), 78T20(H,He), 79T39(H), 80T6(H,He), 80T7(H,He), 80T30(H), 81T18(H), 82T1(H), 83T19(H), 83T29(H), 84T7(H),

84T31(H,He), 84T43(H), 86T20(H), 87T67(Li), 88T50(H), 88T51(H), 89T21(H), 91T8(H), 91T20(H), 91T21(H), 91T43(He)

q = 4 : 70E4(He,Ne,Ar), 76E1(He), 76E3(He,Ne,Ar), 77E2(He), 82E5(He,H_2), 82E12(He), 82E40(H_2), 83E1(H), 83E5(H_2), 83E11(He,Li,H_2), 83E37(He), 83E51(H_2), 83E55(H), 84E6(H_2), 84E12(Li), 84E14(Li), 84E51(C,CH_4,C_2H_6, C_2H_2), 85E14(Li), 85E16(He,Ne,Ar,Xe), 85E20(H), 85E28(H), 85E29(H,He, H_2), 86E55(He), 87E30(He), 87E42(H,H_2), 87E46(He,Ar,Xe,H_2), 88E2(He,Ne,Ar,Kr,Xe,H,N_2,O_2), 90E3(He), 90E15(H_2,He), 90E18(H,H_2), 90E41(He), 91E27(He), 91E40(He), 92E27(H,H_2), 92E42(H_2,N_2,O_2)
; 76T3(H), 77T13(H), 77T16(He), 78T12(H), 80T7(H,He), 80T15(He), 80T30(H), 81T15(H), 84T21(H,Li), 84T27(H), 84T31(H,He), 84T32(He), 84T33(He), 84T43(H), 84T62(He), 85T15(He,H_2), 85T20(H,H_2), 85T21(H), 85T36(He), 86T7(Ne), 86T15(He), 86T21(He), 87T21(H), 87T54(He), 88T8(H_2), 88T30(H), 89T6(C^{3+}), 90T2(He), 91T8(H), 92T9(He), 92T31(H_2)

q = 5 : 76E3(He,Ne,Ar), 81E9(He), 82E12(He), 83E1(H), 83E37(He), 83E55(H), 84E12(Li), 84E51(C,CH_4,C_2H_6,C_2H_2), 85E51(H,H_2), 87E42(H,H_2), 88E2(He, Ne,Ar,Kr,Xe,H,N_2,O_2), 88E57(He), 88E64(Ar), 91E30(H_2,He), 91E41(H_2,He), 91E54(H_2), 92E57(Ne)
; 76T3(H), 77T13(H), 80T30(H), 81T33(H), 84T31(H,He), 84T32(He), 86T30(He), 91T8(H), 91T42(H_2), 91T43(He), 92T33(He), 92T47(H)

q = 6 : 77E4(He), 81E1(H_2), 81E9(He), 82E12(He), 82E26(He), 83E1(H), 83E2(H), 83E4(He), 83E12(He), 83E14(Ti), 83E55(H), 84E12(Li), 84E19(He,Ne,Ar, H_2), 84T43(H), 84E51(C,CH_4,C_2H_6,C_2H_2), 85E2(Au), 85E27(H), 85E30(He,H_2), 85E50(H,H_2), 85E51(H,H_2), 86E30(He), 87E8(He,Ar,Xe,H_2), 87E42(H,H_2), 87E44(He,Ar,Xe,H_2), 87E58(H), 88E2(He,Ne,Ar,Kr,Xe,H,N_2, O_2), 88E23(H), 88E46(Ne), 88E64(Ar), 89E27(H,H_2), 89E41(H_2), 90E41(He), 90E44(He), 90E51(He), 92E5(He), 92E6(He), 92E15(He), 92E32(H_2), 92E41(He), 92E46(Li)
; 73T1(Ar), 75T1(Ar), 76T3(H), 76T5(H), 76T6(H), 77T4(H), 77T5(H), 77T13(H), 77T15(H), 77T17(H), 78T7(Ne,Ar,Kr), 78T11(H), 78T21(H), 79T1(H), 79T10(H(2s)), 79T14(H), 79T27(Cu), 79T30(H), 79T31(H), 79T32(H), 80T3(Ar), 80T9(H), 80T30(H), 81T5(He), 81T8(H), 81T12(H), 81T17(H), 81T19(H), 81T30(H), 82T2(H), 82T5(H), 82T11(H), 82T15(H), 82T16(H), 82T17(H), 82T29(H), 82T32(H), 83T13(H), 83T17(H), 83T20(H), 83T22(H), 83T23(H), 83T30(C), 83T32(H,H_2), 84T20(H), 84T22(H), 84T26(H), 84T31(H,He), 84T32(He), 84T33(He), 84T37(H), 84T48(H), 84T53(He), 84T54(H), 85T3(Al-U), 85T13(H), 85T25(Al^{12+},Cu^{28+},Ag^{46+}),

85T34(H), 85T36(He), 85T60(Al,Ni,Cu,Ag,Ta,Au), 85T64(H), 86T11(H), 86T13(He), 86T32(Ne), 86T33(Ne), 86T35(He), 86T40(H,H_2), 86T76(He), 87T5(H), 87T6(H(2s)), 87T12(z=12-92), 87T25(He), 87T35(He), 87T37(H,He), 87T44(He), 87T59(z=15-92), 88T32(H), 88T57(Al), 89T34(H), 89T37(Al,Cu,Ag,Ta,Au), 89T39(H), 90T13(Au), 90T31(H_2,He), 90T35(H), 91T8(H), 91T13(He), 91T14(He), 91T15(Au), 91T26(He), 91T50(He), 92T37(H), 92T40(Ar), 92T42(Au), 92T53(H)

N

q = 1 : 68E1(N), 76E4(He,Ne,Ar), 77E5(Cs), 79E25(Ar,H_2,N_2,O_2,CO,NO,CO_2), 80E8(He,Ne,Ar,Kr,Xe), 80E22(Ne), 84E32(Ar,Air), 85E7(Cs), 87E18(Li,Na), 88E30(HgCl,HgBr,HgI), 89E48(O^-), 90E14(CO_2), 90E26(He,H_2), 90E29(He)
; 62T1(H), 79T7(H), 84T31(H,He), 85T53(N)

q = 2 : 78E4(He), 79E21(He,Ne), 79E22(He,Ne,Ar), 82E40(H_2), 83E27(He,Ne), 83E32(H), 84E11(Li), 84E28(He,Ne,Ar,Kr,Xe,H_2,N_2), 85E72(H,H_2), 86E1(Li), 86E6(He), 86E79(Kr,Xe), 87E77(H_2,N_2), 88E42(H_2), 90E43(He)
; 77T6(H), 80T6(H,He), 80T7(H,He), 81T18(H), 83T19(H), 84T31(H,He), 86T3(H), 91T8(H)

q = 3 : 82E40(H_2), 84E11(Li), 86E11(H,H_2), 86E64(H_2), 87E77(H_2,N_2), 88E8(H_2), 89E30(H)
; 77T7(H), 77T13(H), 78T20(H), 79T20(H), 79T39(H), 80T6(H,He), 80T7(H,He), 80T22(H), 80T30(H), 81T15(H), 83T3(H), 83T19(H), 83T29(H), 84T6(H), 84T31(H,He), 84T43(H), 84T44(H), 85T20(H,H_2), 85T55(H), 86T74(H), 91T8(H)

q = 4 : 82E12(He), 82E18(He), 82E40(H_2), 87E30(He), 87E77(H_2,N_2), 89E30(H), 91E40(He)
; 76T3(H), 77T13(H), 80T7(H,He), 80T30(H), 84T31(H,He), 84T43(H), 84T64(H), 90T34(Cs), 91T8(H), 92T20(H), 92T52(H)

q = 5 : 77E2(He), 81E15(He,Ne,Ar,H_2,CH_4,NH_3), 82E12(He), 82E40(H_2), 83E1(H), 83E37(He), 85E13(He,H_2), 85E25(H,H_2), 85E28(H), 85E29(H,He,H_2), 87E10(He), 87E30(He), 87E42(H,H_2), 88E50(He,H_2), 88E57(He), 89E12(He), 89E30(H), 90E37(H_2)
; 76T3(H), 77T13(H), 80T30(H), 81T33(H), 84T27(H), 84T31(H,He), 84T32(He), 84T43(H), 85T20(H,H_2), 85T21(H), 86T18(H,H_2), 87T2(He), 88T8(He), 88T30(H), 89T3(He), 89T6(N^{4+}), 91T8(H), 92T26(He),

q = 6 : 81E9(He), 82E12(He), 83E1(H), 83E2(H), 83E12(He,H_2), 83E37(He), 84E10(He,H_2), 85E12(He,H_2), 85E30(He,H_2), 85E32(He), 85E51(H,H_2),

87E8(He,Ar), 87E42(H,H_2), 87E44(He,Ar), 87E55(Ar), 88E57(He), 89E50(He), 90E41(He)
; 76T3(H), 77T13(H), 80T30(H), 84T31(H,He), 84T32(He), 91T8(H), 91T49(H)

q = 7 : 73E1(He,Ne), 77E4(He), 79E5(Al), 81E9(He), 81E10(Ti), 82E12(He), 82E36(He), 83E1(H), 83E2(H), 83E14(Ti), 84E9(He,H_2), 85E12(He,H_2), 85E27(H), 85E50(H,H_2), 85E51(H,H_2), 86E49(He), 87E8(He,Ar,Xe,H_2), 87E12(He), 87E42(H,H_2), 87E44(He,Ar,Xe,H_2), 87E58(H), 87E62(He,H_2), 87E63(Ar,Xe), 88E4(He,Ar,H_2), 88E39(He,Ne,H_2), 91E45(He,Ar,Kr,Xe), 92E41(He)
; 73T1(Ar), 75T1(Ar), 76T3(H), 76T5(H), 76T6(H), 77T5(H), 77T13(H), 78T7(Ne,Ar,Kr), 78T11(H), 81T30(H), 83T20(H), 83T22(H), 83T32(H_2), 84T20(H), 84T22(H), 84T31(H,He), 84T32(He), 84T37(H), 85T64(H), 86T40(H,H_2), 86T54(H), 87T3(He), 87T37(H,He), 87T48(H), 88T57(Al), 89T38(He), 90T24(He), 91T8(H), 92T12(He), 92T50(Ar)

