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Bibliography on Electron Transfer Processes in Ion-Ion/Atom/Molecule Collisions – updated 1990 –

H. Tawara

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

-UPDATED 1990-

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Abstract

Following a previous compilation, new bibliographic information on experimental and theoretical studies on electron transfer processes in ion-ion/atom/molecule collisions is up-dated. The references published through 1989 are surveyed. For easy finding references for particular combination of collision partners, a simple list is also provided. Furthermore, for convenience, a copy of the previous compilation (IPPJ-AM-45 (1986)) is included.

[keywords : bibliography, electron transfer, ion, atom, molecule]

Contents

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no cross sections. energy spectra only

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growth method
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2 - 25 keV/amu
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photon spectroscopy
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- 10^{-3} keV/amu
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parallel plate technique
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growth
0.36 - 100 keV/amu
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position-/time-sensitive detector
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(B = H_2, He, Ne, Ar, Kr, Xe)
growth method
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$Ne^{8+} + He \rightarrow Ne^{6+}$ (n = 2, 3, 4)
photon spectroscopy
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photon spectroscopy
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VUV spectroscopy
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Charge transfer leading to multiple ionization of neon, sodium and magnesium
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$H^+, He^+, He^{2+} + B^{i+} + ie$; $He^{2+} + B \rightarrow He + B^{2+}$;
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$He + K^{i+} + (i-2)e$ (i=1-4)
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38 - 2070 keV/amu
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translational energy spectroscopy
3 - 9 keV/amu
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translational-energy spectroscopy
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5×10^{-4} - 1.4×10^{-2} keV/amu

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230 - 530 keV/amu
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$Cl^{17+} + Ti \rightarrow Cl^{16+}$, $Cl^{15+} + Ti^*(K^{-1}, K^{-2})$
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

69

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
$H^+ + He \rightarrow H(n=3)$
Balmer-alpha intensity as a function of axial and transverse electric field
40 - 80 keV/amu
density matrix

70

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}

71

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

72

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 (B = He, Ne, Ar, Kr, Xe)
no cross sections given. only spectra with state identifications

73

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

74

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

75

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

76

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

77

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.

78

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
$2x10^{-5}$ - $3x10^{-5}$ keV/amu

119

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
H^- + He, Ar, Xe -> H^0
position sensitive detection (E), impulse approximation (T)
0.12 - 0.5 keV/amu
relative angle-differential cross sections

79

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

80

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

81

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
$6x10^{-5}$ - $1x10^{-3}$ keV/amu

82

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

83

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 $H^+ + H(1s) \rightarrow H(all) + H^+$

84

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
$Ar^{q+}(q=4-15)$, $I^{q+}(q=5-27) + B \rightarrow Ar^{(q-1)+}$, $I^{(q-1)+}$ (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

85

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
$Cs_2^{q+}(q=2,3) + B \rightarrow Cs_2^{(q-1)+}$
translational energy spectroscopy
0.02 - 0.03 keV/amu
no cross sections given. reaction window

86

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
$CH_n^+(n=1-5) + B \rightarrow CH_n^{2+}$ (B = Kr, CH_4, N_2, air)
translational spectroscopy
0.03 - 0.4 keV/amu
no cross section given

87

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
$Ar^+ + B \rightarrow Ar + B^+$ (B = N_2, O_2)
TOF technique
2.5×10^{-7} - 2×10^{-6} keV/amu
angular distribution ($0 - 2^0$)

88

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 $\rightarrow Ca^{(q-1)+}$ (q=10-19)
X-ray / scattered particle coincidence
2500 - 9250 keV/amu

89

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

90

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
$H^+ + B \rightarrow H(2p,2s)$ (B = Na, K, Rb, Cs)
growth
0.006 - 5 keV/amu

91

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

92

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^{-5} - 0.01 keV/amu (Kr)
total cross sections

93

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
$Ca^+ + Mg, Sr \rightarrow Ca$
cross beam technique
0.002 - 0.025 keV/amu
total cross sections

94

86E46 Peart,B. Bennett,M.A.
J. Phys. B 19 (1986) L321-324
Measurement of one-electron transfer between $^3He^{2+}$ and H^- ions
$^3He^{2+} + H^- \rightarrow He^+ + H$
crossed beam technique
0.03 - 2.6 keV/amu

95

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

96

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
$Ne^{7+} + He \rightarrow Ne^{6+}$
translation spectroscopy / position-sensitive detector
0.5 keV/amu
relative differential cross sections (angle)

97

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

98

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
$3.3x10^{4}$ keV/amu
K-,L-shell capture cross sections

99

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

100

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

101

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 -> 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 - $7x10^{-3}$ keV/amu

102

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 -> 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
$7x10^{-4}$ keV/amu

103

86E79 Sharma, S. Hasted, J.B. Mathur, D.
Ind.J.Phys. 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

104

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

105

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

106

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 + 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^+)

107

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

108

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

109

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

110

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

111

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

112

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.
$H^+ + He, Ne, Kr, Xe \rightarrow H^*(n) + h\nu (n = 3,4 \rightarrow n = 2)$
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

113

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)

114

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

115

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

116

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

117

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

118

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

186

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

187

87E 2 Almeida,D.P. Castro Faria,N.V. de Freire,F.L. Montenegro,E.C. Pinho,A.G.de
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

188

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

189

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 $1/Z_1^2$

190

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,O ; B = Li(2s),Na(3s))
growth
0.25 - 5 keV/amu
also excitation cross section to Li(2p) and Na(3p) with interference filter.

191

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

192

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)
$H^+ + Na(3s) \rightarrow H^0 + Na^+$; $H^+ + Na(3p)$
photon spectroscopy technique
2 - 20 keV/amu

193

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
$H^+ + Kr(^1S_0) \rightarrow H(n=1) + Kr^+(^2P_{3/2}, ^2P_{1/2})$;
$He^+ + Xe(^1S_0) \rightarrow H(n=1,2) + Xe^+(^2P_{3/2}, ^2P_{1/2})$
TOF
0.03 - 0.05 keV/amu (c.m.)
angular distribution

194

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
$C^{4+} + H, H_2 \rightarrow C^{3+}(3s,3p,3d)$
VUV photon spectroscopy
0.05 - 3.3 keV/amu
ratios of subshell cross sections

195

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
$C^{6+}, N^{7+}, O^{8+} + He, H_2 \rightarrow C^{5+}, N^{6+}, O^{7+}$;
$C^{6+}, N^{7+} + Ar, Xe \rightarrow C^{5+}, N^{6+}$; $N^{6+}, O^{7+}, Ne^{9+} + He \rightarrow N^{5+}, O^{6+}, Ne^{8+}$;
$N^{6+} + Ar \rightarrow N^{5+}$; $O^{7+} + H_2 \rightarrow O^{6+}$; $Ne^{8+} + He, Ar \rightarrow Ne^{7+}$;
$O^{6+} + He, Ne, H_2, Ar, Kr, Xe$
energy gain spectroscopy
0.5 keV/amu
no cross sections. only n-distribution

196

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
$A^{(z-3)+} + H_2 \rightarrow A^{(z-2)++} + H_2$ (A = Nb, La)
coincidence between X-rays and scattered particles
3240 - 5040 keV/amu (La) ; 2370 - 6450 keV/amu (Nb)

197

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

198

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

199

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
$N^{5+}(1s^2) + He \rightarrow N^{3+}(1s^2nln'l')$
0.357 - 4.28 keV/amu
emission cross sections for $2s^2\ ^1S$ - $2s2p\ ^1P$ transition

200

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
$O^+ + O \rightarrow O + O^+$
the previous values should increase by a factor of 1.7(+0.7; -0.3)

201

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
$Ar^{q+}(q=2-5) + Ar \rightarrow Ar^{(q-1)+} + Ar^+$
trapped ion
10^{-5} keV/amu
rate coefficients at 300K

202

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
$D^+ + Cs \rightarrow D^0$, $D^+ : D^0 + Cs \rightarrow D^0$, $D^- : D^- + Cs \rightarrow D^0$
0.125 - 1 keV/amu
angular differential cross sections

203

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
$Ar^{q+}(q=8,9,11) + Ar \rightarrow Ar^{r+} + Ar^{s+}$ (r = q-1, q-2, q-3)
translational energy spectroscopy
0.045 x q keV/amu
relative cross sections

204

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
$Ar^{q+} + Ar \rightarrow Ar^{r+} + Ar^{s+}$ (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

205

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
$A^+ + A \rightarrow A + A^+$ (A = He, Ar, H_2)
growth
2 - 5 keV (for all ions)

206

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
$Ar^{8+} + B \rightarrow Ar^{7+}(4l,5l) + B^+$ (B = He, H_2)
X-ray spectroscopy (E), PSS (T)
0.5 - 2 keV/amu
emission cross sections, cross sections for (n,l) states

207

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

208

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.
$H^+ + B \rightarrow H + B^+$; $H^- + B^{2+} : H + B \rightarrow H^+ + B + e$;
$H^- + B^+$ (B = Na,K,Rb)
growth method
0.5 - 5 keV/amu
also secondary electron emission coefficients for SS,Cu

209

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.
$Ar^{2+}(3p^4\ ^3P,^1D) + K \rightarrow Ar^+ + K^+$
optical attenuation method
0.1 keV/amu

210

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.
$H^+ + H_2O \rightarrow H^0$
TOF
0.03 - 0.05 keV/amu
probabilities given as a function of scattering angle.

211

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.
$H^+ + Xe \rightarrow H^+ + Xe$; $H + Xe^+$
TOF technique
4 - 6.6 keV/amu
angular distribution

212
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 -> Kr^{+} + He^{+} at sub-eV collision energies.
$Kr^{2+}(^1D_2, ^1S_0)$ + He -> $Kr^{+}(^2P_{3/2}, ^2P_{1/2})$ + He^{+}
crossed-beam technique
$3.8x10^{-6}$ - $6.2x10^{-6}$ keV/amu
total cross section ratios only

213
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

214
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

215
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

216
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.

217
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

218
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

219

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

220

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 -> H(2p) + B^+ (B= He,Ne,Ar)
photon detection method
1 - 25 keV/amu

221

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

222

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 -> C^{3+},C^{2+};N^{4+} + B -> N^{3+},N^{2+};
N^{5+} + B -> N^{4+},N^{3+};O^{5+} + B -> O^{4+},O^{3+} (B= He)
retardation method
0.5 - 6 keV/amu

223

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 -> 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.

224

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^+ -> H + B^+; H^+ + B^{2+} + e (B= C,N)
crossed beam technique
46 - 141 keV/amu

225

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
$2x10^{-2}$xq (keV/amu) (B = He, Ne, Ar, Kr, Xe)
total cross sections. various transfer channels determined.

226

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

227

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

228

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
1.1×10^{-4} - 2.4×10^{-4} keV/amu

229

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

230

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+} ($10 \leq q \leq 20$) 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

231

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 =
(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

232

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 ^{3}He and ^{4}He targets.
X-ray spectroscopy
5.5×10^3 keV/amu Ne
no isotope effect in REC

233

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.