O

q = 0 : 79E15(Na,K,Cs)

q = 1 : 78E15(Ar,H_2,N_2,O_2,CO,NO,CO_2), 79E15(Na,K,Cs), 80E8(He,Ne,Ar,Kr,Xe), 81E14(He), 83E52(Li), 83E53(Li,H_2), 84E32(Ar,Air), 87E18(Li,Na), 87E82(O), 89E36(N_2), 89E48(O^-), 90E26(He,H_2), 90E59(H_2), 91E32(H_2), 92E47(He)
; 63T1(H), 80T8(H), 84T31(H,He), 90T2(Ar)

q = 2 : 76E15(He), 78E4(He), 81E14(He), 81E23(O_2), 82E6(H), 83E28(He,Ne,Ar, Kr,Xe,Hg,H_2,N_2,O_2,NO,CO_2,SO_2,NO_2,NH_3,CH_4,C_2H_2), 83E53(Li,H_2), 83E55(H), 85E42(He,H_2,N_2), 87E39(He), 88E25(He,Ne,Ar,H_2,D_2,N_2,O_2), 89E5(He), 89E16(H_2)
; 79T6(H), 80T6(H,He), 80T35(He), 83T19(H), 84T7(H), 84T31(H,He), 84T43(H), 84T60(He), 87T27(He), 91T4(He), 91T8(H)

q = 3 : 81E14(He), 81E23(O_2), 82E6(H), 83E53(Li,H_2), 83E55(H), 84E12(Li), 88E58(H), 89E5(He), 89E16(H_2), 90E32(H,H_2,He)
; 77T13(H), 78T15(He,N), 80T6(H,He), 80T7(H,He), 80T30(H), 81T40(H), 83T4(H), 83T19(H), 83T35(H), 83T42(H), 84T31(H,He), 84T43(H), 88T52(H), 91T8(H)

q = 4 : 81E14(He), 83E55(H), 84E12(Li), 87E7(H,H_2), 89E5(He), 91E40(He)
; 76T3(H), 77T13(H), 80T7(H,He), 80T30(H), 84E11(Li), 84T31(H,He), 84T43(H), 88T21(H), 91T8(H)

q = 5 : 80E4(He), 81E14(He), 82E12(He), 82E18(He), 83E55(H), 84E12(Li), 86E57(He), 87E30(He), 87E70(He), 88E21(Ne), 88E57(He), 89E5(He), 89E10(He,Ne,Ar,Kr,H_2), 89E25(H)
; 76T3(H), 77T13(H), 80T30(H), 84T31(H,He), 91T3(H), 91T8(H)

q = 6 : 77E2(He), 80E4(He), 80E20(C,Al), 81E14(He), 82E12(He), 83E1(H), 83E4(He), 83E12(He,H_2), 83E37(He), 83E55(H), 84E12(Li), 85E28(H), 85E29(H,He,H_2), 85E30(He,Ar,H_2), 86E55(He), 87E8(He,Ne,Ar,Kr,Xe,H_2), 87E27(He), 87E42(H,H_2), 87E44(Ar,Kr,H_2), 87E46(He,Ar,Xe,H_2), 87E70(He), 87E99(He), 88E5(H_2), 88E35(He), 88E57(He), 89E10(He,Ne,Ar,Kr,H_2), 89E12(He), 89E39(He), 89E50(He), 90E37(H_2), 90E41(He), 91E55(He), 92E7(He), 92E44(H_2)
; 76T3(H), 77T13(H), 78T15(He,N), 80T30(H), 81T33(H), 84T27(H), 84T31(H,He), 84T32(He), 84T43(H), 85T21(H), 86T18(H,H_2), 86T30(He), 87T49(He), 88T30(H), 89T6(O^{5+}), 91T2(H), 91T8(H)

q = 7 : 80E4(He), 80E20(C,Al), 81E9(He), 81E14(He), 82E12(He), 82E36(He), 83E1(H), 85E51(H,H_2), 86E49(He), 87E8(He,H_2), 87E27(He), 87E42(H,H_2), 87E44(He,H_2), 87E70(He), 88E5(He,H_2), 88E21(Ne), 88E57(He), 89E10(He,Ne,Ar,Kr,H_2), 91E30(H_2,He), 91E45(He,Ar,Kr,Xe)
; 76T3(H), 77T13(H), 84T31(H,He), 84T32(He), 91T8(H), 91T42(H_2)

q = 8 : 76E13(He,H_2,N_2,O_2,C_3H_8), 76E14(He,H_2,N_2,O_2,C_3H_8), 77E4(He), 79E5(Al), 80E4(He), 80E20(C,Al), 81E1(H_2), 81E9(He), 81E14(He), 82E12(He), 82E26(He), 83E1(H), 83E2(H), 83E4(He), 83E6(He), 83E14(Ti), 85E2(Au), 85E10(H_2), 85E27(H), 85E50(H,H_2), 85E51(H,H_2), 86E30(He), 87E8(He,Ar,Xe,H_2), 87E27(He), 87E31(H), 87E42(H,H_2), 87E44(He,Ar), 87E58(H), 87E62(He,H_2), 87E70(He), 88E21(Ne), 89E10(He,Ne,Ar,Kr,H_2), 89E27(H,H_2), 89E41(H_2), 89E45(He), 90E7(D_2), 90E8(H_2,He), 90E16(He,Ar), 90E41(He), 91E12(D_2), 91E45(He,Ar,Kr,Xe), 92E32(He), 92E41(He)
; 73T1(Ar), 75T1(Ar), 76T3(H), 76T6(H), 77T4(H), 77T5(H), 77T9(H), 7710(Ag), 77T13(H), 78T1(H), 78T3(H), 78T7(Ne,Ar,Kr), 78T11(H), 78T13(H), 78T15(He,N), 79T1(H), 79T9(H,He), 79T10(H(2s)), 79T27(Cu), 79T31(H), 79T32(H), 79T34(H), 80T13(H), 81T5(He), 81T19(H), 81T30(H), 81T37(He), 83T17(H), 83T22(H), 83T23(H), 83T30(O), 83T32(H_2), 83T36(H), 84T20(H), 84T22(H), 84T31(H,He), 84T32(He), 84T37(H), 84T43(H), 84T48(H), 84T53(He), 85T26(He), 85T27(C), 85T35(He), 85T64(H), 86T7(Ne), 86T33(Ne), 86T35(He), 86T13(He), 86T76(He), 87T22(He), 87T25(He), 87T37(H,He), 87T38(He), 87T68(He), 88T30(H),

88T32(H), 88T35(H), 88T45(Ag), 88T57(Al), 89T39(H), 90T31(H_2,He), 91T8(H), 91T13(He), 91T14(He), 91T50(He), 91T56(H_2), 92T2(H_2), 92T12(He), 92T38(H), 92T53(H)

F

q = -1 : 88E40(Ne,N_2), 90E38(He,Ne)

q = 0 : 88E60(He,Ne,Ar,Kr,Xe)

q = 1 : 90T2(Ne,Ar)

q = 6 : 82E12(He), 84E45(He), 85E73(He,Ne,Ar), 88E47(H_2), 88E57(He), 89E62(He,H_2), 90E47(Ne), 90E60(H_2), 91E5(H_2)
; 89T11(H_2), 92T34(H_2)

q = 7 : 82E12(He), 83E50(He), 84E34(He,Ne), 84E45(He), 88E57(He), 91E35(H_2,He)
; 78T15(Ar), 84T32(He)

q = 8 : 78E12(He), 81E9(He), 82E12(He), 82E31(Ne), 82E35(He), 84E45(He), 85E51(H,H_2), 86E22(Ne), 89E55(H_2), 90E11(H_2)
; 84T32(He), 85T19(Ne), 90T43(H_2)

q = 9 : 77E4(He), 78E11(Si), 79E5(Al), 81E9(He), 81E10(Ti), 82E35(He), 83E14(Ti), 85E50(H,H_2), 85E51(H,H_2), 86E22(Ne), 87E25(Ne), 87E64(H_2,CH_4,C_2H_4,C_2H_6,C_3H_6,C_3H_8), 92E41(He)
; 73T1(Ar), 75T1(Ar), 77T4(H), 77T5(H), 78T7(Ne,Ar,Kr), 79T18(Ne), 80T20(Ar), 81T16(Ar), 81T30(H), 83T20(H), 83T22(H), 85T64(H), 87T37(H,He), 91T50(He)

Ne

q = 1 : 70E2(N_2), 70E3(Ar), 74E2(Cs), 77E5(Cs), 77E10(He,Ar,H_2), 77E11(He), 78E13(He,Ne,Ar,Kr,Xe), 78E14(He,Ne,Ar,Kr,Xe), 79E8(Ar), 80E7(Ne), 80E13(He,Xe,H_2), 81E17(O_2), 82E3(He,Ne,Ar), 82E11(Ne), 82E33(Li), 83E23(O_2), 83E33(Xe), 83E43(Ne,Xe), 83E52(Li), 85E5(Li), 87E18(Li,Na)
; 62T1(Ne), 85T56(Ne), 87T1(Na), 87T69(Hg)

q = 2 : 70E3(Ar), 77E10(He,Ar,H_2), 77E11(He), 78E4(Ne,Ar), 78E9(He,Ne,Ar,Kr, Xe), 78E13(He,Ne,Ar,Kr,Xe), 79E7(He,Ne,Ar,Kr,Xe), 80E13(He,Xe,H_2), 80E16(Xe), 80E19(He,Ne,Ar,Kr,Xe), 81E7(He), 82E3(He,Ne,Ar), 82E4(Xe), 83E8(Ne), 83E9(He), 83E13(He,Ne,Ar,Kr,Xe), 83E20(Xe), 83E23(O_2), 83E24(He), 83E25(He,H_2), 83E28(He,Ne,Ar,Kr,Xe,Hg,H_2,N_2,O_2,NO,CO_2,SO_2, NO_2,NH_3,CH_4,C_2H_2), 83E33(Xe), 83E43(Ne,Xe), 83E52(Li), 84E20(H_2), 84E23(Xe), 84E27(He), 84E30(He,Ne,Ar), 84E47(Li), 85E15(H,H_2), 86E1(Li), 86E10(Ne), 88E48(Li), 89E19(H_2), 89E47(N_2), 90E48(Li,Na,K)

; 79T6(H), 80T6(H,He), 80T7(H,He), 83T19(H), 84T43(H), 85T23(Ne), 91T22(H)

q = 3 : 70E3(Ar), 77E10(He,Ar,H_2), 77E11(He), 78E13(He,Ne,Ar,Kr,Xe), 80E13(He,Xe,H_2), 81E7(He), 82E3(He,Ne,Ar), 82E38(Ne), 83E8(Ne), 83E9(He), 83E13(He,Ne,Ar,Kr,Xe), 83E24(He), 83E25(He,H_2), 83E33(Xe), 83E43(Ne,Xe), 84E20(H_2), 84E27(He), 84E40(He), 84E47(Li), 85E15(H,H_2), 86E10(Ne), 87E71(He), 88E58(H), 89E37(He,Ne)
; 80T6(H,He), 80T7(H,He), 83T19(H), 84T43(H), 92T16(H)

q = 4 : 70E3(Ar), 77E10(He,Ar,H_2), 77E11(He), 78E13(He,Ne,Ar,Kr,Xe), 81E4(He), 81E7(He), 82E3(He,Ne,Ar), 82E38(Ne), 83E8(Ne), 83E9(He), 83E13(He,Ne, Ar,Kr,Xe), 83E24(He), 83E25(He,H_2), 83E43(Ne,Xe), 84E20(H_2), 84E27(He), 84E36(Ne), 84E40(He), 84E47(Li), 85E15(H,H_2), 86E21(D,D_2), 87E71(He)
; 80T7(H,He), 84T43(H), 88T58(He), 92T16(H)

q = 5 : 81E7(He), 82E38(Ne), 83E8(Ne), 83E9(He), 83E13(He,Ne,Ar,Kr,Xe), 83E24(He), 83E25(He,H_2), 83E43(Ne,Xe), 84E20(H_2), 84E27(He), 84E40(He), 84E47(Li), 85E15(H,H_2), 86E21(D,D_2), 87E71(He), 88E31(Na)
; 84T43(H), 92T16(H)

q = 6 : 81E7(He), 82E38(Ne), 83E8(Ne), 83E9(He), 83E12(He), 83E13(He,Ne,Ar, Kr,Xe), 83E43(Ne,Xe), 84E27(He), 84E39(He), 84E40(He), 84E47(Li), 85E15(H,H_2), 85E30(He), 86E21(D,D_2), 87E71(He), 88E31(Na), 88E57(He), 89E1(He), 91E42(He), 92E46(Li), 92E48(He)
; 89T28(He), 92T16(H)

q = 7 : 82E12(He), 82E38(Ne), 83E9(He), 83E13(He,Ne,Ar,Kr,Xe), 83E43(Ne,Xe), 84E27(He), 84E40(He), 84E45(He), 85E15(H,H_2), 86E17(H_2), 86E21(D,D_2), 86E48(He), 86E49(He), 88E31(Na), 88E44(Ne), 91E45(He,Ar,Kr,Xe), 92E46(Li)
; 92T16(H)

q = 8 : 81E3(Ne), 81E15(He,Ne,Ar,H_2,CH_4,NH_3), 82E1(He,Ne,Ar,Xe,CH_4), 82E12(He), 82E38(Ne), 83E1(H), 83E9(He), 83E43(Ne,Xe), 84E27(He), 84E40(He), 84E45(He), 85E10(H_2), 85E11(He,H_2), 85E31(He), 85E45(Na), 86E14(He), 86E49(He), 87E8(He), 87E42(H,H_2), 87E44(He,Ar), 87E62(He,H_2), 88E31(Na) 88E57(He), 89E12(He), 91E6(H_2,He), 91E36(Na), 92E46(Li), 92E55(Na)
; 84T32(He), 88T30(H), 91T10(H_2,He), 92T12(He), 92T16(H)

q = 9 : 82E12(He), 82E20(He,Ne,Ar,Xe), 82E38(Ne), 83E1(H), 83E43(Ne,Xe), 84E45(He), 85E51(H,H_2), 85E71(H_2), 87E42(H,H_2), 87E44(He), 87E90(^3He,^4He), 88E31(Na), 88E56(He,H_2), 92E46(Li), 92E56(Ne)
; 84T32(He), 87T38(H_2), 91T60(Ne), 92T16(H), 92T60(Ne)

q = 10 : 73E1(He,Ne), 81E15(He,Ne,Ar,H_2,CH_4,NH_3), 81E20(Ne), 82E15(He,Ne,H_2,N_2, O_2,CH_4), 82E20(He,Ne,Ar,Xe), 82E38(Ne), 83E1(H), 83E4(He), 83E43(Ne,Xe), 85E50(H,H_2), 85E51(H,H_2), 87E90(^{3}He,^{4}He), 88E31(Na), 89E60(He,Ne,Ar)
; 76T6(H), 77T4(H), 77T5(H), 77T13(H), 79T31(H), 79T35(H), 80T13(H), 80T23(H), 80T24(H,Cu^{28+}), 81T30(H), 83T15(H), 83T20(H), 83T22(H), 83T30(Ne), 83T32(H_2), 84T48(H), 85T3(Al-U), 85T16(Ne^{9+},Zn^{29+},Sn^{49+}, Yb^{69+},Th^{89+}), 85T25(Al^{12+},Cu^{28+},Ag^{46+}), 85T26(He), 85T41(He), 85T47(He,Ne), 85T60(Al,Ni,Cu,Ag,Ta,Au), 85T64(H), 86T11(H), 86T26(Be^{3+},Al^{12+},Cu^{28+},Au^{78+}), 87T12(z=12-92), 87T14(Al,Zn,Ag,Ta,U), 87T35(He), 87T41(Al,Zn,Ag,Ta,U), 87T59(z=15-92), 88T48(Al,Zn,Ag,Ta,U), 89T31(Be), 89T37(Cu,Ag,Ta,Au), 90T31(H_2,He), 90T35(H), 91T15(Cu,Ag,Ta,Au), 92T16(H), 92T42(Al,Zn,Ag,Ta,Au)

Na

q = -1 : 84E52(He,Ne,Ar), 86E53(H_2,D_2,N_2,O_2,CO,CO_2,CH_4)

q = 1 : 69E1(N_2), 76E7(Ne), 79E16(Ne), 84E5(Na,Na(3p)), 86E12(Na), 87E59(O^-), 87E103(Na^*(3p)), 90E28(Na^*(nl)), 91E7(Na^*(3p)), 91E23(Na^*)
; 76T8(Na), 84T55(Li), 86T5(H^-), 86T10(H), 86T27(H^-), 86T47(Na), 86T55(Li), 87T1(Na), 90T34(Na^{**}), 91T12(Na)

q = 11 : 83T20(H)

Mg

q = 1 : 70E1(Ne,Ar,N_2), 78E7(Mg), 82E27(Ca), 87E101(He, Ar), 88E14(He), 90E22(Mg,Zn)

q = 2 : 78E7(Mg), 80E2(Mg), 83E28(He,Ne,Ar,Kr,Xe,Hg,H_2,N_2,O_2,NO,CO_2,SO_2,NO_2, NH_3,CH_4,C_2H_2), 90E22(Mg,Zn)
; 54T1(H), 78T20(H), 80T7(H,He), 80T9(H), 89T6(Mg^+)

q = 3 : 78T20(He), 80T7(H,He)

q = 4 : 80T7(H,He)

q = 6 : 84T35(H)

q = 9 : 91E5(H_2)

q = 12 : 81E10(Ti), 83E14(Ti)
; 77T5(H), 81T30(H), 83T8(H), 83T20(H), 83T22(H), 86T32(Ne)

Al

q = 1 : 73E2(He,N_2)

q = 2 : 85E56(H,H_2)

; 54T2(H), 90T19(H,H_2

q = 3 : 85E56(H,H_2)

; 54T2(H), 78T20(He), 86T43(H), 88T22(H), 89T6(Al^{2+})

q = 4 : 85E56(H,H_2)

q = 5 : 85E56(H,H_2)

q = 6 : 85E56(H,H_2)

q = 7 : 85E56(H,H_2)

q = 8 : 85E10(H_2), 85E46(H_2), 85E56(H,H_2)

q = 9 : 85E56(H,H_2)

q = 10 : 85E56(H,H_2)

q = 12 : 85E17(He,H_2), 88E56(He,H_2)

q = 13 : 81E10(Ti)

; 83T8(H), 83T20(H), 83T22(H), 88E56(He)

Si

q = 1 : 80T34(H^+), 82T37(H^+)

q = 2 : 54T1(H), 76T7(H), 78T20(H), 80T34(He^+), 82T36(H)

q = 3 : 80T7(H,He), 85T63(He^+)

q = 4 : 80T7(H,He), 85T63(He), 88T21(H), 89T6(Si^{3+}), 90T17(H)

q = 5 : 91E31(He)

q = 6 : 90T17(H)

q = 7 : 90T17(H)

q = 8 : 87E27(He)

; 90T17(H)

q = 9 : 90T17(H)

q = 10 : 90T17(H)

q = 11 : 85E21(He), 85E24(He),

; 83T6(He), 90T17(H)

q = 13 : 87E27(He)

; 84T4(Ar), 88T43(He), 90T17(H)

q = 14 : 81E10(Ti), 83E14(Ti), 87E27(He)

; 76T6(H), 77T5(H), 77T13(H), 79T31(H), 80T13(H), 81T30(H), 82T32(H), 83T8(H), 83T20(H), 83T22(H), 84T4(Ar), 88T35(H), 89T43(Si^{14+}), 90T17(H), 90T31(H_2,He)

P

q = 1 : 84E32(Ar,Air)

q = 5 : 89T6(P^{4+})

q = 15 : 83T8(H)

q = 15 : 90T31(H_2,He)

S

q = 0 : 79E15(Na,K,Cs)

q = 1 : 79E15(Na,K,Cs)

q = 2 : 90E57(H,H_2)
; 80T7(H,He), 81T7(H)

q = 3 : 90E56(H,H_2,He)
; 80T7(H,He)

q = 4 : 80T7(H,He)

q = 6 : 89T6(S^{5+})

q = 7 : 91E14(H_2,He)

q = 11 : 82E12(He), 84E25(He)

q = 13 : 81E18(Ar), 82E12(He), 82E34(Ar), 84E25(He), 85E66(He), 86E3(He), 88E36(H_2)
; 89T4(He,H_2)

q = 14 : 81E18(Ar)

q = 15 : 81E18(Ar), 87E66(H_2), 91E49(H_2)
; 85T19(Ar), 88T44(H_2), 91T5(H_2), 92T3(H,Be^{3+},Ne^{9+},S^{15+}), 92T61(Ar)

q = 16 : 81E10(Ti), 81E18(Ar), 83E14(Ti), 87E67(Ar)
; 77T5(H), 81T30(H), 83T8(H), 83T20(H), 84T29(C), 85T27(Ne), 89T18(z=10-92)