234

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

235

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 -> O^+ + He^+
translational energy spectroscopy
3.75×10^{-3} - 1.6×10^{-2} keV/amu
angular distribution. predominant capture into $2p^3$ ^2P state.

236

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

237

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

238

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

239

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

240

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

241

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 -> $N^{5+}(n),N^{4+}(n,n')$ (B= He,Ar);
O^{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,Ar);
Ne^{8+} + B ->$Ne^{7+}(n),N^{6+}(n,n')$ (B= He,Ar);
Ne^{9+} + B ->$Ne^{8+}(n),N^{7+}(n,n')$ (B= He)
translational energy spectroscopy
-> 0.5 keV/amu
no absolute cross sections

242

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

243

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 (B = He, Ne, Ar, Kr, Xe)
no cross sections given

244

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.

245

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.

246

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.

247

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_2, N_2, O_2, CH_4)
translational energy spectroscopy
0.27 keV/amu
energy gain spectrum only. no cross sections given

248

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

249

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

250

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.

251

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

252

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

253

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

254

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.
$A^{q+} + B \rightarrow A^{(q-1)}, A^{(q-2)}, A^{(q-3)+} + B^i$
(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.

255

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.

256

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.

TOF
0.01 - 0.03 keV/amu
Angular distribution.

257

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^+.

258

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.

259

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

260

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
$3x10^{-3}$ keV/amu
no cross sections given

261

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

262

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).
$N^{7+},O^{8+},Ne^{8+} + H_2,He \rightarrow N^{6+}(n,l),O^{7+}(n,l),Ne^{7+}(1s^2,nl)$
photon spectroscopy
4 keV/amu
no cross sections. relative population only

263

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
$N^{7+} + B \rightarrow N^{6+} + B^{k+}$ (B= Ar,Xe; k= 1 - 4)
translational energy spectroscopy + recoil ion
0.75 keV/amu
no cross sections

264

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.
$H^+ + H^- \rightarrow H + H^+ + e$
crossed beam,LZ
$5x10^{-2}$ - 40 keV/amu

265

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
$H^+ + H^- \rightarrow H + H$
crossed beam technique
1 - 40 keV/amu

266

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.
$S^{15+} + H_2 \rightarrow S^{14+}(2l,nl) + H_2^+$
X-ray-X-ray coincidence
2190 - 5000 keV/amu
resonant capture + excitation

267

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.
$S^{16+} + Ar \rightarrow S^{15+}(1s) + Ar^+(K^{-1})$
X-ray-X-ray coincidence technique
500 keV/amu
Impact parameter dependence. no cross sections given

268

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.
$H^+ + H,H_2,He \rightarrow H$
liquid nitrogen-cooled Wood tube
$2x10^3$ - $7.5x10^3$ keV/amu

269

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.
$C_4H_5N^{2+} + C_4H_5N \rightarrow C_4H_5N^+, C_4H_5N$
TOF

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

270

87E96 Sekiya, H. Tsuji, M. Nishimura, 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
$2x10^{-5}$ keV/amu
no cross section given

271

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

272

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

273

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.

274

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)

275

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 -> $O_2(^1\pi, ^3\pi_g)$
translational energy spectroscopy
-> 0.1 keV/amu
Vibrationally separated states determined

276

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.
$H^+ + B \rightarrow H(2p,Lyman-\alpha) + B^+$ (B= He,Ne,Kr,Xe)
0.01 - 2 keV/amu
polarization of Lyman-α lines

277

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.
$H^+ + Li \rightarrow H + Li^+$; $H^+ + B \rightarrow H^+ + B^+$
(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)

278

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

279

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

280

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

281

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

282

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".
$O^{6+} + He \rightarrow O^{4+} + He^{2+}$
short comment

283

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.
$H_2^+ + Ne \rightarrow H^* + H^+ \rightarrow$ 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.

284

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.
$He^+ + O_2 \rightarrow He + O_2^+(c^4\Sigma_u^-,B^2\Sigma_g^-)$
TOF with dissociated ions
0.7 - 4 keV/amu
Energy and angular distribution of dissociated ions

285

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.
$^3He^{2+} + He \rightarrow He^0 + He^{2+}$
0-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.
$O^{6+} + H_2 \rightarrow O^{5+}(1s^2nl; n = 3,4)$
; $O^{7+} + H_2,He \rightarrow O^{6+}(1snl; n = 3,4)$
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

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 -> He^{+},He^{0}; He^{+} + B -> He^{0}(B = He,Ne,Ar,)
; He^{+} + B -> He^{2+} (B = He,Ne,Ar,Kr)
growth/attenuation method
187 - 1000 keV/amu
total cross sections

9

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 -> He^{-} (B = He,Ne,Ar,Kr)
growth method
187 - 1000 keV/amu

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 -> 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 -> 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^{+} + $H_2(D_2)$ -> $He(3^3P;\ m_l=1)$ + $H_2^{+}(D_2^{+})$
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 -> N_2 + $O_2(a^4\Pi_u)$
; $N_2^{+}(X,v=1)$ + NO -> N_2 + $NO^{+}(a\ ^3\Sigma^{+})$
$3x10^{-6}$ - $3.6x10^{-5}$ keV/amu
rate constants $N_2^{+}(X,v=1)$ + B -> $N_2^{+}(X,v=0)$ + 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.
$Mg^+ + He \rightarrow Mg; Be^+ + He \rightarrow Be$
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 experiment 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.
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

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) + $H_2 \rightarrow I^{(q-1)+}(n)$
photon spectroscopy
10^2,2.5×10^2 keV/amu
strong core-effect

23

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=5,7,8) collisions.
O^{q+}(q = 5,7,8) + Ne $\rightarrow O^{(q-2)+}, ^{(q-1)+}, ^{(q+1)+}, ^{(q+2)+}$
growth
0.5×10^3 - 2.5×10^3 keV/amu
total cross sections

24

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

25

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

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.
$He^+ + Xe \rightarrow He + Xe^+$
crossed-beam technique
1.3×10^{-3} - 2.4×10^{-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.
$O^{2+} + B \rightarrow O^+ + B^+$ (B = He,Ne,Ar,H_2,D_2,N_2,O_2)
retarding method
1.8×10^{-4} - 2.5×10^{-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+},OCS_2^{2+} and CS_2^{2+}
$A^{2+} + B \rightarrow A^+ + B^+$ (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.
$Kr^{5+} + He,Ne,Ar \rightarrow Kr^{4+}$; $Kr^{5+} + Ne \rightarrow Kr^{3+}$
; Kr^{3+} Ar,Kr,Xe $\rightarrow Kr^+$; $Kr^{4+} + Ar,Kr \rightarrow Kr^+$
; $Xe^{3+} + Ar \rightarrow Xe^+$; $Xe^{4+} + Ne,Ar \rightarrow Xe^{2+}$
; $Xe^{4+} + Kr \rightarrow Xe^+$
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.
$Ar^{q+} + B \rightarrow Ar^{(q-1)+}$ (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.
$H(2s) + B \rightarrow sum(H^+ + H^- + H(1s))$
(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
$9.9x10^{-3}$ 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)
$A^+ + HgB_2 \rightarrow A + HgB_2^+$ (A = N,N_2; B = Cl,Br,I)
photon spectroscopy
$3.6x10^{-5}$ - $6.4x10^{-2}$ 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.
$Ar^+(^2P_{1/2},^2P_{3/2}) + H_2,N_2,CO \rightarrow Ar(^1S_0)$;
$Kr^+(^2P_{1/2},^2P_{3/2}) + CO \rightarrow Kr(^1S_0)$
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 -> $O^{4+}(1s^2 2pnl$; 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

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)

42

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

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
$N^{7+} + B \rightarrow N^{5+}(3ln'l') + B^{2+} \rightarrow N^{5+}(2l) + e + B^{2+}$
(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.
$F^- + B \rightarrow F^0, F^+$ (B = N_2,Ne); $Cl^- + Ar \rightarrow Cl^0, Cl^+$
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
$He^+ + Na \rightarrow He^*(2^3S,2^1S,2^3P,2^1P) + Na^+$
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
$N^{2+*}(2p\ ^2P_{1/2}) + H_2 \rightarrow N^+(2p^2\ ^1S_2, ^1D_2;\ 2p^3\ ^3D_3)$
translational energy spectroscopy
0.036 - 0.36 keV/amu
H_2^+ and $H^+ + H$ are distinguished.

48

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
$Ca^{17+} + Ar \rightarrow Ca^{(17-r)+}$ (r = 1 - 5)
X-ray-ion coincidence technique
1.17×10^3 keV/amu

49

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
$Ne^{7+} + Ne \rightarrow Ne^{r+} + Ne^{p+}$ (r = 6 - 2; p = 1 - 6)
recoil ion-scattered particle coincidence
angular distributions over 1 - 20 mrad.; no cross sections given

50

88E45 Schönfeldt, W.A. Mokler, P.H. Maor, D.
Z.Phys.D 9 (1988) 47 - 57
Charge transfer in 1.4 MeV/amu $Ni^{q+} \rightarrow Kr$ collisions , q = 16 - 22
Ni^{q+}(q = 19 - 22) + Kr -> $Ni^{q'+}$
X-ray measurement
1400 keV/amu
total cross sections

51

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
$C^{6+} + Ne \rightarrow C^{5+} + Ne^{4+};\ C^{5+} + Ne^+;\ C^{6+} + Ne^{4+};\ C^{6+} + Ne^+$
scattered projectile-recoil ion coindence
833 keV/amu
angular differential cross section

52

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
$F^{6+} + H_2 \rightarrow F^{5+}(1s2snln'l') + H_2^{2+}$
X-ray-projectile coincidence
789 - 1713 keV/amu

53

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+}
$A^{2+} + Li(2s) \rightarrow A^+(nl)$ (A = Ne,Ar)
translational energy spectroscopy
no cross sections. identification of various channels

54

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
$C_nH_mN_p^+ + C_4H_5N \rightarrow C_nH_mN_p^0 + C_4H_5N^+$
(n = 2,3,4; m = 3,4,5; p = 0,1)
TOF
4×10^{-2} keV/amu

55

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 $N^{5+}(1s2s\ ^3S)$ ions in collisions with He and H_2 at 3.4 keV/amu
$N^{5+}(1s2s\ ^3S) + H_2,He \rightarrow N^{4+}(1s2ln'l')$
photon spectroscopy
3.4 keV/amu
no cross section given

56

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

57

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
$Li^+ + Ar,Kr \rightarrow Li^+(2p\rightarrow 2s;\ 3d\rightarrow 2p)$
photon spectroscopy
5.7×10^{-2} - 0.57 keV/amu

58

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
$I^{13+} + H_2,He \rightarrow I^{12+}$; $I^{12+} + H_2,He \rightarrow I^{11+}$
growth method
100 keV/amu
cusp cross sections

59

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
$H + B \rightarrow H^*(2p)$; $H^+ + B \rightarrow H^*(2p)$ (B = N_2,O_2)
Lyman α detection
0.04 - 2.5 keV/amu

60

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
$K^+,Rb^+,Sr^+,Sr^+(4d) + Na \rightarrow K,Rb,Sr,Sr$

61

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

62

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+}, Ne^{8+} + He -> $A^{(q-1)+}$
angular scattering spectroscopy
0.37 - 1.3 keV/amu
differential cross sections in angle

63

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
$O^{3+}(2s^22p)^2P^0$ + H -> $O^{2+}(2s^22pnl)$ + H^+ (n = 2,3);
$Ne^{3+}(2s^22p^3nl)^4S^0$ + H -> $Ne^{2+}(2s^2sp^3nl)$ + H^+ (n = 3)
translational energy spectroscopy
0.26 - 0.75 keV/amu(O); 0.09 - 0.7 keV/amu(Ne)

64

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 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

4

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.

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 $\Delta n \geq 1$ L-shell dielectronic recombination cross sections.
Nb^{q+}(q = 28 - 32) + H_2,He -> $Nb^{(q-1)+}$ + $h\nu$
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.
$Ar^{8+} + B \rightarrow Ar^{7+}, Ar^{6+}$ ($B = H_2, He$)
photon spectroscopy
3.75 keV/amu
no cross sections given
: strong $\Delta n=0$ 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.
$Kr^{8+} + He(H_2) \rightarrow Kr^{7+}(4snl), Kr^{6+}$
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.
$A^{(Z-2)+}(1s^2) + He \rightarrow A^{(Z-4)+}(1s^2 3l3l') + He^{2+}$ (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 ($15 \leq q \leq 35$) 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 -> $Ar^{3+}(4p)$
translational energy-spectroscopy
$8x10^{-4}$ - $5x10^{-3}$ 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 -> O^{2+},O^+ + H_2^+
ion trapping technique/attenuation
$8x10^{-5}$ keV/amu (O^{2+}) ; $1.3x10^{-4}$ 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 -> H(2s) + Cs^+ in the energy range 200 - 2000 eV.
H^+ + Cs -> H(2s) + Cs^+
0.2 - 2 keV/amu
angular distribution proportional to E^{-1}.

18

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 -> 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

19

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 -> $N^+(^2S)$ + $H_2^+(X\ ^2\Sigma,v)$
translational energy spectroscopy
0.025 - 0.1 keV/amu
relative cross sections

20

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 -> $Kr^+(^2P_{1/2,3/2})$ + $Ne^+(^2P_{1/2,3/2})$
translational energy spectroscopy
$5x10^{-3}$ - $2.4x10^{-2}$ keV/amu
relative cross sections

21

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

22

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) -> N_2^* + $He^+(Ne^+)$
translational energy spectroscopy
0.2 keV/amu
various channels observed ; no cross sections given

23

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 -> CO^+
translational energy spectroscopy
0.2 keV/amu
double ionization energy = 41.76 ±0.1eV ; various excited states observed ; no cross sections

24

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 -> OCS^{2+},CS_2^{2+} (B = Ne,Ar)
0.07 keV/amu
only energy spectra.

25

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 -> O^{4+} + H^+
merged-beams technique
$9x10^{-4}$ - $8x10^{-1}$ keV/amu

26

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Electron loss and transfer for 20 - 110 keV iodine-rare gas collisions.
I + B -> I^-,I^+ (B = He,Ne,Ar,Kr,Xe)
growth method
0.15 - 0.86 keV/amu

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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 -> C^{5+},O^{7+}
photon spectroscopy
1 - 9 keV/amu
emission cross sections

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 -> $He^+(2p)$
photon spectroscopy
0.3 - 1.75 keV/amu

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J.Phys.B 22 (1989) L 585 - 589
Collisions spectroscopy with aligned and oriented atoms II. charge exchange in He^+ - Na(3p) collisions.
$He^+ + Na(3s,3p) \rightarrow He(n) + Na^+$
TOF method
0.125 - 0.75 keV/amu
n=2 dominant at low energies : n=3 at high energies

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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.
$N^{q+}(q = 3,4,5) + H \rightarrow N^{(q-1)+} + H^+$
merged-beam technique
$1x10^{-3}$ - 1.4 keV/amu

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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

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

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Phys.Rev.A 40 (1989) 3026 - 3631
Absolute differential cross sections for small angle H^+ - He direct and charge transfer scattering at keV energies.
$H^+ + He \rightarrow H(0.02 - 1°)$
position-sensitive detection
5 keV/amu
angular distribution (0.02 - 1°). also direct scattering
$H^+ + He \rightarrow H^+ + He$
T: MO close-coupling calculation

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Direct and charge transfer scattering of KeV energy H^+ and He^+ projectiles from rare gas atoms to obtain small-angle absolute cross sections.
$A^+ + B \rightarrow A$ (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.

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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.
$Ar^{4+} + B \rightarrow Ar^{2+}$
translational energy spectroscopy
2×10^{-2} keV/amu
angular distributions ; no cross section given.

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State-selected atomic ion reactions ; a new experimental method.
first results on the $O^+(\ ^4S, ^2D, ^2P\ ) + N_2$ system.
$O^+(^2P) + N_2 \rightarrow O(^3P) + N_2^+(v=1)$
; $O^+(^2D) + N_2 \rightarrow O(^1D) + N_2^+(v=0)$
modified TPEPICO
5×10^{-4} - 1.25×10^{-3} keV/amu
ratios for $^2P/^2D(<1)$; no absolute cross sections

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89E37 Lebius, H. Koslowski, H.R. Huber, B.A.
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State-selective single electron capture by multiply charged ions-reaction window and multichannel Landau-Zener calculations.
$Ar^{3+} + Ar \rightarrow Ar^{2+}$; $Ne^{3+} + He \rightarrow Ne^{2+}$; $Ne^{3+} + Ne \rightarrow Ne^{2+}$
; $Ar^{3+} + Ne \rightarrow Ar^{2+}$
translational energy spectroscopy
1.5×10^{-2} keV/amu
cross sections for different (nl) states
T: Landau-Zener calculation

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Nucl.Instr.Meth.in Phys.Res.B 42 (1989) 38 - 40
He^{2+} collisions with Ne and Ar atoms into excited states.
$He^{2+} + B \rightarrow He^*(\ 6g\ ^2G_{7/2} \rightarrow 4f\ ^2F^0_{5/2}\ )$; $He(\ 3^3S \rightarrow 2^3P$; $2^3S\ )$
(B = Ne,Ar)
photon spectroscopy
35 - 85 keV/amu
emission cross sections ; Ar^*,Ne^* emission cross sections in He^+,He^{2+} collisions

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J.Phys.B 22 (1989) 1217 - 1224
Subshell selective electron capture (2 - 105 keV/amu) studied by VUV spectroscopy in O^{6+} + He collisions.
$O^{6+} + He \rightarrow O^{5+} + He^+$
photon spectroscopy
2 - 105 keV/amu
emission cross sections for 3p->2s ; 3s->2p ; 3d->2p ;4f->3d ; 4d->3p

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Balmer-α emission from H^+ impact on Kr and Xe atoms.
$H^+ + Kr,Xe \rightarrow H(3l)$
photon-spectroscopy
4 - 20 keV/amu

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Correlation in double electron capture in collisions of fully stripped ions on He and H_2.
$C^{6+} + H_2 \rightarrow C^{4+}(3l,3l')$; $O^{8+} + He \rightarrow O^{6+}(3l,3l') + He^{2+}$
electron spectroscopy
5 - 6 keV/amu

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Double Rydberg of high angular momentum (l = 6 - 8) produced in Ar VIII by Ar^{9+} + Cs collisions.
Ar^{9+} + Cs -> Ar^{7+}($1s^2 2s^2 2p^5 5gnl$: n = 7 - 9)
photon spectroscory
2.25 keV/amu
transition energies ; no cross sections given

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89E43 Martinez, H. Morales, A. de Urquijo, J. Alvarez, I. Cisneros, C.
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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

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Europhys.Letters 40/41 (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 $q^{1.3}$

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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.

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89E46 Nakai, Y. Shirai, T. Tabata, T. Ito, R.
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A semiempirical formula for single-electron capture cross sections of multiply charged ions colliding with H, H_2 and He.
analytical fitting

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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

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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

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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.
$Ar^+(^2P_{3/2}) + B \rightarrow Ar$ ($B = H_2, N_2, O_2, CO$)
cold nozzle technique
20,30,70 K
rate coefficients

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J.Phys.B 22 (1989) 509 - 524
Collision spectroscopy of O^{5+} and N^{5+} colliding on a He target.
$A^{5+} + He \rightarrow A^{5+}$($n = 2,3,4$), $A^{4+}(2lnl')$ ($A = N,O$)
energy-gain spectroscopy
0.6 keV/amu
angular distributions (0 - 0.15°)

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Electron capture and ionization in ion-ion collisions.
a review

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Charge exchange and metastability of small multiply charged gold clusters.
$(Au)_n^{2+} + B \rightarrow (Au)_n^+$; $(Au)_4^3 + B \rightarrow (Au)_4^{2+}$
($n = 2 - 4$; $B = Ar, N_2, Kr, CO, Xe, O_2$)
3×10^{-5} keV/amu
fragmentation cross sections are comparable to charge exchange cross sections.

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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

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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
$9 \times 10^2 - 1.7 \times 10^3$ keV/amu
electron-electron interaction in ion-atom collisions.

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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
$7.5 \times 10^{-3} - 2.5 \times 10^{-1}$ keV/amu
fractions of metastable ions (2 - 5 %)

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.
$H^+ + He \rightarrow H + He^+$; $H + He^+ + e$
: $He^{2+} + He \rightarrow He^+ + He^+$; $He^+ + He^{2+} + e$
coincidence tecnique
9 - 100 keV/amu (H) ; 6 - 67 keV/amu (He)
also $H^+ + He \rightarrow H^+ + He^+ + e$; $H^+ + He^{2+} + 2e$
; $He^{2+} + He \rightarrow He^{2+} + He^+ + e$

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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)

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Phys.Rev.A 40 (1989) 59 - 68
Charge exchange cross sections for 445 MeV Cl ions in solid C targets.
$Cl^{16+} + C \rightarrow Cl^{17+}$; $Cl^{15+} + C \rightarrow Cl^{16+}, Cl^{17+}$
; $Cl^{17+} + C \rightarrow Cl^{16+}$ (total; 2p; 3p) ; $Cl^{16+} + C \rightarrow Cl^{15+}(5n)$
growth + fitting
1.27×10^4 keV/amu
also excitation $Cl^{16+} + C \rightarrow Cl^{16+}(2p,3p)$; $Cl^{15+} + C \rightarrow Cl^{15+}(2\ ^1P)$

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A laser-induced fluorescence study of product rotational state distributions in the charge transfer reaction
: $Ar^+(^2P_{3/2}) + N_2 \rightarrow Ar + N_2^+(X)$ at 0.28 and 0.40 eV.
$Ar^+(^2P_{3/2}) + N_2 \rightarrow Ar + N_2^+(X)$
ion-molecule crossed beam technique
(7 - 10) $\times 10^{-6}$ keV/amu
X-distribution

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Phys.Rev.A 39 (1989) 1571 - 1574
Evidence for electron correlation during double capture in fast (v = 10 a.u.) collisions.
$Ne^{10+} + B \rightarrow Ne^{9+}, Ne^{8+}$ (B = He,Ne,Ar)
electron-projectile coincidence
3.5×10^3 keV/amu
strong electron correlation

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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

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Coincidence measurements of slow recoil ions with projectile ions in 42 MeV Ar^{q+} - Ar collisions.