Cl

q = -1 : 85E74(Na,Mg,Ar), 88E22(He,Ne,Ar,Kr,Xe), 88E40(Ar)

q = 1 : 88E19(He)

q = 2 : 88E19(He,Ne,Ar,Kr,Xe)

q = 11 : 86E30(He)

q = 15 : 89E58(C)

q = 16 : 89E58(C,

q = 17 : 83E14(Ti), 86E76(Ti), 89E58(C)
; 78T7(Ne,Ar,Kr), 83T8(H), 83T22(H)

Ar

q = 1 : 70E2(N_2), 74E2(Cs), 76E9(Ar), 77E5(Cs), 78E4(Ar), 78E13(He,Ne,Ar,Kr, Xe), 78E14(He,Ne,Ar,Kr,Xe), 80E7(Ar), 80E11(Ar), 81E5(Ar), 81E17(O_2), 82E8(He,Ne), 82E11(Ar), 83E23(O_2), 83E30(N_2), 83E33(Xe), 84E3(Ar), 86E8(Ne,Ar,Kr), 86E34(N_2), 86E35(N_2), 86E41(N,O_2), 87E17(He,Ar,H_2), 87E18(Li,Na), 87E97(H_2S,CS_2,NO_2), 88E72(H_2), 88E32(H_2,N_2,CO), 88E34(N_2), 88E48(Li), 89E44(H^-), 89E49(H_2,N_2,O_2,CO), 89E59(N_2), 90E28(Na^*(nl))

; 62T1(Ar), 86T8(H_2), 86T64(N_2), 86T65(H_2), 87T1(Na), 87T63(H), 89T12(N_2)

q = 2 : 75E4(Ar), 76E6(Kr,N_2), 76E9(Ar), 77E9(Ne,Ar,Kr), 78E4(He,Ne,Kr), 78E13(He,Ne,Ar,Kr,Xe), 79E7(He,Ne,Ar,Kr,Xe), 80E3(Ar), 80E6(He,Ne,Ar), 80E9(Na), 80E10(Na), 80E19(He,Ne,Ar,Kr,Xe), 81E7(He), 81E8(He,Ne,Ar, Xe), 81E11(He,Xe), 81E13(Ne), 81E22(N_2), 82E8(He,Ne), 82E16(Ar,Kr,Xe), 82E21(Na), 83E9(Li), 83E13(Ar,Xe), 83E17(He,Ne,Ar), 83E21(He), 83E23(O_2), 83E24(He), 83E27(He,Ne), 83E28(He,Ne,Ar,Kr,Xe,Hg,H_2,N_2,O_2, NO,CO_2,SO_2,NO_2,NH_3,CH_4,C_2H_2), 83E30(N_2), 83E33(Xe), 83E48(N_2,O_2,CO,CO_2,CH_4,C_2H_6), 83E49(Ar), 84E3(Ar), 84E20(H_2), 84E27(He), 84E28(He,Ne,Ar,Kr,Xe,H_2,N_2), 84E47(Li), 84E53(He), 85E15(H,H_2), 85E40(He,Ne,Ar), 85E48(Ar), 85E57(Ar), 86E1(Li), 86E8(Ne,Ar,Kr), 86E31(He,H_2), 86E44(Ar), 87E13(Ar), 87E21(K), 87E38(He,Ne,Ar,Kr,Xe,O_2,NO,N_2O,NH_3,CO_2,CH_4,C_2H_6,1-C_4H_8, C_6H_6), 88E29(He), 89E32(He), 89E44(H^-), 89E56(Li,Na,Mg,K), 90E23(Cu), 90E24(He,Ar), 90E39(Na,K,Rb,Cs), 90E48(Li,Na,K), 91E18(He,Ar,H_2,N_2,O_2,CO_2), 91E43(Li,Na,K,Rb,Cs), 91E51(Na,K,Rb,Cs)

; 85T23(Ne), 86T29(He), 86T67(He), 86T50(He), 87T64(He)

q = 3 : 75E4(Ar), 76E6(Kr,N_2), 76E10(He), 78E1(He), 82E8(He,Ne), 78E4(He), 78E13(He,Ne,Ar,Kr,Xe), 80E3(Ar), 81E7(He), 81E8(He,Ne,Ar,Xe), 81E13(Ne), 83E4(D_2), 83E9(He,Li), 83E13(Ar,Xe), 83E21(He), 83E24(He), 83E33(Xe), 83E38(He), 83E55(H), 84E3(Ar), 84E20(H_2), 84E24(Ar), 84E27(He), 84E29(He), 84E47(Li), 85E15(H,H_2), 85E38(H_2), 85E43(He,Ne, Ar,Kr), 85E58(He,Ne,Ar,Kr), 86E8(Ne,Ar,Kr), 86E26(He,Ne,Ar,Kr,Xe), 86E31(He,H_2), 86E69(He), 87E13(Ar), 87E41(Ar^{3+}), 87E81(Ar), 89E35(Ar,Kr), 89E37(Ne,Ar), 89E44(H^-), 92E21(H_2,Ar)

q = 4 : 75E4(Ar), 76E6(Kr,N_2), 76E10(He), 78E1(He), 78E13(He,Ne,Ar,Kr,Xe), 80E3(Ar), 81E7(He), 81E8(He,Ne,Ar,Xe), 81E13(Ne), 83E4(D_2), 83E9(He,Li), 83E13(Ar,Xe), 83E24(He), 83E38(He), 83E55(H), 84E3(Ar), 84E20(H_2), 84E27(He), 84E47(Li), 85E8(Ar), 85E15(H,H_2), 85E58(He,Ne,Ar,Kr), 86E8(Ne,Ar,Kr), 86E21(D,D_2), 86E31(He,H_2), 86E38(He,H_2), 86E69(He), 87E1(H), 87E13(Ar), 87E52(H,He,H_2), 88E63(He,Ne,Ar,Kr), 89E15(Ar), 89E44(H^-), 89E63(Ar), 90E4(Ar), 90E5(Ar), 90E52(CH_4), 92E21(H_2,Ar)

q = 5 : 75E4(Ar), 76E6(Kr,N_2), 76E10(He), 78E1(He), 78E13(He,Ne,Ar,Kr,Xe), 80E3(Ar), 81E7(He), 81E8(He,Ne,Ar,Xe), 81E13(Ne), 83E4(D_2), 83E9(He,Li), 83E13(Ar,Xe), 83E24(He), 83E38(He), 83E55(H), 84E3(Ar), 84E20(H_2), 84E27(He), 84E47(Li), 85E8(Ar), 85E15(H,H_2), 86E8(Ne,Ar,Kr), 86E21(D,D_2), 86E31(He,H_2), 86E38(He,H_2), 86E69(He), 87E13(Ar), 87E52(H,He,H_2), 88E15(D), 88E63(He,Ne,Ar,Kr), 89E44(H^-), 92E21(H_2,Ar)

q = 6 : 75E4(Ar), 75E6(Ne,Ar,Kr,Xe,N_2), 76E6(Kr,N_2), 76E10(He), 78E1(He), 78E13(He,Ne,Ar,Kr,Xe), 79E4(He,Ne,Ar,Kr,Xe), 80E3(Ar), 80E5(H_2), 80E15(He), 81E7(He), 81E8(He,Ne,Ar,Xe), 81E13(Ne), 83E4(D_2), 83E9(He,Li), 83E13(Ar,Xe), 83E24(He), 83E38(He), 83E55(H), 84E3(Ar), 84E20(H_2), 84E27(He), 84E35(Ne,Ar), 84E47(Li), 85E8(Ar), 85E15(H,H_2), 85E39(Ne,Ar,Xe), 85E54(Ne,Ar,Xe), 86E8(Ne,Ar,Kr), 86E21(D,D_2), 86E31(He,H_2), 86E38(He,H_2), 86E69(He), 87E1(H,H_2), 87E16(Ar), 87E52(H,He,H_2), 89E1(He), 89E44(H^-), 89E63(Ar), 90E5(Ar), 91E1(He), 92E2(He), 92E21(H_2,Ar)
; 78T4(He,Ar), 83T31(He), 84T35(H), 88T28(D), 89T29(He), 89T30(H)

q = 7 : 75E4(Ar), 76E6(Kr,N_2), 76E10(He), 78E1(He), 78E13(He,Ne,Ar,Kr,Xe), 80E3(Ar), 81E7(He), 81E8(He,Ne,Ar,Xe), 81E13(Ne), 83E4(He), 83E9(Li), 83E13(Ar,Xe), 83E24(He), 83E38(He), 83E55(H), 84E3(Ar), 84E20(H_2), 84E27(He), 84E47(Li), 85E8(Ar), 85E15(H,H_2), 85E39(Ne,Ar,Xe), 85E54(Ne,Ar,Xe), 86E8(Ne,Ar,Kr), 86E21(D,D_2), 86E31(He,H_2), 86E38(He,H_2), 86E69(He), 87E16(Ar), 87E47(He), 87E48(He), 89E44(H^-), 90E16(Ar), 90E31(He,Ne,Ar)
; 78T4(He,Ar)

q = 8 : 76E10(He), 78E13(He,Ne,Ar,Kr,Xe), 80E3(Ar), 81E7(He), 81E8(He,Ne,Ar, Xe), 81E13(Ne), 83E4(D_2), 83E9(Li), 83E13(Ar,Xe), 83E55(H), 84E3(Ar), 84E27(He), 84E47(Li), 85E8(Ar), 85E15(H,H_2), 85E39(Ne,Ar,Xe), 85E54(Ne,Ar,Xe), 86E8(Ne,Ar,Kr), 86E21(D,D_2), 86E38(He,H_2), 86E69(He), 87E15(Ar), 87E16(Ar), 87E80(He,H_2), 89E8(H_2), 89E9(He,H_2), 89E44(H^-), 89E63(Ar), 90E16(Ar), 90E52(CH_4), 91E45(He,Ar,Kr,Xe), 92E8(He), 92E9(H_2,He), 92E55(Na), 92E23(He), 92E24(Cs)
; 85T3(He), 88T8(He,Ne,Ar,Kr,Xe,D_2), 88T30(H), 90T34(Cs)