Ar^{q+} + Ar -> $A^{q'+}$ (q = 4,6,8,10,12,14)
projectile-recoil ion coincidence
10^3 keV/amu
recoil ion production cross sections

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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

Reference list of theories

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Inelastic heavy particle collisions involving the crossing of potential energy curves II. ; charge transfer from H-atoms to Al^{3+},B^{2+},Li^{2+} and Al^{2+}.
Al^{3+} + H -> $Al^{2+}(^2S,^2P)$; B^{2+} + H -> $B^+(^1P)$;
Li^{2+} + H -> $Li^+(^3S,^1S)$; Al^{2+} + H -> Al^+
Landau-Zener
10^{-3} -10 keV/amu
also rate coefficients for 10^3 - $3x10^4$ K

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J.Chem.Phys. 37 (1962) 2631 - 2645
Charge exchange between gaseous ions and atoms.
A^+ + A -> A + A^+ (A= H,He,Ne,Ar,Kr,Xe,Hg,K,Ca); N^+ + H -> N + H^+
IP
10^{-8} - 5 keV/amu(A); $7x10^{-3}$ - 7 keV/amu(N^+)

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J.Geophys.Res. 68 (1963) 1773 - 1775
Accidentally resonant asymmetric charge transfer in protonosphere.
$O^+(^4S)$ + H -> O
10^{-6} - 5 keV/amu

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Charge transfer of Si^{2+} ions with atomic hydrogen in the interstellar medium.
Si^{2+} + H -> Si^+ + H^+
MO
3 - $3x10^4$ K
rate coefficients

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Symmetric charge transfer in low-energy ion-atom collisions.
A^+ + A -> A + A^+ (A= Li,Na,K,Rb,Cs,Ca)
10^{-5} - 10^{-3} keV/amu

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Differential cross sections for charge exchange at high energies.
H^+ + He -> H : H^+ + Ar -> H + $Ar^+(K^{-1})$
CDW approximation
293 keV/amu(He) ; $6x10^3$ keV/amu(Ar)
differential cross sections

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Charge transfer of multiply ionized species.
A^{2+} + H -> A^+ (A= C,Mg,Si) ; A^{3+} + H -> A^{2+} (A= C,N) ;
A^{3+} + He -> A^{2+} (A= Li,Be,B,C,Mg,Al)
review
rate coefficients;important for astrophysics

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Low velocity C^{6+} + H(1s) charge transfer; the two state approximation.
C^{5+} + H(1s) -> C^{5+}
S-matrix
0.06 - 25 keV/amu
total cross sections

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Highly stripped ions on hydrogen atoms; the adiabatic approach I.
Energy gap and coupling at pseudocrossings.

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construction of the S matrix.

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Silicon lines spectral diagnostics : the effect of charge transfer.
Si^{+} + H^{+} -> Si^{2+} + H ; Si^{2+} + He^{+} -> Si^{3+} + He
modelling

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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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Influence of the linear Stark effect on electron capture into fully stripped ions.
H^{+} + H,He -> H(n=2); O^{8+} + He -> O^{7+}(n=2)
OBK
50 -400 keV/amu(H^{+}); 7×10^{2} = 1.3×10^{3} keV/amu(O^{8+})
alignment parameters given; (2p)/(2s) ratios given

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asymptotic form for 3-electron exchange for triply charged ions; 1) direct exchange 2) successive exchange

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analytical expression for exchange interaction

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Charge transfer of O IV with hydrogen.
O^{3+} + H -> $O^{2+}(2s^{2}2p3s\ {}^{1}P^{0},{}^{3}P^{0};\ 2s^{2}2p3p\ {}^{1}D,{}^{3}D;\ 2s^{2}2p3p\ {}^{1}S,{}^{3}S)$
MO
5×10^{3} - 5×10^{4} K

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On the choice of translation factors for approximate molecular wave functions.
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MO with translation factor
0.25 - 25 keV/amu

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Charge transfer ionization of Si^+ by H^+ at thermal energies.
$Si^+(^2P)$ + H^+ -> $Si^{2+}(^1S)$ + H ; Si^{2+} + H -> Si^+ + H^+
MO
10 - 19^6 K

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Theory of charge-exchange transitions to excited states in ion-atom collisions.
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Landau-Zener model
rate coefficients at thermal energies

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Charge excange involving ion excitation.
He^+ + $Hg(6s^2)$ -> He + $Hg^{**}(7p)$
asymptotic theory

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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

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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

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Electron detachment for $H^-(D^-)$ in collisions with Ne.
H^-,D^- + Ne -> H(D)

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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

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Distorted-wave theory of heavy-particle collisions at intermediate energies.
O^{2+} + He -> O^{*} ($2p^3$ $^2P^0$,$^2D^0$)
DWA
10^{-3}- 5 keV/amu

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strong potential Born, Impulse Approx. continuum-distorted-wave-approximation.

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Quantal calculation
10^{-3} - 10^{-1} keV/amu
3d capture is dominant at low energies.

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Non-resonant exchange between two electrons.
C^{4+} + He -> C^{3+} + He^{+}
quasi-classical approximation

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translation factor in MO model

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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
$1.4x10^{5}$ - $2.1x10^{6}$ keV/amu

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

47

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^{17+}
quantum statistical,semiclassical,independent particle model
3600 - 15000 keV/amu
total cross sections.

48

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

49

85T63 Opradolce,L. McCarroll,R. Valion,P.
Astron.Astrophys. 148 (1985) 229 - 233
Charge transfer of Si^{4+} with helium.
Si^{4+} + He -> $Si^{3+}(2p^{6}3p)^{2}P$, $(2p^{6}3s)^{2}S$ + He^{+};
Si^{3+} + He^{+} -> Si^{4+} + He
molecular quantal treatment
$4x10^{-7}$ - 3.5 keV/amu
rates given

120

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+}
With translation factor
5 - 70 keV/amu

121

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 : $Ar^{+}(^{2}P_{1/2}, {}^{2}P_{3/2})$ + N_2 -> Ar + N_2^{+}
ab initio approach
$2x10^{-2}$ keV/amu

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86T65 Baer, M. Nakamura, H. Ohsaki, A.
Chem.Phys.Letters 131 (1986) 468 - 474
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

123

86T15 Barany,A. Danared,H. Cederquist,H. Hvelplund,P. Knudsen,H Pedersen,J.O.K. Cocke,C.L. Tunnell,L.N. Waggoner,W. Giese,J.P.
J.Phys.B 19 (1986) L427 - 431
Stueckelberg angular scattering oscillations in two electron capture by C^{4+} from He at low energies.
$C^{4+} + He \rightarrow C^{2+} + He^{2+}$
Two state curve crossing model
0.025 - 0.125 keV/amu
Angle differential cross sections

124

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

125

86T66 Belkic, Dz. Saini, S. Taylor, H.S.
Z.Phys.D 3 (1986) 59 - 67

Electron capture by protons from the K-shell of H and Ar.
$H^+ + H(1s) \rightarrow H(nlm) + H^+$; $H^+ + Ar \rightarrow H(nl) + Ar^+(K^{-1})$
T-matrix
25 - 125 keV/amu(H); 10^3 - 1.3×10^4 keV/amu(Ar)
angular distribution

126

86T17 Blanco,S.A. Falcon,C.A. Piancetini,R.D.
J.Phys.B 19 (1986) 3945 - 3950
Electron capture from H(2s) by H^+ at low energies
$H^+ + H(2s) \rightarrow H(n=2) + H^+$
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)

127

86T67 Braga, J.P. Knowles, D.B. Murrel, J.N.
Mol.Phys 57 (1986) 665 - 674
A theoretical study of the non-adiabatic charge transfer process $Ar^{2+}(^3P) + He(^1S) \rightarrow Ar^+(^2P) + He^+(^2S)$.
$Ar^{2+}(^3P) + H(^1S) \rightarrow Ar^+(^2P) + He^+(^2S)$
close-coupling calculation with C.I.
3×10^{-5} - 3×10^{-3} keV/amu
also angular differential cross sections; comparison with Landau-Zener calculation

128

86T68 Briggs, J.S.
J.Phys.B 19 (1986) 2703 - 2714
Critical second-order scattering in three-body rearrangement and break-up processes.
second-order T-matrix

129

86T18 Burgdorfer,J. Morgenstern,R. and Niehaus,A.
J.Phys.B 19 (1986) L507 - 513
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.

130

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

131

86T20 Cooper,D.L. Ford,M.J. Gerratt,J. Raimondi,M.
Phys.Rev.A 34 (1986) 1752 - 1756
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

132

86T69 Dakhnovskii, Yu.I. Ovchinnikov, A.A.
Mol.Phys. 58 (1986) 237 - 252
Adiabatic electron transfer in polar media : Quantum transition state theory.
general theory
transition state theory

133

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 are oscillatory.