q = 9 : 80E3(Ar), 81E7(He), 81E13(Ne), 83E4(D_2), 83E9(Li), 83E13(Ar,Xe), 83E55(H), 84E3(Ar), 84E27(He), 84E47(Li), 85E15(H,H_2), 85E39(Ne,Ar,Xe), 85E54(Ne,Ar,Xe), 86E38(He,H_2), 87E15(Ar), 87E16(Ar), 89E31(He), 89E42(Cs), 90E16(Ar), 91E31(He), 91E45(He,Ar,Kr,Xe), 92E24(Cs), 92E33(Ar), 92E57(Ne)

q = 10 : 80E3(Ar), 81E7(He), 83E4(D_2), 83E9(Li), 85E15(H,H_2), 85E39(Ne,Ar,Xe), 85E54(Ne,Ar,Xe), 86E38(He,H_2), 87E16(Ar), 89E63(Ar), 90E52(CH_4)

q = 11 : 80E3(Ar), 83E4(D_2), 86E38(He,H_2), 87E15(Ar), 87E16(Ar), 90E16(Ar), 91E45(He,Ar,Kr,Xe)

q = 12 : 80E3(Ar), 83E4(D_2), 86E38(He,H_2), 87E16(Ar), 89E63(Ar)

q = 13 : 83E4(D_2), 86E38(He,H_2), 87E16(Ar)

q = 14 : 83E4(D_2), 86E38(He,H_2), 89E63(Ar), 90E52(CH_4)

q = 15 : 83E4(D_2), 84E44(Xe), 86E38(He,H_2), 92E1(Ar)

q = 16 : 83E4(D_2), 84E19(Ar), 84E44(Xe)

q = 17 : 84E19(Ar,H_2), 84E44(Xe)
; 85T41(He), 85T47(He), 86E9(H,H(n))

q = 18 : 73E1(He,Ne), 84E19(Ar,H_2), 85E18(N_2), 85E60(N_2)
; 76T6(H), 77T5(H), 77T13(H), 80T13(H), 80T24(H,Cu^{28+}), 81T30(H), 83T8(H), 83T20(H), 83T21(H), 83T22(H), 83T32(H_2), 85T3(Al-U), 85T25(Al^{12+},Cu^{28+},Ag^{46+}), 85T60(Al,Ni,Cu,Ag,Ta,Au), 87T12(z=12-92), 87T59(z=15-92), 89T31(Be), 89T37(Cu,Ag,Ta,Au), 90T13(Ag), 91T15(Cu,Ag,Ta,Au), 92T42(Cu,Ag,Ta,Au)

K

q = -1 : 84E52(He,Ne,Ar), 86E53(H_2,D_2,N_2,O_2,CO,CO_2,CH_4)

q = 1 : 80E1(K), 87E91(He,Ne), 88E55(Na), 90E6(Na^*(4d)), 90E21(Na^*(4d))
; 62T1(K), 76T8(K), 86T47(K)

Ca

q = 1 : 86E45(Mg,Sr), 92E45(Na)
; 62T1(Ca), 76T8(Ca)

q = 2 : 83E28(He,Ne,Ar,Kr,Xe,Hg,H_2,N_2,O_2,NO,CO_2,SO_2,NO_2,NH_3,CH_4,C_2H_2)

q = 10 : 86E59(He,H_2), 86E80(He,H_2)
; 90T6(H_2)

q = 11 : 86E59(He,H_2), 86E80(He,H_2)
; 90T6(H_2)

q = 12 : 86E59(He,H_2), 86E80(He,H_2)
; 90T6(H_2)

q = 13 : 86E59(He,H_2), 86E80(He,H_2)

q = 14 : 86E59(He,H_2), 86E80(He,H_2)

q = 15 : 86E59(He,H_2), 86E80(He,H_2)

q = 16 : 84E43(He), 85E66(He), 86E5(H_2), 86E59(He,H_2), 86E80(He,H_2),
; 90T6(H_2), 90T9(H_2,He)

q = 17 : 84E43(He), 85E66(He), 86E5(H_2), 86E59(He,H_2), 86E80(He,H_2), 88E43(Ar)
; 88T43(He,H_2), 89T4(He,H_2), 89T26(He), 90T6(H_2), 90T9(H_2,He)

q = 18 : 84E43(He), 85E66(He), 86E5(H_2), 86E59(He,H_2), 86E80(He,H_2),
88E37(He,Ne,Ar,Kr,Xe,H_2,N_2)
; 90T6(H_2), 90T9(H_2,He)

q = 19 : 86E5(H_2), 86E59(He,H_2), 86E80(He,H_2), 88E37(He,Ne,Ar,Kr,Xe,H_2,N_2)
; 90T9(H_2,He)

q = 20 : 88E37(He,Ne,Ar,Kr,Xe,H_2,N_2)
; 77T4(H), 79T31(H), 81T30(H), 83T20(H), 83T22(H), 86T32(Ne)

Sc

q = 12 : 91E31(He)

Ti

q = -1 : 85E74(Na,Mg,Ar)

q = 3 : 83T34(H^+)

q = 4 : 83T34(H), 85T36(H), 88T22(H), 91T32(H)

q = 5 : 91T32(H)

q = 6 : 91T32(H)

q = 7 : 91T32(H)

q = 8 : 91T32(H)

q = 9 : 91T32(H)

q = 10 : 91T32(H)

q = 11 : 91T32(H)

q = 13 : 91E31(He)

q = 19 : 88E36(H_2)
; 89T4(He,H_2)

q = 22 : 83T22(H)

V

q = 18 : 85E35(He), 85E66(He)

q = 19 : 84E43(He), 85E35(He), 85E66(He)

q = 20 : 84E43(He), 85E35(He), 85E66(He)
; 89T4(He,H_2)

q = 21 : 84E43(He), 85E35(He)

q = 22 : 85E35(He)

q = 23 : 85E35(He)

Cr

q = 1 : 73E2(He,N_2), 84E32(Ar,Air)

q = 4 : 91T32(H)

q = 6 : 84T35(H), 91T32(H)

q = 8 : 91T32(H)

q = 10 : 91T32(H)

q = 13 : 91T32(H)

q = 24 : 83T20(H), 83T22(H)

Fe

q = 1 : 70E1(Ne,Ar,N_2), 84E32(Ar,Air), 87E61(H,He, H_2)

q = 2 : 87T43(H)

q = 3 : 83E42(H,H_2)

q = 4 : 83E42(H,H_2)
; 91T32(H)

q = 5 : 83E42(H,H_2), 86E7(Ar)
; 91T32(H)

q = 6 : 83E42(H,H_2)
; 91T32(H)

q = 7 : 83E42(H,H_2)

q = 8 : 83E42(H,H_2)
; 91T32(H)

q = 9 : 78E2(H,H_2), 83E42(H,H_2)
; 92T4(H_2)

q = 10 : 78E2(H,H_2), 83E42(H,H_2), 86E7(Ar)
; 91T32(H)

q = 11 : 78E2(H,H_2), 83E42(H,H_2)

q = 12 : 78E2(H,H_2), 83E42(H,H_2), 86E7(Ar), 87E55(Ar)
; 85T43(H), 91T32(H)

q = 13 : 78E2(H,H_2), 83E42(H,H_2)
; 85T43(H)

q = 14 : 78E2(H,H_2), 83E42(H,H_2)
; 85T43(H)

q = 15 : 78E2(H,H_2), 86E7(Ar), 87E55(Ne,Ar,Kr,Xe)
; 85T43(H), 91T32(H)

q = 16 : 78E2(H,H_2)
; 85T43(H)

q = 17 : 78E2(H,H_2), 91E31(He)
; 85T43(H)

q = 18 : 78E2(H,H_2)
; 85T43(H)

q = 20 : 78E2(H,H_2), 84E19(Ar), 86E7(Ar), 87E55(Ne,Ar,Kr,Xe)
; 91T32(H)

q = 21 : 78E2(H,H_2), 84E19(Ar), 87E55(Ar)

q = 22 : 78E2(H,H_2)

q = 23 : 78E2(H,H_2), 84E19(Ar), 92E14(H_2)

q = 24 : 78E2(H,H_2), 84E19(Ar), 92E14(H_2)
; 81T19(H),

q = 25 : 78E2(H,H_2), 84E19(Ar), 86E7(Ar), 92E14(H_2)

q = 26 : 83E7(He,Ne,Ar), 84E19(Ar), 84E26(He,Ne,Ar,N_2), 84E50(Ar,Kr,Zr,Ag,Sn),
85E18(He,N_2)
; 77T13(H), 79T33(H), 80T13(H), 81T12(H), 83T22(H), 91T32(H)

Ni

q = 2 : 87T43(H)

q = 4 : 91T32(H)

q = 5 : 91T32(H)

q = 6 : 91T32(H)

q = 8 : 91T32(H)

q = 10 : 91T32(H)

q = 12 : 91T32(H)

q = 14 : 91T32(H)

q = 17 : 91T32(H)

q = 19 : 88E45(Kr)

q = 20 : 88E45(Kr)

q = 21 : 88E45(Kr)

q = 22 : 88E45(Kr)

q = 25 : 89T4(He,H_2)

q = 28 : 83T20(H), 83T22(H)

Cu

q = 1 : 70E1(Ne,Ar,N_2)

q = 20 : 91E31(He)

q = 29 : 83T22(H), 89T43(Cu^{29+})

Zn

q = 1 : 90E22(Zn)

q = 2 : 80T9(H)

q = 30 : 77T4(H)

Ga

q = 1 : 92E36(Ga)

Ge

q = 1 : 84E32(Ar,Air)

q = 29 : 88E36(H_2)
; 89T4(He,H_2),

q = 30 : 90E33(H_2)

q = 31 : 90E55(Ne), 92E28(H_2), 92E58(Ne), 92E59(H_2)
; 91T5(H_2)

As

q = 1 : 84E32(Ar,Air)

Br

q = 0 : 90E17(He,Ne,Ar,Kr,Xe)

Kr

q = 1 : 70E2(N_2), 75E5(Cs), 77E5(Cs), 78E14(He, Ne, Ar, Kr, Xe), 80E7(Kr), 81E5(Kr), 83E23(O_2), 83E30(N_2), 87E87(Kr), 87E88(Kr), 88E32(CO)
; 62T1(Kr),

q = 2 : 78E6(Kr), 79E7(He,Ne,Ar,Kr,Xe), 80E19(He,Ne,Ar,Kr,Xe), 81E7(He), 81E17(He,Ne,Xe), 83E13(Ar,Xe), 83E24(He,Ne,Ar,Kr,Xe), 83E26(He,H_2), 83E28(He,Ne,Ar,Kr,Xe,Hg,H_2,N_2,O_2,NO,CO_2,SO_2,NO_2,NH_3,CH_4,C_2H_2), 83E30(N_2), 83E45(Kr), 84E20(H_2,N_2,CO_2,CH_4,C_2H_6,C_3H_8), 84E27(He), 84E47(Li), 85E40(He,Ne,Ar), 85E47(H_2), 85E53(He,Ne), 86E1(Li), 86E31(He,Ne,Ar,Kr,Xe,H_2,N_2,CO_2,CH_4,C_2H_6,C_3H_8), 86E44(Kr), 87E37(He,Ne, Ar,Kr,Xe), 87E84(He), 89E20(Ne)

; 85T23(Ne), 88T49(He)

q = 3 : 81E7(He), 83E13(Ar,Xe), 83E24(He,Ne,Ar,Kr,Xe), 83E26(He,H_2), 83E45(Kr), 84E20(H_2,N_2,CO_2,CH_4,C_2H_6,C_3H_8), 84E27(He), 84E47(Li), 86E31(He,Ne,Ar,Kr,Xe,H_2,N_2,CO_2,CH_4,C_2H_6,C_3H_8), 87E37(He,Ne,Ar,Kr,Xe), 87E41(Kr^{3+}), 88E27(Ar,Kr,Xe),

q = 4 : 81E7(He), 83E13(Ar,Xe), 83E24(He,Ne,Ar,Kr,Xe), 83E26(He,H_2), 83E45(Kr), 84E20(H_2,N_2,CO_2,CH_4,C_2H_6,C_3H_8), 84E27(He), 84E47(Li), 86E31(He,Ne,Ar,Kr,Xe,H_2,N_2,CO_2,CH_4,C_2H_6,C_3H_8), 87E37(He,Ne,Ar,Kr,Xe), 88E27(Ar,Kr)

; 80T14(H_2)

q = 5 : 81E7(He), 83E13(Ar,Xe), 83E24(He,Ne,Ar,Kr,Xe), 83E26(He,H_2), 83E45(Kr), 84E20(H_2,N_2,CO_2,CH_4,C_2H_6,C_3H_8), 84E27(He), 84E47(Li), 86E31(He,Ne,Ar, Kr,Xe,H_2,N_2,CO_2,CH_4,C_2H_6,C_3H_8), 88E27(He,Ne,Ar)

; 80T14(H_2)

q = 6 : 81E7(He), 83E13(Ar,Xe), 83E24(He,Ne,Ar,Kr,Xe), 83E26(He,H_2), 83E45(Kr), 84E20(H_2,N_2,CO_2,CH_4,C_2H_6,C_3H_8), 84E27(He), 84E47(Li), 86E31(He,Ne,Ar, Kr,Xe,H_2,N_2,CO_2,CH_4,C_2H_6,C_3H_8), 89E1(He)

; 80T14(H_2)

q = 7 : 81E7(He), 83E13(Ar,Xe), 83E24(He,Ne,Ar,Kr,Xe), 83E26(He,H_2), 83E45(Kr), 84E20(H_2,N_2,CO_2,CH_4,C_2H_6,C_3H_8), 84E25(He), 84E27(He), 84E47(Li), 86E31(He,Ne,Ar,Kr,Xe,H_2,N_2,CO_2,CH_4,C_2H_6,C_3H_8)

; 80T14(H_2)

q = 8 : 81E7(He), 83E13(Ar,Xe), 83E24(He,Ne,Ar,Kr,Xe), 83E26(He,H_2), 83E45(Kr), 84E20(H_2,N_2,CO_2,CH_4,C_2H_6,C_3H_8), 84E25(He), 84E27(He), 84E47(Li), 86E31(He,Ne,Ar,Kr,Xe,H_2,N_2,CO_2,CH_4,C_2H_6,C_3H_8), 89E11(He,H_2), 92E10(H_2,He)

q = 9 : 81E7(He), 83E13(Ar,Xe), 83E24(He,Ne,Ar,Kr,Xe), 83E26(He,H_2), 83E45(Kr), 84E20(H_2,N_2,CO_2,CH_4,C_2H_6,C_3H_8), 84E25(He), 84E27(He), 84E47(Li), 86E31(He,Ne,Ar,Kr,Xe,H_2,N_2,CO_2,CH_4,C_2H_6,C_3H_8), 89E11(He,H_2)

q = 10 : 81E7(He), 83E13(Ar,Xe), 84E25(He), 84E27(He), 84E47(Li)

q = 11 : 83E13(Ar,Xe), 84E25(He), 84E27(He), 84E47(Li)

q = 12 : 83E13(Ar,Xe), 84E25(He), 84E27(He)

q = 13 : 84E25(He), 84E27(He)

q = 14 : 84E25(He)

q = 15 : 84E25(He)

q = 16 : 84E25(He)

q = 17 : 84E25(He)

q = 18 : 84E25(He), 87E55(Ne,Ar,Kr,Xe), 90E30(Ar,Kr), 92E25(Kr)

q = 19 : 84E25(He)

q = 20 : 84E25(He)

q = 22 : 84E25(He)

q = 23 : 84E25(He)

q = 25 : 84E25(He)

q = 36 : 81E6(Ti,Mn,Ni,Cu,Zr,Ag), 86E50(C,Ne,Al,Si,Ar,Cr,Cu,Zr,Sb),
90E35(C,Al,Cu)
; 77T13(H), 80T13(H), 83T21(H), 83T22(H), 89T31(Be)

Rb

q = 1 : 88E55(Na)
; 76T8(Rb), 86T47(Rb)

Sr

q = 1 : 88E55(Na), 91E28(H^+), 92E31(Mg,Ca), 92E45(Na,Rb)

q = 38 : 83T20(H)

Zr

q = 40 : 83T22(H)

Nb

q = 24 : 92T4(H_2)

q = 28 : 84E19(H_2), 89E7(He,H_2)
; 90T5(H_2)

q = 29 : 89E7(He,H_2)
; 90T5(H_2)

q = 30 : 89E7(He,H_2)
; 90T5(H_2)

q = 31 : 84E19(Ar,H_2), 87E9(H_2), 89E7(He,H_2)
; 89T27(H_2), 90T5(H_2)

q = 32 : 89E7(He,H_2)
; 90T5(H_2)

q = 34 : 84E19(H_2)

Mo

q = 6 : 92E22(Ar)

q = 42 : 83T22(H)

Ag

q = 4 : 91E57(H_2,He,Ar)

Cd

q = 2 : 80T9(H)

q = 48 : 83T22(H)

In

q = 1 : 84E32(Ar,Air)

Sb

q = 1 : 84E32(Ar,Air)

I

q = 0 : 89E26(He,Ne,Ar,Kr,Xe)

q = 1 : 87E40(Mg)
; 90T2(Mg)

q = 5 : 86E38(He,H_2), 90E9(He)

q = 6 : 86E38(He,H_2), 90E9(He)

q = 7 : 86E38(He,H_2), 90E9(He)

q = 8 : 86E38(He,H_2), 90E9(He)

q = 9 : 86E38(He,H_2), 90E9(He)

q = 10 : 85E67(He), 85E68(He), 86E29(He), 86E38(He,H_2), 90E9(He)

q = 11 : 86E38(He,H_2), 90E9(He)

q = 12 : 86E38(He,H_2), 88E20(H_2), 88E53(He,H_2), 90E9(He)

q = 13 : 85E67(He), 85E68(He), 86E29(He), 86E38(He,H_2), 88E20(H_2), 88E53(He,H_2), 90E9(He)

q = 14 : 85E67(He), 85E68(He), 86E29(He), 86E38(He,H_2), 88E20(H_2), 90E9(He)

q = 15 : 85E67(He), 85E68(He), 86E29(He), 86E38(He,H_2), 88E20(H_2), 90E9(He)

q = 16 : 86E38(He,H_2), 88E20(H_2), 90E9(He)

q = 17 : 85E67(He), 85E68(He), 86E29(He), 86E38(He,H_2), 88E20(H_2), 90E9(He)

q = 18 : 86E38(He,H_2), 88E20(H_2)

q = 19 : 85E67(He), 85E68(He), 86E29(He), 86E38(He,H_2), 90E9(He)

q = 20 : 85E67(He), 85E68(He), 86E29(He), 86E38(He,H_2)

q = 21 : 86E38(He,H_2), 90E9(He)

q = 22 : 85E67(He), 85E68(He), 86E29(He), 86E38(He,H_2)

q = 23 : 85E67(He), 85E68(He), 86E29(He), 86E38(He,H_2), 90E9(He)

q = 24 : 85E67(He), 85E68(He), 86E29(He), 86E38(He,H_2)

q = 25 : 85E67(He), 85E68(He), 86E29(He), 86E38(He,H_2), 90E9(He)

q = 26 : 85E67(He), 85E68(He), 86E29(He), 86E38(He,H_2)

q = 27 : 85E67(He), 85E68(He), 86E29(He), 86E38(H_2), 90E9(He)

q = 28 : 85E67(He), 85E68(He), 86E29(He)

q = 29 : 85E67(He), 85E68(He), 86E29(He)

q = 30 : 85E67(He), 85E68(He), 86E29(He)

q = 31 : 85E67(He), 85E68(He), 86E29(He)

q = 32 : 85E67(He), 85E68(He), 86E29(He)

q = 33 : 85E67(He), 85E68(He), 86E29(He)

q = 34 : 85E67(He), 85E68(He), 86E29(He)

q = 35 : 85E67(He), 85E68(He), 86E29(He)

q = 36 : 85E67(He), 85E68(He), 86E29(He)

q = 37 : 85E67(He), 85E68(He), 86E29(He)

q = 38 : 85E67(He), 85E68(He), 86E29(He)

q = 40 : 85E67(He), 85E68(He), 86E29(He)

q = 41 : 85E67(He), 85E68(He), 86E29(He)

q = 53 : 89T43(I^{53+})