134

86T22 Deco,G.R. Hanssen,J. Riverola,R.D.
J.Phys.B 19 (1986) L635 - 638
Application of a first-Born- type approximation for 2l electron capture in ion-atom collisions
H^+ + H(1s) -> H(2s,2p); H^+ + $He(1s^2)$ -> H(2s,2p)
First-Born-approximation
25 - 1000 keV/amu
Total cross sections

135

86T23 Deco,G.R. Rivaroea,R.D.
J.Phys.B 19 (1986) 1759 - 1770
Relativistic continuum distorted-wave model for electron capture
$H^+ + H(1s) \rightarrow H(1s) + H^+$
CDW model
$5x10^7$, $5x10^9$ keV/amu
Angular distribution

136

86T24 Deco,G.R. Piancetini,R.D. Rivarola,R.D.
J.Phys.B 19 (1986) 3727 - 372
Symmetric eikonal theory for $n_i l_i m_i \rightarrow n_f l_f m_f$ electron capture in ion-atom collisions.
General system
Symmetric eikonal approximation

137

86T70 Devdariani, A.V. Ostrovskii, V.N.
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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

138

86T25 Dewangan,D.P. Eichler,J.
J.Phys.B. 19 (1986) 2939 - 2944
A first-order Born approximation for charge exchange with Coulomb boundary conditions.
$H^+ + Ar \rightarrow H + Ar^+(K^{-1})$
First order Born approximation
10^3 - $2x10^4$ keV/amu

139

86T26 Eichler,J.
Electronic and Atomic Collisions (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

140

86T27 Errea,L.F. Mendez,L. Mo,O. Riera,A.
J.Chem.Phys. 84 (1986) 147 -151

Non-adiobatic ionic-covalent transitions:exponetial 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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86T28 Errea,L.F. Martin,F. Mendez,L. Riera,A. Yanez,M.
J.Chem.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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86T29 Friedrich,B. Pick,S. Hladek,L. Herman,Z. Nikitin,E.E. Reznikov,A.I. Umanskii,S.Ya
J.Chem.Phys. 84 (1986) 807 - 812
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

143

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^{5+} , O^{6+} + He -> C^{5+} , O^{5+}(n,l)
AO
0.5 -40 keV/amu
(n,l) partial cross sections given

144

86T71 Godunov, A.L. Kunikeev, S.D. Senashenko, V.S.
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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

145

86T31 Henne,A. Toepfer,A. Ludde,H.J. Dreizler,R.M.
J.Phys.B 19 (1986) L361 - 365
Time-dependent Hartree-Fock calculations for the He^+ (1s) + He^+(1s) system
$He^+(1s) + He^+(1s) \rightarrow He^{2+} + He$
Time-dependent Hartree-Fock
1 - 20 keV/amu

146

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

147

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 method
1000 keV/amu

148
86T34 Hsin,S.H. Lieber,M. Klatke,R.E. McGuire,J.H. Sie,N.C.
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

149
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 expansion method.
$A^{Z+} + He \rightarrow A^{(Z-1)+}(n,l,m)$ (A = C,O)
AO
10 - 2000 keV/amu

150
86T36 Janev,R.K. Lazur,V.Yu. Grozdanov,T.P.
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Dynamic autoionization widths for capture ionization in slow ion-atom collisions.
Analytic expressions for dynamic autoionization in transfer ionization

151
86T37 Janev,R.K. Krstic,P.S.
J.Phys.B 19 (1986) 3695 - 3715
Non-adiabatic transitions between two groups of intersecting energy levels.
Closed forms for transition probabilities.

152
86T72 Kern, K. Schlier,Ch.
Z.Phys.D 1 (1986) 391 - 401
Orbiting trajectories and the adiabatic approximation to the capture cross section.
average dipole orientation (ADO) theory; Monte Carlo calculation

153
86T38 Kimura,M.
Electronic and Atomic Collisions (1986) 431 - 444
Theoretical treatment of electron capture and excitation in two-electron system ion-atom,atom-atom collisions at low to intermediate energy.
review

154
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 expansion method
0.14 - 3 keV/amu
Alignment and orientation

155
86T40 Kimura,M.
Phys.Rev.A 33 (1986) 4440 - 4443
Theoretical 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^{5+} , N^{7+} + H, $H_2 \rightarrow C^{5+}$, N^{6+}
travelling MO
0.1 - 10 keV/amu
Total cross sections given

156

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.
$H^+ + He \rightarrow H$ (2s,2p,total) $+ He^+$; $H^+ + He(\ ^1P, ^1S)$
MO - AO matching method
1 - 100 keV/amu
Impact parameter dependence

157

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 extremely low energies.
$H^+ + H \rightarrow H + H^+$; $He^{2+} + He \rightarrow He + He^{2+}$
MO
10^{-10} - 10^{-6} keV/amu

158

86T43 Kirby,K. Heil,T.G.
J.Chem.Phys. 85 (1986) 6420 - 6424
A molecular representation of $Al^{3+} + H$ charge transfer reactions.
$Al^{3+} + H \rightarrow Al^{2+}$
MO expansion
0.014 - 14 keV/amu
Total cross section

159

86T73 Kobayashi, K. Ishihara, T.
Phys.Rev.A. 34 (1986) 626 -628
Differential cross sections for electron capture in fast proton-hydrogen collisions.
$H^+ + H \rightarrow H + H^+$
eikonal approx. with distortion by internuclear interaction
25 - 125 keV/amu
angular distribution over 0 - 3 mrad

160

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.
$N^{3+} + H \rightarrow N^{2+} + H^+$
semiclassical comlex energy theory

161

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Electron capture mechanisms
review

162

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
$Be^{4+} + He \rightarrow Be^{3+}$, Be^{2+}
MO with translation factor
0.25 - 25 keV/amu
Total cross sections given

163

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

164

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

165

86T48 Moiseiwitsch,B.L.

J.Phys.B 19 (1986) 3733 - 3738

Relativistic symmetric eikonal approximation for electron capture.

general formalism

eikonal approximation

166

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

167

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

$1x10^{-5}$ keV/amu

168

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

169

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

170

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;
He^+ + Li^+ -> H^+ + Li^{2+} , H^+ + Li^{2+} + e
Classical trajectory Monte Carlo
50 - 1000 keV/amu
total cross sections

171

86T13 Saha,G.C.
Phys.Rev.A 34 (1986) 2809 - 2821
Electron capture in collisions of He^+ with Li atoms and of Li^{3+} ,C^{6+} and O^{8+} with He atoms in the high energy region
He^{2+} + Li(1s) -> He^+(nl); He^{2+} + Li(2s) -> He^+(nl);
Li^{3+} + He(1s) -> Li^{2+}(nl); C^{6+} + He(1s) -> C^{5+}(nl); O^{8+} + He -> O^{7+}(NL)
CDW approximation
200 - 4000 keV/amu

173

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^{5+},O^{8+} + He -> C^{5+}(n),O^{7+}(n) + hv
CDW
(0.42 - 2.1)x10^3 keV/amu(C); (0.625 - 2.5)x10^3 keV/amu(O)

174

86T54 Salin,A.
Phys.Rev.A 34 (1986) 4436 - 4437
Convergence of coupled-state calculations for electron capture 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

175

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)

176

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

177

86T56 Sinha,C. Tripathi,S. Sil,N.C.
Phys.Rev.A 34 (1986) 1026 - 1030
Charge transfer in the eikonal approximation.
H^+ + H -> H(1s) + H^+
Eikonal approximation
40 - 5000 keV/amu

178

86T75 Spalburg, M.R. Los, J. Devdariani, A.Z.
Chem.Phys. 103 (1986) 253 - 263
On the validity of simple two-state electronic transition models.
general theory
Landau-Zener-Demkov model
locations and widths of transition zones calculated

179

86T57 Taulbjerg,K.
J.Phys.B 19 (1986) L367 - 372
Reaction windows for electron capture by highly charged ions
General system
Landau-Zener

180

86T58 Urbain,X. Giusti-Suzor,A. Fussen,D. Kubach,C.
J.Phys.B 19 (1986) L273 - 277
Theoretial study of associative ionization in H^+ - H^- collisions at low energy (0.001 - 5 eV)
H^+ + H^- -> H_2^+ + e
$1x10^{-5}$ - $5x10^{-3}$ kev/amu

181

86T59 Waknon,P. Gala,S. Diro,M.C. Courbin-Gaussorgues,C. Sidis,V.
J.Phys.B 19 (1986) 611 - 628
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

182

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

183
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 Sturmian approach
17.5 - 200 keV/amu
Total cross sections

184
86T62 Zaifman,D. Maor,D.
Phys.Rev.Letters 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

185
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

286
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

287
87T58 Anholt,R. Becker,U.
Phys.Rev.A 36 (1987) 4628 - 4636
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

288
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Phys. Rev. A 36 (1987) 1994-2001
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

289
87T 3 Bachau,H.
Europhys. Letters 3 (1987) 559-564
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

290

87T66 Baer, M. Nakamura, H.
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

291

87T67 Barnard, S.A. Ford, M.J. Cooper, D.L. Grerratt, J. Raimondi, M.
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

292

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

293

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

294

87T 6 Blanco,S.A. Falcon,C.A. Reinhold,C.O. Casaubon,J.I. Piancetini,R.D.
J.Phys.B 20 (1987) 6295-6304
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

295

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

296

87T 8 Cooper,I.L. Dickinson,A.S. Sur,S.K. Ta,C.T.
J. Phys. B 20 (1987) 2005-2023
Ab initio studies of collision between Li^+ ions
Li^+ + Li^+ -> $Li^{2+}(1s)$ + $Li(1s^22s;1s^22p)$
1.4 - 13 keV/amu

297

87T10 Crothers,D.S.F. Dunseath,K.M.
J. Phys. B 20 (1987) 4115-4128
Target continuum distorted-wave theory for capture of innershell electron by fully stripped ions
$H^+ + B \rightarrow H + B^+(K^{-1})$ (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

298

87T 9 Crothers,D.S.F. McCarroll,R.
J. Phys. B 20 (1987) 2835-2842
Correlated continuum distorted-wave resonant double electron capture in He^{2+} - He collisions
$He^{2+} + He \rightarrow He + He^{2+}$
CDW
125 -350 keV/amu

299

87T59 Deco,E.R. Rivarola,R.D.
J.Phys.B 20 (1987) 3853 - 3865
Relativistic electron capture in ion-atom collisions.
$H^+ + H(1s) \rightarrow H(1s) + H^+$: 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.

300

87T11 Deco,G.R. Rivarola,R.D.
J. Phys. B 20 (1987) 317-324
A theoretical model for charge transfer at relativistic energies
$H^+ + H(1s) \rightarrow H(1s) + H^+$; $H^+ + B^{4+}(1s) \rightarrow H(1s) + B^{5+}$
Symmetric eikonal theory
$5 \times 10^5 - 10^8$ keV/amu
Analytic expression for K-K transfer

301

87T12 Deco,G.R. and Rivarola,R.D.
J. Phys. B 20 (1987) 5117-25
Relativistic continuum distorted-wave model for arbitrary initial and final shells -electron capture in ion-atom collisions
$A^z + B \rightarrow A^{(z-1)+} + B^+$ (A=C, Ne, Ar; B=12-92)
relativistic CDW
10^5 keV/amu

302

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

303

87T60 Dewangan,D.P. Eichler,J.
Com.At.Mol.Phys. 21 (1987) 1 - 13
Electron capture and the long range of the Coulomb interaction.
a review

304

87T68 Dube, L.T. Salin, A.
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

305

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+})

306

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

307

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

308

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

309

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

310

87T19 Freire,F.L. Montenegro,E.C.
Z.Phys.D 7 (1987) 239-241
On the calculation of the electron capture within the strong potential Born approximation
Strong potential Born approx.
analytical expressions for high energy limit

311

87T20 Fritsch,W. Lin,C.D.
Phys.Letters A 123 (1987) 128-131
Two electron description of electron transfer in $He^+ + He^+$ collision
$He^+ + He^+ \rightarrow He(all\ ,^3S) + He^{2+}$
AO
3-80 keV/amu
significant contribution from ^3S state

312

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
$C^{4+} + H \rightarrow C^{3+}(3l),\ C^{3+}(total) + H^+$
MO with translation effect + radial/rotational coupling
$9x10^{-4}$ - 1.178 keV/amu

313

87T22 Gayet,R. Salin,A.
J.Phys.B 20 (1987) L 571-576
Simultaneous capture and ionization by fast ion impact on helium
$A^{Z+} + He \rightarrow A^{(Z-1)+} + He^+ ;\ A^{(Z-1)+} + He^{2+} + e$ (A=H,He,Li,O)
CDW
400 - 1500 keV/amu

314

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
$He^{2+} + He \rightarrow He^{2+} + He(elastic);\ He + He^{2+} ;\ He^+ + He^+$:
$He^+(1) + He^+(1) \rightarrow He^+(1) + He^+(1)(elastic);\ He^+(1) + He^+(1)$
time dependent Hartree-Fock
7.5-25 keV/amu
Impact paramater dependence of pribabilities

315

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

316

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)

317

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

318

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 -> O^{+}($2p^3$ ^2P,^2D) + He^{+}
PSS
$3x10^{-4}$-0.03 keV/amu
Differential cross sections

319

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 -> Li^{+} + H^{+}
AO
1-36 keV/amu

320

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

321

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

322

87T31 Hsin,S.H. Lieber,M.
Phys.Rev.A 35 (1987) 4833-4835
Third-Born-approximation effects in electron capture
H^{+} + H -> H + H^{+}
Strong potential Born approximation;DWBA
10^3-$2x10^5$ keV/amu
Angular distribution

323

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 -> He + Cd^{++}; Ne^{+} + Hg -> Ne + Mg^{++}
Semiclassial method
rate coefficients at thermal energies

324

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 -> H(n=3)
Two-centered AO close-coupling expansion method
Density matrix ; time lag of electron after capture into n=3

325

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

326

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

327

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

328

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^+.