Xe

q = 1 : 70E2(N_2), 75E5(Cs), 77E5(Cs), 79E2(Xe), 80E7(Xe), 81E5(Xe), 83E30(N_2), 86E32(Xe), 91E24(He,Ne,Ar,CH_4)
; 62T1(Xe)

q = 2 : 78E6(Xe), 79E1(Ar,Xe,H_2,N_2,O_2,CO_2), 79E2(Xe), 79E7(He,Ne,Ar,Kr,Xe), 80E19(He,Ne,Ar,Kr,Xe), 83E13(Ar,Xe), 83E24(He,Ne,Ar,Kr,Xe), 83E26(He,H_2), 83E30(N_2), 84E20(H_2,N_2,CO_2,CH_4,C_2H_6,C_3H_8), 84E27(He), 84E47(Li), 85E38(H_2), 85E40(He,Ne,Ar), 86E1(Li), 87E33(He,Ne,Ar,Kr,Xe), 88E17(He)
; 85T23(Ne)

q = 3 : 79E2(Xe), 83E13(Ar,Xe), 83E24(He,Ne,Ar,Kr,Xe), 83E26(He,H_2), 83E34(Xe), 84E20(H_2,N_2,CO_2,CH_4,C_2H_6,C_3H_8), 84E27(He), 84E47(Li), 87E33(He,Ne,Ar, Kr,Xe), 88E17(He), 88E27(Ar)

q = 4 : 79E2(Xe), 83E13(Ar,Xe), 83E24(He,Ne,Ar,Kr,Xe), 83E26(He,H_2), 83E34(Xe), 84E20(H_2,N_2,CO_2,CH_4,C_2H_6,C_3H_8), 84E27(He), 84E47(Li), 87E33(He,Ne,Ar, Kr,Xe), 88E17(He), 88E27(Ne,Ar,Kr)

q = 5 : 83E13(Ar,Xe), 83E24(He,Ne,Ar,Kr,Xe), 83E26(He,H_2), 83E34(Xe), 84E20(H_2,N_2,CO_2,CH_4,C_2H_6,C_3H_8), 84E27(He), 84E47(Li), 87E33(He,Ne,Ar, Kr,Xe)

q = 6 : 83E13(Ar,Xe), 83E24(He,Ne,Ar,Kr,Xe), 83E26(He,H_2), 83E34(Xe), 84E20(H_2,N_2,CO_2,CH_4,C_2H_6,C_3H_8), 84E27(He), 84E47(Li), 87E33(He,Ne,Ar, Kr,Xe), 89E1(He)

q = 7 : 83E13(Ar,Xe), 83E24(He,Ne,Ar,Kr,Xe), 83E26(He,H_2), 83E34(Xe), 84E20(H_2,N_2,CO_2,CH_4,C_2H_6,C_3H_8), 84E27(He), 84E47(Li), 87E33(He,Ne,Ar, Kr,Xe)

q = 8 : 83E13(Ar,Xe), 83E24(He,Ne,Ar,Kr,Xe), 83E26(He,H_2), 83E34(Xe), 84E20(H_2,N_2,CO_2,CH_4,C_2H_6,C_3H_8), 84E27(He), 84E47(Li)

q = 9 : 83E13(Ar,Xe), 83E24(He,Ne,Ar,Kr,Xe), 83E26(He,H_2), 83E34(Xe), 84E20(H_2,N_2,CO_2,CH_4,C_2H_6,C_3H_8), 84E27(He), 84E47(Li)

q = 10 : 79E14(He,Ne,Na,Ar,Kr,Cd,Xe,Cs), 83E13(Ar,Xe), 83E24(He,Ne,Ar,Kr,Xe), 83E26(He,H_2), 83E34(Xe), 84E20(H_2,N_2,CO_2,CH_4,C_2H_6,C_3H_8), 84E27(He), 84E47(Li), 87E36(Ne,Ar,Xe)

q = 11 : 83E13(Ar,Xe), 83E24(He,Ne,Ar,Kr,Xe), 83E34(Xe), 84E20(H_2,N_2,CO_2,CH_4, C_2H_6,C_3H_8), 84E27(He), 84E47(Li), 87E36(Ne,Ar,Xe), 88E1(He), 91E8(He)

q = 12 : 83E13(Ar,Xe), 83E34(Xe), 84E27(He), 87E36(Ne,Ar,Xe), 88E1(He)

q = 13 : 83E13(Ar,Xe), 83E34(Xe), 84E27(He), 87E36(Ne,Ar,Xe), 88E1(He), 91E8(He)

q = 14 : 83E13(Ar,Xe), 83E34(Xe), 87E36(Ne,Ar,Xe), 88E1(He), 91E8(He)

q = 15 : 83E13(Ar,Xe), 83E34(Xe), 87E36(Ne,Ar,Xe), 88E1(He), 89E14(Xe), 90E1(Xe), 91E8(He), 92E13(Xe)

q = 16 : 87E36(Ne,Ar,Xe), 88E1(He), 89E14(Xe), 91E8(He)

q = 17 : 87E36(Ne,Ar,Xe), 88E1(He), 89E14(Xe), 91E8(He)

q = 18 : 87E36(Ne,Ar,Xe), 88E1(He), 89E14(Xe), 91E8(He)

q = 19 : 87E36(Ne,Ar,Xe), 88E1(He), 89E14(Xe), 91E8(He)

q = 20 : 87E36(Ne,Ar,Xe), 88E1(He), 89E14(Xe), 90E1(Xe), 91E8(He), 92E13(Xe)

q = 21 : 88E1(He), 89E14(Xe), 91E8(He)

q = 22 : 88E1(He), 89E14(Xe)

q = 23 : 88E1(He), 89E14(Xe), 91E8(He)

q = 24 : 88E1(He), 89E14(Xe)

q = 25 : 88E1(He), 89E14(Xe), 90E1(Xe), 91E8(He), 92E13(Xe)

q = 26 : 88E1(He), 89E14(Xe)

q = 27 : 88E1(He), 89E14(Xe), 91E8(He)

q = 28 : 88E1(He), 89E14(Xe), 92E13(Xe)

q = 29 : 88E1(He), 89E14(Xe), 91E8(He)

q = 30 : 88E1(He), 89E14(Xe), 90E1(Xe), 92E13(Xe)

q = 31 : 88E1(He), 89E14(Xe), 90E1(Xe), 91E8(He), 92E13(He,Xe)

q = 32 : 89E14(Xe), 92E13(He,Xe)

q = 33 : 89E14(Xe), 92E13(He)

q = 34 : 89E14(Xe)

q = 35 : 89E14(Xe), 90E1(Xe), 92E13(He,Xe)

q = 36 : 92E13(He,Xe)

q = 37 : 92E13(He,Xe)

q = 40 : 92E13(He)

q = 42 : 92E13(He,Xe)

q = 51 : 88E36(H_2)

q = 52 : 85E52(Be,Al,Cu,Ag,Au,Mylar), 86E71(Be,U), 87E4(Al,Cu,Ag,Au), 92E3(Si<110>)
; 86T26(Be^{3+},Al^{12+},Cu^{28+},Au^{78+})

q = 53 : 85E52(Be,Al,Cu,Ag,Au,Mylar), 87E3(Si), 87E4(Al,Cu,Ag,Au)

q = 54 : 85E52(Be,Al,Cu,Ag,Au,Mylar), 86E71(Be,U), 87E72(Be,Ni,Ta), 87E4(Al,Cu,Ag,Au)
; 83T21(H), 83T22(H), 86T26(Be^{3+},Al^{12+},Cu^{28+},Au^{78+}), 87T29(Be), 88T61(Ag,Au), 89T31(Be)

Cs

q = -1 : 86E54(He,Ne,Ar,Kr,Xe,D_2,N_2,O_2,CO,CO_2,SO_2,N_2O,CH_4,SF_6)

q = 1 : 76T8(Cs), 82T8(Cs^+), 86T47(Cs)

q = 2 : 86E39(Ar,Kr,Xe,H_2,N_2,O_2)

q = 3 : 86E39(He,Ne,Ar,Kr,Xe,H_2,N_2,O_2)

Ba

q = 1 : 90E54(Na), 91E28(H^+), 92E45(Na,Rb,Cs)

La

q = 40 : 87E9(H_2)
; 92T4(H_2)

q = 57 : 87E72(Be,Ni,Ta)

Sm

q = 34 : 86E52(Xe)

q = 35 : 86E52(Xe)

q = 36 : 86E52(Xe)

q = 37 : 86E52(Xe)

q = 38 : 86E52(Xe)

q = 39 : 86E52(Xe)

q = 40 : 86E52(Xe)

q = 41 : 86E52(Xe)

q = 42 : 86E52(Xe)

q = 43 : 86E52(Xe)

q = 44 : 86E52(Xe)

q = 45 : 86E52(Xe)

q = 46 : 86E52(Xe)

q = 47 : 86E52(Xe)

q = 48 : 86E52(Xe)

q = 49 : 86E52(Xe)

q = 50 : 86E52(Xe)

q = 51 : 86E52(Xe)

q = 52 : 86E52(Xe)

Gd

q = 1 : 91E47(Gd)

q = 37 : 87E55(Ar,Xe)

Dy

q = 4 : 92E20(H,H_2)

q = 5 : 92E20(H,H_2)

q = 6 : 92E20(H,H_2)

q = 7 : 92E20(H,H_2)

q = 8 : 92E20(H,H_2)

q = 9 : 92E20(H,H_2)

q = 10 : 92E20(H,H_2)

q = 11 : 92E20(H,H_2)

q = 12 : 92E20(H,H_2)

q = 13 : 92E20(H,H_2)

q = 14 : 92E20(H,H_2)

q = 15 : 92E20(H,H_2)

q = 16 : 92E20(H,H_2)

q = 17 : 92E20(H,H_2)

q = 18 : 92E20(H,H_2)

q = 19 : 92E20(H,H_2)

q = 20 : 92E20(H,H_2)

Er

q = 1 : 73E2(He,N_2)

q = 2 : 73E2(He,N_2)

Ta

q = 4 : 92E20(H,H_2)

q = 5 : 92E20(H,H_2)

q = 6 : 92E20(H,H_2)

q = 7 : 92E20(H,H_2)

q = 8 : 92E20(H,H_2)

q = 9 : 92E20(H,H_2)

q = 10 : 92E20(H,H_2)

q = 11 : 92E20(H,H_2)

q = 12 : 92E20(H,H_2)

q = 13 : 92E20(H,H_2)

q = 14 : 92E20(H,H_2)

q = 15 : 92E20(H,H_2)

q = 16 : 92E20(H,H_2)

q = 17 : 92E20(H,H_2)

q = 18 : 92E20(H,H_2)

q = 19 : 92E20(H,H_2)

q = 20 : 92E20(H,H_2)

q = 21 : 92E20(H,H_2)

q = 73 : 89T31(Be)

W

q = 2 : 90E27(Ar)

q = 74 : 83T22(H)

Re

q = 6 : 92E20(H,H_2)

q = 7 : 92E20(H,H_2)

q = 8 : 92E20(H,H_2)

q = 9 : 92E20(H,H_2)

q = 10 : 92E20(H,H_2)

q = 11 : 92E20(H,H_2)

q = 12 : 92E20(H,H_2)

q = 13 : 92E20(H,H_2)

q = 14 : 92E20(H,H_2)

q = 15 : 92E20(H,H_2)

q = 16 : 92E20(H,H_2)

q = 17 : 92E20(H,H_2)

q = 18 : 92E20(H,H_2)

q = 19 : 92E20(H,H_2)

q = 20 : 92E20(H,H_2)

Au

q = 2 : 81E14(He)

q = 3 : 81E14(He), 92E20(H,H_2)

q = 4 : 81E14(He), 92E20(H,H_2)

q = 5 : 81E14(He), 83E10(He,Ne), 92E20(H,H_2)

q = 6 : 81E14(He), 83E10(He,Ne), 92E20(H,H_2)

q = 7 : 81E14(He), 83E10(He,Ne), 92E20(H,H_2)
; 84T38(He)

q = 8 : 81E14(He), 83E10(He,Ne), 92E20(H,H_2)

q = 9 : 81E14(He), 83E10(He,Ne), 92E20(H,H_2)
; 84T38(He)

q = 10 : 81E14(He), 83E10(He,Ne), 92E20(H,H_2)
; 84T38(He)

q = 11 : 81E14(He), 83E10(He,Ne), 86E30(He), 92E20(H,H_2)

q = 12 : 81E14(He), 83E10(He,Ne), 83E18(H_2), 84E41(H_2), 92E20(H,H_2)
; 84T38(He)

q = 13 : 81E12(H_2), 81E14(He), 83E10(He,Ne), 83E18(H_2), 84E41(H_2), 92E20(H,H_2)
; 84T38(He),

q = 14 : 81E14(He), 83E10(He,Ne), 83E18(H_2), 84E41(H_2), 92E20(H,H_2)
; 84T38(He),

q = 15 : 81E12(H_2), 81E14(He), 83E10(He,Ne), 83E18(H_2), 84E1(He), 84E41(H_2),
92E20(H,H_2)
; 84T38(He)

q = 16 : 81E14(He), 83E10(He,Ne), 83E18(H_2), 84E41(H_2), 92E20(H,H_2)
; 84T38(He)

q = 17 : 81E14(He), 83E10(He,Ne), 83E18(H_2), 92E20(H,H_2)

q = 18 : 81E14(He), 83E10(He,Ne), 83E18(H_2), 84E41(H_2), 92E20(H,H_2)
; 84T38(He)

q = 19 : 92E20(H,H_2)

q = 20 : 81E14(He), 83E10(He,Ne), 92E20(H,H_2)
; 84T38(He)

q = 21 : 81E14(He), 83E10(He,Ne), 92E20(H,H_2)
; 84T38(He)

q = 22 : 81E14(He), 92E20(H,H_2)
; 84T38(He)

q = 23 : 81E14(He), 92E20(H,H_2)
; 84T38(He)

q = 24 : 81E14(He), 92E20(H,H_2)

q = 25 : 84T38(He)

q = 52 : 91E30(H_2,He,C,N_2)

q = 75 : 91E30(H_2,He,C,N_2)

q = 79 : 89T43(Au^{79+})

Hg

q = 1 : 62T1(Hg)

Tl

q = 1 : 91E29(Tl^+)

Pb

q = 79 : 88E36(H_2)

U

q = 1 : 82E39(U)
; 88T46(U)

q = 2 : 78T6(Ne)

q = 4 : 92E20(H,H_2)

q = 5 : 92E20(H,H_2)

q = 6 : 92E20(H,H_2)

q = 7 : 92E20(H,H_2)

q = 8 : 92E20(H,H_2)

q = 9 : 92E20(H,H_2)

q = 10 : 92E20(H,H_2)

q = 11 : 92E20(H,H_2)

q = 12 : 92E20(H,H_2)

q = 13 : 92E20(H,H_2)

q = 14 : 92E20(H,H_2)

q = 15 : 92E20(H,H_2)

q = 16 : 92E20(H,H_2)

q = 17 : 90E9(He), 92E20(H,H_2)

q = 18 : 90E9(He), 92E20(H,H_2)

q = 19 : 90E9(He), 92E20(H,H_2)

q = 20 : 90E9(He), 92E20(H,H_2)

q = 21 : 90E9(He), 92E20(H,H_2)

q = 22 : 90E9(He), 92E20(H,H_2)

q = 23 : 90E9(He), 92E20(H,H_2)

q = 24 : 90E9(He), 92E20(H,H_2)

q = 25 : 90E9(He), 92E20(H,H_2)

q = 26 : 90E9(He)

q = 27 : 90E9(He)

q = 28 : 90E9(He)

q = 29 : 90E9(He)

q = 30 : 90E9(He)

q = 31 : 90E9(He)

q = 32 : 89T40(Ne), 90E9(He)

q = 33 : 90E9(He)

q = 34 : 90E9(He)

q = 35 : 90E9(He)

q = 36 : 87E55(Ne,Ar,Kr,Xe), 90E9(He)
; 78T6(N,Ne,Ar.Kr)

q = 37 : 90E9(He)

q = 38 : 90E9(He)

q = 40 : 90E9(He)

q = 41 : 87E55(Ar)

q = 42 : 90E9(He)

q = 44 : 86E7(Ar), 87E55(Ne,Ar,Kr,Xe), 90E9(He)

q = 48 : 87E55(Ar)

q = 51 : 84E19(H_2)

q = 52 : 84E19(H_2)

q = 53 : 84E19(H_2)

q = 54 : 84E19(He,Ne,Ar,Xe,N_2)

q = 55 : 84E19(H_2)

q = 56 : 84E19(H_2)

q = 57 : 84E19(H_2)

q = 58 : 84E19(H_2)

q = 59 : 84E19(H_2)

q = 65 : 85E75(Ar,Xe)
; 85T61(Ar)

q = 75 : 85E75(Ar,Xe)
; 85T61(Ar)

q = 83 : 87E4(Al,Cu,Ag,Au)

q = 86 : 91E30(H_2,He)

q = 89 : 87E4(Al,Cu,Ag,Au)
; 87T26(C,H_2)

q = 90 : 87E4(Al,Cu,Ag,Au), 90E62(H_2), 91E30(H_2,He)

q = 91 : 84E18(C,Cu,Ta), 87E4(Al,Cu,Ag,Au)

q = 92 : 84E18(C,Cu,Ta), 87E72(Be,Ni,U)
; 78T6(Ne), 87T29(Be), 88T12(U^{92+}), 88T60(U^{91+}), 88T61(U^{91+}), 89T31(Be), 89T43(U^{92+}), 89T47(U^{91+}), 89T18(z=10-92), 90T40(U^{91+}), 91T16(U^{91+})

Molecular ion species

H_2

q = 1 : 77E5(Cs), 84E13(Na,Mg,Ar,Cs), 85E5(Li), 85E7(Cs), 86E15(Na,Mg,Ar,Cs), 86E16(Cs), 86E33(H_2), 86E56(He,Ne,Ar), 86E77(Ar), 87E17(He,Ar,H_2), 87E45(He,Ne,Ar,Kr,Xe), 87E89(He,Ne,Ar,Kr,CH_4,C_2H_6,C_3H_8,C_2H_4,C_3H_6,C_4H_8), 87E92(H_2), 87E100(Ne), 88E16(H_2), 91E44(Na(3s),Na^*(3p))
; 84T50(Mg), 86T19(H_2), 87T66(Ar), 90T8(H_2), 90T18(He)

H_3

q = 1 : 77E5(Cs), 85E7(Cs),

D_2

q = 1 : 84E38(Cs), 88E16(H_2),

D_3

q = 1 : 84E38(Cs),

N_2

q = 1 : 77E5(Cs), 82E41(Ar,N_2), 84E32(Ar,Air), 85E7(Cs), 86E36(Ar), 86E75(Ar), 87E51(N_2), 88E12(O_2,NO), 88E30(HgCl,HgBr,HgI), 88E62(H_2), 90E14(CO_2), 90E27(N_2)
; 86T64(Ar), 89T53(Ar)

q = 2 : 87E51(N_2), 89E22(He,Ne), 91E33(He,Ne,Ar)

O_2

q = 1 : 84E32(Ar,Air), 84E38(Cs), 87E72(Cs)

CO

q = 1 : 86E77(Ar), 87E69(He,Ne,Ar)

q = 2 : 87E60(Ne), 89E23(Ne)

CO_2

q = 2 : 88E26(He,Ne,Ar,Kr,Xe)

CF

q = 1 : 87E69(He,Ne,Ar)

CH

q = 1 : 86E40(Kr,N_2,CH_4,Air)

q = 2 : 88E18(He)

CH_2

q = 1 : 86E40(Kr,N_2,CH_4,Air)

CH_3

q = 1 : 86E40(Kr,N_2,CH_4,Air)

CH_4

q = 1 : 86E40(Kr,N_2,CH_4,Air)

CH_5

q = 1 : 86E40(Kr,N_2,CH_4,Air)

NH

q = 2 : 88E18(He)

OH

q = 2 : 88E18(He)

OCS

q = 2 : 88E26(He,Ne,Ar,Kr,Xe)

q = 3 : 87E49(Ar,Kr,Xe,H_2,N_2,O_2,CH_4), 89E24(Ne,Ar)

CS

q = 1 : 92E51(He)

q = 2 : 92E51(He)

CS_2

q = 2 : 87E50(He,Ne,Ar,Kr,Xe,H_2,N_2,O_2), 88E26(He,Ne,Ar,Kr,Xe)

q = 3 : 87E50(He,Ne,Ar,Kr,Xe,H_2,N_2,O_2), 89E24(Ne,Ar)

C_4H_5N

q = 2 : 87E95(C_4H_5N)

SH

q = 2 : 88E18(He)

Ar_2

q = 1 : 87E97(H_2S,CS_2,NO_2)

$(Na)_n$ (n=1-21)

q = 1 : 88E6(Cs)

$(Au)_n$ (n=2-4)

q = 2 : 89E52(Ar,Kr,Xe,N_2,O_2,CO)

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