329

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)

330

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.

331

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
$A^{Z+} + H,He \rightarrow A^{(Z-1)+}(n)$ (A=C,N,O,F)
Travelling MO
0.1-10 keV/amu

332

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)

333

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

334

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

335

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.

336

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

337

87T42 Moiseiwitsch,B.L.
J.Phys.B 20 (1987) 4111-4114
Relativistic eikonal phase factors for electron capture
Relativistic eikonal approximation
Formalism

338

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.

339

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

340

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)

341

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

342

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

343

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^{+} + $He(1s^2)$ -> H(1s) + He^{+}(1s)
Second Born approximation,Faddeev-Watson approximation
2820 - 20000 keV/amu
Angular differential cross sections

344

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) -> N^{6+}(nlm) + H^{+}
CDW
710-2857 keV/amu
Arbitrary (nlm) ->arbitratry (n'l'm') transfer

345

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 -> O^{5+}(n,l) + He^{+}
MO expansion method with ETF
0.14 - 7 keV/amu
(n,l) partial cross sections

346

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) -> 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 enargy (<30 keV)

347

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

348

87T52 Shingal,R. Bransden,B.H.
J.Phys.B 20 (1987) L 533 - 535
Mutual neutralization in H^{+} + H^{-} collisions
H^{+} + H^{-} -> H(nl) + H(1s)
Multistate impact parameter method
8 - 50 keV/amu

349

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) -> H^{+} + Na(nl) ; H(nl) + Na^{+}
Two-center expansion with travelling atomic orbitals
0.8 - 50 keV/amu

350

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

351

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^{+}

352

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

353

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
$H^+ + B^{(Z-1)+} \rightarrow H(1s,total) + B^{Z+}$; $H^+ + B^{(Z+1)+} + e$
(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)

354

87T57 Winter,T.G. Hatton,G.J. Day,A.R. Lane,N.F.
Phys.Rev.A 36 (1987) 625 - 640
Differential cross sections for electron transfer and elastic scattering in collisions between alpha particles and hydrogen atoms
$He^{2+} + H \rightarrow He^+ + H^+$; $He^{2+} + H$(elastic)
MO
1 - 70 keV/amu
Angular distribution

65

88T 1 Alston, S.
Phys.Rev.A 38 (1988) 3124 - 3127
Strong-potential Born-approximation electron capture cross sections for realistic atomic potentials
$H^+ + B \rightarrow H + B^+(K^{-1})$ (B = C,Ar)
strong-potential Born approx
150 - 2500 keV/amu(C); 1500 - 20000 keV/amu(Ar)

66

88T 2 Alston, S.
Phys.Rev.A 38 (1988) 6092 - 6097
Further contributions of the Thomas double-scattering mechanism to electron capture in the second Born approximation
$H^+ + H(1s),He(1s^2) \rightarrow H(1s) + H^+,He^+$
multiple-peaking approx., linearized-propagator approx.
10^2 - $5x10^4$ keV/amu

67

88T 3 Bachan, H. Deco, G. Salin, A.
J.Phys.B 21 (1988) 1403 - 1410
Introduction of short-range interactions in continuum distorted-wave theory of electron capture for ion-atom collisions
$H^+ + Ne(2s,2p^0,2p^1) \rightarrow H(1s) + Ne^+$
CDW
10^2 = $3x10^2$ keV/amu

68

88T 4 Baer, M. Niedner, G. Toennies, J.P.
J.Chem.Phys. 88 (1988) 1461 - 1463
A comparison between theoretical and experimental state-to-state charge transfer cross sections for $H^+ + H_2$ at 20 keV
: Evidence for quantum effects
$H^+ + H_2(v=0) \rightarrow H + H_2^{+*}(v_f)$
infinite order sudden approx
$2x10^{-2}$ keV/amu

69
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
$H^+ + B \rightarrow H + B^+(K^{-1})$ (B = He,N,O)
corrected first Born approximation
50 - $5x10^4$ keV/amu
K-electron capture

70
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High energy electron capture by fully stripped ions from He atoms - a QED approach
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second-order S-matrix method
10^2 - 10^3 keV/amu

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Charge exchange between H^+ and H(n=2) at low collision energies
$H^+ + H(2s,2p_0,2p_\pm) \rightarrow H(total,2s,2p_0,2p_{\pm 1})$
OEDM
0.06 - 2.25 keV/amu
dominant contribution from resonance reactions

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State-selective one-electron capture by multiply charged ions, investigated with a modified multichannel Landau-Zener model
$Ar^{8+}(2p^6) + He,Ne,Ar,Xe \rightarrow Ar^{7+}(2p^5nl:n=4-6)$
; $Ar^{8+}(2p^53s\ ^3P) + D_2,He,Ar,Xe \rightarrow Ar^{6+}(2p^53snl:n=4-6)$
; $N^{5+}(1s2s\ ^3S) + He \rightarrow N^{4+}(1s2s3l)$
; $C^{4+}(1s2s^3S) + H_2 \rightarrow C^{3+}(1s2s3l)$
modified multichannel Landau-Zener model
$2.5x10^{-3}$ - 6.25 keV/amu

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Proton and alpha particle impact transfer ionization cross sections for He and Li
$H^+ + B \rightarrow H + B^+$; $He^{2+} + B \rightarrow He^+ + B^+$ (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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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
$A^{Z+} + B^{40+} \rightarrow A^{Z+} + B^{39+} + e^+$
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
$H^+ + H^+,U^{92+} \rightarrow H(1s) + H^+,U^{92+} + e^+$
: $U^{92+} + U^{92+} \rightarrow U^{91+}(1s) + U^{92+} + e^+$
PWBA
distribution of emitted positrons at gamma= 10,100

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The boundary-corrected second Born (B2B) approximation : proton-hydrogen electron capture
$H^+ + H \rightarrow H + H^+$
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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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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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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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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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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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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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
θ = 0.04 - 1°. Integrated cross sections given

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Charge transfer in low-energy O^{4+}-H and Si^{4+}-H collisions
$O^{4+} + H \rightarrow O^{3+}(3s,3p,total)$; $Si^{4+} + H \rightarrow Si^{3+}(3d,4s,total)$
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
$Al^{3+} + H \rightarrow Al^{2+}(3s,3p,4s,4p,total)$
; $Ti^{4+} + H \rightarrow Ti^{3+}(3s,3p,4s,4p,total)$
MO with translation factor
$0.8x10^{-3}$ - 1.1 keV/amu

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Electron detachment in low-energy $H^-(D^-)$-Na collisions
$H^- + Na \rightarrow H + Na^-$
effective range approx.
0.01 - 0.25 keV/amu

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Electron capture in asymmetric collisions
$H^+ + B \rightarrow H + B^+(K^{-1})$ (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
$A^{q+} + B^{r+}(n) \rightarrow A^{(q-1)+}(n') + B^{(r+1)+}$
classical-over barrier model

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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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On a first order theory for charge exchange with Coulomb boundary conditions
$H^+ + B^{(Z-1)+} \rightarrow H + B^{Z+}$ (B = He,Li,Be,B,C)
first order Coulomb Born approx.
$(0.5\text{-}20)x25xZ^2$ keV/amu
analytical form for impact parameter dependence for K-K electron transfer

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Electron capture in highly charged ion collisions and a theoretical analysis of the energy-gain spectrum
$Ar^{6+} + D(1s) \rightarrow Ar^{5+}(4s,4p,4d,4f,5s,5p,5d,5f,5g) + D^+$
2σ state AO
0.1 keV/amu

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Electron capture by slow multicharged ions : core effect on final l distribution
$C^{4+},N^{5+},O^{6+},O^{8+},Ne^{8+},Ar^{8+} + H \rightarrow$
$C^{3+},N^{4+},O^{5+},O^{7+},Ne^{7+},Ar^{7+}(nl) + H^+$
MO expansion with OEDM
0.25 - 20 keV/amu

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Second-order singularities in transfer ionization
$H^+ + He \rightarrow H + He^{2+} + e$
$5x10^3,5x10^4$ keV/amu
Thomas peak in transfer ionization

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Contribution of excited hydrogen atoms to charge-exchange excitation of impurities in fusion plasms
$C^{6+},O^{8+} + H(n) \rightarrow C^{5+}(n'),O^{7+}(n') + H^+$ (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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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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Perturbation approximation for scattering amplitudes in ion-atom collisions

general theory for perturbation expansion with Coulomb potential

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Differential cross sections for electron capture
: a comparison of three approximation
H^{+} + H(1s) -> 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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J.Phys.B 21 (1988) 1395 - 1401
First-order calculation in charge transfer at large scattering angles
H^{+} + Ne -> H + Ne^{+}
750 keV/amu
scattering angle : 0 - 180^0

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K-shell vacancy production in asymmetric collisions
A^Z + B -> $A^{(Z-1)+}$ + $B^{+}(K^{-1})$ (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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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 -> $Si^{12+}(K^{-1})$; Ca^{17+} + H_2,He -> $Ca^{16+}(K^{-1})$
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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Cascade theory for double KX-ray emission in transfer and excitation collisions
S^{15+} + H_2 -> S^{14+*} -> 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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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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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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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
$H^+ + H(1s) \rightarrow H(1s)$
: $Ne^{10+} + B \rightarrow Ne^{9+}(1s) + B(K^{-1})$ (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 $Kr^+(^2P_{3/2},^2P_{1/2})$ ions produced in low-energy charge exchange collisions of $Kr^{2+}(^1S_0)$ with $He(^1S_0)$
$Kr^{2+}(^1S_0) + He(^1S_0) \rightarrow Kr^+(^2P_{3/2},^2P_{1/2}) + He^+(^2S_{1/2})$
asymptotic approach
$1x10^{-6}$ - $2.4x10^{-5}$ keV/amu

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State-selective electron capture in slow C^{3+} - H collisions
$C^{3+} + H \rightarrow C^{2+}$(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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Classical charge transfer and ionization cross sections for one-and three-dimensional collision processes
$A^{Z+} + H \rightarrow A^{(Z-1)+} + H^+$ (A = H,He,Li,C)
: $H^+ + He^+,Li^{2+}(1s) \rightarrow H + He^{2+},Li^{3+}$
classical trajectory Monte Carlo method
3 - 250 keV/amu
total cross sections. ionization cross sections also given.

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Fine-structure excitation of O^{2+} by charge transfer of O^{3+} in H at low energies
$O^{3+}(^2P_{1/2,3/2}) + H \rightarrow$
$O^{2+}(^3S_1,^3D_3,^3D_2,^3D_1,^1P_1,^1P_1^0,^3P_2^0,^3P_1^0,^3P_0^0)$
multi-state MO expansion method.
$1.9x10^{-5}$ - $1.7x10^{-3}$ keV/amu
also $O^{3+}(^2P_{3/2}) + H \rightarrow O^{3+}(^2P_{1/2}) + H$ cross sections given

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Single-electron-removal processes in collisions of positrons and protons with helium at intermediate velocities
$H^+ + He \rightarrow H + He^+$
CTMC
1 - 500 keV/amu
angular distribution; ionization cross sections by H^+ and e^+

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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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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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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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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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Theoretical study of differential charge transfer cross sections for Ne^{4+} + He collisions at low energies
$Ne^{4+}(2p^2\ ^3P)$ + $He(1s^2)$ -> $Ne^{3+}(2p^2 3s\ ^2P,^4P)$ + $He^+(1s)$
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^- -> He^+(n=4,5) + H(1s)
OEDM model with ETF
$5x10^{-4}$ - 2.25 keV/amu

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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+} -> U^{91+}(nl) + U^{92+}
fully-relativistic,two-center,coupled channel calculation
$5x10^5$ - 10^5 keV/amu
excitation cross sections

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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
$He^{2+} + H(1s) \rightarrow He^+(total,2s,2p_0,2p_1)$
: $H^+ + He^+ \rightarrow H(1s,total) + He^{2+}$
triple center coupled state approach
1.6 - 40 keV/amu
also ionization cross sections

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Triple-center determination of differential cross sections for electron transfer and elastic scattering in α-H collisions
$He^{2+} + H \rightarrow He^+ + H^+$
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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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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Closed-form expression for 1s -> 1s electron capture amplitude in second-order Faddeev approximation.
2nd-order Faddeev approx.

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semiclassical method
0.8 - 8 keV/amu

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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 ->
S^{12+},Ca^{16+},Ti^{18+},V^{19+},Ni^{24+},Ge^{28+} + hν(B = H_2,He)
Impulse approx.(intermediate coupling; LS-coupling)

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A three-dimentional quantum mechanical study of vibrationally resolved charge transfer process in H^+ + H_2 at E_{cm}=20eV.
H^+ + $H_2(v_i=0)$ -> H + $H_2^+(v_f)$
Infinite order sudden approx.(IOSA)
$6x10^{-2}$ keV/amu
also H^+ + $H_2(v_f)$

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Symmetric charge transfer to multiply charged ions.
He^{2+} + He^+ -> He^+ + He^{2+}
; $A^{(Z-2)+}$ + $A^{(Z-3)+}$ -> $A^{(Z-3)+}$ + $A^{(Z-2)+}$ (A = Be,B,C,N,O)
; $A^{(Z-10)+}$ + $A^{(Z-9)+}$ -> $A^{(Z-9)+}$ + $A^{(Z-10)+}$ (A = Mg,Al,Si,P,S)
IP with curved trajectories
10^{-2} - 10 keV/amu

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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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Nonperturbative treatments of charge exchange at arbitrary energies : an alternative variational principle.
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Schwinger-variational method
60,125,5000 keV/amu
Angular distribution

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A Schwinger-type variational principle for charge exchange at arbitary energies.
Schwinger type variational method

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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

74

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.
$F^{6+} + H_2 \rightarrow F^{5+*}$; $Ca^{17+} + H_2,He \rightarrow Ca^{15+*}$
Impulse approx.
$6x10^2$ - $1.9x10^3$(F); $3.7x10^3$ - $9.5x10^3$ keV/amu(Ca)
radiative and non-radiative rates calculated.

75

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.
$Ar^+(^2P_{3/2}) + N_2(v=0,j) \rightarrow Ar + N_2^+(v'=1,j')$
Coupled channel-DWBA
$(4-10)x10^{-6}$ keV/amu
cross sections for $j'=0-28$

76

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.

77

89T14 Decker, F. Eichler, J.
Phys.Rev.A 39 (1989) 1530 - 1533
Consistent treatment of electron screening in charge transfer.
$H^+ + He \rightarrow H + He^+$; $H^+ + C \rightarrow H + C^+(K^{-1})$
; $He^{2+} + Li \rightarrow He^+ + Li^+(K^{-1})$
screened first Born app. with Coulomb boundary condition(SB1S)
10^2 - 10^4 keV/amu(H); 10^2 - $6x10^2$ keV/amu(He)

78

89T15 Decker, D. Eichler, J.
J.Phys.B 22 (1989) L95 - 100
Exact second-order Born calculations for charge exchange with Coulomb boundary conditions.
$H^+ + H,He(1s) \rightarrow H(1s) + H^+ + He^+$
second-order Born app. with Coulomb boundary conditions.
125(H),$5.4x10^3$(He) keV/amu

79

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.
$H^+ + H \rightarrow H + H^+$
DWBA/boundary-corrected Born appr.
125 - 5000 keV/amu
angular distributions

80

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

81

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

82

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

83

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.

84

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,$1s^2 2s3s$,$1s^2 2s3p$)
MO
0.25 - 6.25 keV/amu

85

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

86

89T23 Gayet, R.
J.de Phys. 50 (1989) C1/53 - C1/70

Multiply capture and ionization in high energy ion-atom collisions.
a review

87

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

88

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.
$H^+ + H_2 \rightarrow H(total)$
two state model
0.2 - 20 keV/amu

89

89T26 Hahn, Y.
Phys.Rev.A 40 (1989) 2950 - 2957
Transfer excitation processes in ion-atom collisions at high energies
$Ca^{17+} + He \rightarrow Ca^{16+*} + He^+$; $Nb^{31+} + H_2 \rightarrow Nb^{30+**} + H_2^+$
Resonant transfer excitation

90

89T27 Hahn, Y. Ramadan, H.
Phys.Rev.A 40 (1989) 6206 - 6209
Uncorrelated transfer excitation collisions at high energies.
$Ni^{31+} + H_2 \rightarrow Ni^{31+*}$; $F^{5+} + He,H_2 \rightarrow F^{5+*}$
Uncorrelated transfer excitation at high energies

91

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.
$Ne^{6+} + He \rightarrow Ne^{5+} + He^+$
AO-CC
0.1 kev/amu
energy-gain spectrum : impact parameter dependence

92

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.
$Ar^{6+} + He(1s^2) \rightarrow Ar^{7+}(3d,4s,4p) + He^+$
AO
1.25×10^{-2} - 1 keV/amu

93

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.
$Ar^{6+} + H \rightarrow Ar^{5+}(4l;5l)$; $Ar^{8+} + H \rightarrow Ar^{7+}(5l;6l)$
AO
1 - 50 keV/amu

94

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.
$A^{Z+} + Be \rightarrow A^{(Z-1)+} + h\nu(K\text{-}REC) + Be^+$ (A = Ne,Ar,Kr,Xe,Ta,U)
relativistic impulse approx.
10^4 - 10^5 keV/amu

95
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_o, $2p^2$ ^1D_e) + He^{2+}
AO
50 - 167 keV/amu

96
89T33 Macek, J. Taubjerg, K.
Phys.Rev.A 39 (1989) 6064 - 6067
Strong potential wave functions with elastic channel distortion.
Channel-distorted wave approx.

97
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
$1.3x10^{-2}$ - $1.3x10^2$ keV/amu

98
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

99
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 - $3x10^3$ keV/amu

100
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
$1.4x10^5$ - $2.1x10^6$ keV/amu

101
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

102

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+}.
$C^{6+} + O^{8+} + H \rightarrow C^{5+}(nl), O^{7+}(nl)$
CTMC
40 - 140 keV/amu

103

89T40 Olson, R.E. Ullrich, J. Schmidt-Böcking, H.
Phys.Rev.A 39 (1989) 5572 - 5583
Multiple-ionization collisions dynamics.
$U^{32+} + Ne \rightarrow U^{32+} + Ne^{1+}$; $U^{31+}(n) + Ne^{1+}$
CTMC
1.4×10^3 keV/amu
n-distribution; impact parameter; electron spectrum
; angular distribution of scattered projectile
; angular distribution of recoil ions; stopping power

104

89T52 Omar, G. Moussa, A.H. Hahn, Y.
Phys.Rev.A 40 (1989) 6709 - 6710
Strong electron correlation and anomalous electron capture.
$Ca^+, Sc^{2+}, Ti^{3+}, Fe^{7+} + B \rightarrow Ca, Sc^+, Ti^{2+}, Fe^{6+}$

105

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.
$Li^{3+} + Li(2s) \rightarrow Li^{2+}(n) + Li^+$
MO/Landau-Zener model
2×10^{-4} - 1 keV/amu
n=4 dominant

106

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.
$He^+ + CO_2 \rightarrow He$
two-state approx
0.025 - 1.25 keV/amu
branching ratios for $CO_2^+, CO^+, O^+, C^+, CO_2^{2+}$

107

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

108

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

109

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

110

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 $\sigma(H_2)/\sigma(H)$

111

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

112

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

113

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

114

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

115

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 $x10^3$ keV/amu
orientation angle dependence

116

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.

List of finding references for particular collision partners

example :

H <--- projectile ion

q = -1 : 77E12(He)

charge reference number (target)

(the first two numbers indicate the publication year)

(E:experiment, T:theory)

Atomic 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) ; 83T41(Ne), 84T42(Cs^+), 88T23(Na)

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) ; 79T4(H), 80T2(H), 85T48(Na), 86T5(Na), 86T27(Na), 87T51(H), 88T62(Cs), 89T44(Ne)

q = 1* : 79E6(He,Ne,Ar,Kr), 84E49(O,O_2),

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)
; 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^+), 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)

D

q = -1 : 80E17(Na,Rb,Cs), 83E54(H_2), 87E14(Cs), 87E75(Na,K), 87E76(Cs)
; 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),

He

q = 0 : 82E37(H_2), 86E61(H_2),

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)

; 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)

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)
; 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), 89T6(He^+), 89T10(He,Li), 89T14(Li), 89T24(He), 89T32(He), 89T45(H_2)

Li

q = -1 : 84E52(He,Ne,Ar)

q = 0 : 86E58(Cs)

q = 1 : 69E1(N_2), 76E5(He,Ar), 79E9(Li); 81T32(Li), 82T8(Li^+), 82T9(Li^+), 82E40(H_2), 84E48(Li^+), 85E24(Mg,Ca,Sr,Ba), 86E74(He), 87E59(H^-), 88E52(Ar,Kr)
; 76T8(Li), 80T10(H), 82T19(H), 83T24(Ca), 84T5(H), 84T49(Li), 84T55(Na), 86T38(He), 86T55(Na), 86T59(He), 87T8(Li^+), 88T17(H), 88T54(Li), 88T55(Be^+)

q = 2 : 82T10(H), 82E40(H_2)
; 54T2(H), 80T10(H), 82T19(H), 84T5(H), 84T43(H), 85T18(H), 86T47(Li), 87T28(H)

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(H), 86T77(C,N), 87T5(H), 87T6(H(2s)), 87T22(He), 87T25(He), 88T6(He), 88T39(C,O,Ne), 88T51(H), 89T41(Li)

Be

q = 1 : 79E17(He,Ne), 88E14(He)

q = 2 : 54T1(H), 86T60(H), 88T55(Li), 89T6(Be^+)

q = 3 : 78T20(He), 86T60(H), 88T53(H)

q = 4 : 77T4(H), 77T5(H), 77T9(H), 77T12(H), 77T13(H), 78T3(H), 78T11(H), 79T10(H(2s)), 79T30(H), 79T31(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),

B

q = 1 : 83E23(O_2)

q = 2 : 86E47(H^-); 54T2(H), 80T9(H), 80T30(H)

q = 3 : 71E1(He), 77E2(He), 82E12(He), 83E30(He)

; 77T13(H), 77T16(He), 78T12(H), 78T20(He), 80T30(H), 89T6(B^{2+})

q = 4 : 82E12(He)
; 77T13(H), 80T30(H)

q = 5 : 77E4(He), 82E12(He), 87E27(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), 83T25(H), 84T22(H), 84T37(H), 84T54(H), 85T64(H), 87T5(H), 88T57(Al)

C

q = -1 : 86E25(He,Ne,Ar,Kr,Xe)

q = 0 : 79E15(Na,K,Cs)

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)
; 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)
; 75T3(H), 77T6(H), 78T20(H), 80T6(H,He), 82T19(H), 83T19(H), 84E11(Li), 84T31(H,He), 84T43(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)
; 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)

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)
; 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+})

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),
; 76T3(H), 77T13(H), 80T30(H), 81T33(H), 84T31(H,He), 84T32(He), 86T30(He)

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)
; 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)

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^-)
; 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)
; 77T6(H), 80T6(H,He), 80T7(H,He), 81T18(H), 83T19(H), 84T31(H,He), 86T3(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)

q = 4 : 82E12(He), 82E18(He), 82E40(H_2), 87E30(He), 87E77(H_2,N_2), 89E30(H)
; 76T3(H), 77T13(H), 80T7(H,He), 80T30(H), 84T31(H,He), 84T43(H), 84T64(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)
; 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+})

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)
; 76T3(H), 77T13(H), 80T30(H), 84T31(H,He), 84T32(He)

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)
; 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)

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^-)
; 63T1(H), 80T8(H), 84T31(H,He)

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)

q = 3 : 81E14(He), 81E23(O_2), 82E6(H), 83E53(Li,H_2), 83E55(H), 84E12(Li), 88E58(H), 89E5(He), 89E16(H_2)
; 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)

q = 4 : 81E14(He), 83E55(H), 84E12(Li), 87E7(H,H_2), 89E5(He)
; 76T3(H), 77T13(H), 80T7(H,He), 80T30(H), 84E11(Li), 84T31(H,He), 84T43(H), 88T21(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)

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)
; 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+})

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)
; 76T3(H), 77T13(H), 84T31(H,He), 84T32(He)

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)
; 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)

F

q = -1 : 88E40(Ne,N_2)

q = 0 : 88E60(He,Ne,Ar,Kr,Xe)

q = 6 : 82E12(He), 84E45(He), 85E73(He,Ne,Ar), 88E47(H_2), 88E57(He), 89E62(He,H_2)
; 89T11(H_2)

q = 7 : 82E12(He), 83E50(He), 84E34(He,Ne), 84E45(He), 88E57(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)
; 84T32(He), 85T19(Ne)

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)
; 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)

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)
; 79T6(H), 80T6(H,He), 80T7(H,He), 83T19(H), 84T43(H), 85T23(Ne)

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),

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)

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)

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)
; 89T28(He)

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)

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)
; 84T32(He), 88T30(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(^{3}He,^{4}He), 88E31(Na), 88E56(He,H_2)
; 84T32(He), 87T38(H_2)

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)

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^-)
; 76T8(Na), 84T55(Li), 86T5(H^-), 86T10(H), 86T27(H^-), 86T47(Na), 86T55(Li), 87T1(Na)

q = 11 : 83T20(H)

Mg

q = 1 : 70E1(Ne,Ar,N_2), 78E7(Mg), 82E27(Ca), 88E14(He)

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)
; 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 = 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)

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+})
q = 8 : 87E27(He)
q = 11 : 85E21(He), 85E24(He)
; 83T6(He),
q = 13 : 87E27(He)
; 84T4(Ar), 88T43(He)
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+})

P

q = 1 : 84E32(Ar,Air)
q = 5 : 89T6(P^{4+})
q = 15 : 83T8(H)

S

q = 0 : 79E15(Na,K,Cs)
q = 1 : 79E15(Na,K,Cs)
q = 2 : 80T7(H,He), 81T7(H)

q = 3 : 80T7(H,He)

q = 4 : 80T7(H,He)

q = 6 : 89T6(S^{5+})

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)
; 85T19(Ar), 88T44(H_2)

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)
; 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)

; 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^-)

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)

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^-),

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)
; 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^-)
; 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)
; 85T3(He), 88T8(He,Ne,Ar,Kr,Xe,D_2), 88T30(H)

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)

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)

q = 11 : 80E3(Ar), 83E4(D_2), 86E38(He,H_2), 87E15(Ar), 87E16(Ar)

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)

q = 15 : 83E4(D_2), 84E44(Xe), 86E38(He,H_2)

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)

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)
; 62T1(K), 76T8(K), 86T47(K)

Ca

q = 1 : 86E45(Mg,Sr)
; 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)

q = 11 : 86E59(He,H_2), 86E80(He,H_2)

q = 12 : 86E59(He,H_2), 86E80(He,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)

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)

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)

q = 19 : 86E5(H_2), 86E59(He,H_2), 86E80(He,H_2), 88E37(He,Ne,Ar,Kr,Xe,H_2,N_2)

q = 20 : 88E37(He,Ne,Ar,Kr,Xe,H_2,N_2)
; 77T4(H), 79T31(H), 81T30(H), 83T20(H), 83T22(H), 86T32(Ne)

Ti

q = -1 : 85E74(Na,Mg,Ar)

q = 3 : 83T34(H^+)

q = 4 : 83T34(H), 85T36(H), 88T22(H)

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 = 6 : 84T35(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)

q = 5 : 83E42(H,H_2), 86E7(Ar)

q = 6 : 83E42(H,H_2)

q = 7 : 83E42(H,H_2)

q = 8 : 83E42(H,H_2)

q = 9 : 78E2(H,H_2), 83E42(H,H_2)

q = 10 : 78E2(H,H_2), 83E42(H,H_2), 86E7(Ar)

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)

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)

q = 16 : 78E2(H,H_2)
; 85T43(H)

q = 17 : 78E2(H,H_2)
; 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)

q = 21 : 78E2(H,H_2), 84E19(Ar), 87E55(Ar)

q = 22 : 78E2(H,H_2)

q = 23 : 78E2(H,H_2), 84E19(Ar)

q = 24 : 78E2(H,H_2), 84E19(Ar)
; 81T19(H),

q = 25 : 78E2(H,H_2), 84E19(Ar), 86E7(Ar)

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)

Ni

q = 2 : 87T43(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 = 29 : 83T22(H), 89T43(Cu^{29+})

Zn

q = 2 : 80T9(H)

q = 30 : 77T4(H)

Ge

q = 1 : 84E32(Ar,Air)

q = 29 : 88E36(H_2)
; 89T4(He,H_2),

As

q = 1 : 84E32(Ar,Air)

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)

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)

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)
; 77T13(H), 80T13(H), 83T21(H), 83T22(H), 89T31(Be)

Rb

q = 1 : 88E55(Na)
; 76T8(Rb), 86T47(Rb)

Sr

q = 1 : 88E55(Na)

q = 38 : 83T20(H)

Zr

q = 40 : 83T22(H)

Nb

q = 28 : 84E19(H_2), 89E7(He,H_2)

q = 29 : 89E7(He,H_2)

q = 30 : 89E7(He,H_2)

q = 31 : 84E19(Ar,H_2), 87E9(H_2), 89E7(He,H_2)
; 89T27(H_2)

q = 32 : 89E7(He,H_2)

q = 34 : 84E19(H_2)

Mo

q = 42 : 83T22(H)

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)

q = 5 : 86E38(He,H_2)

q = 6 : 86E38(He,H_2)

q = 7 : 86E38(He,H_2)

q = 8 : 86E38(He,H_2)

q = 9 : 86E38(He,H_2)

q = 10 : 85E67(He), 85E68(He), 86E29(He), 86E38(He,H_2)

q = 11 : 86E38(He,H_2)

q = 12 : 86E38(He,H_2), 88E20(H_2), 88E53(He,H_2)

q = 13 : 85E67(He), 85E68(He), 86E29(He), 86E38(He,H_2), 88E20(H_2), 88E53(He,H_2)

q = 14 : 85E67(He), 85E68(He), 86E29(He), 86E38(He,H_2), 88E20(H_2)

q = 15 : 85E67(He), 85E68(He), 86E29(He), 86E38(He,H_2), 88E20(H_2)

q = 16 : 86E38(He,H_2), 88E20(H_2)

q = 17 : 85E67(He), 85E68(He), 86E29(He), 86E38(He,H_2), 88E20(H_2)

q = 18 : 86E38(He,H_2), 88E20(H_2)

q = 19 : 85E67(He), 85E68(He), 86E29(He), 86E38(He,H_2)

q = 20 : 85E67(He), 85E68(He), 86E29(He), 86E38(He,H_2)

q = 21 : 86E38(He,H_2)

q = 22 : 85E67(He), 85E68(He), 86E29(He), 86E38(He,H_2)

q = 23 : 85E67(He), 85E68(He), 86E29(He), 86E38(He,H_2)

q = 24 : 85E67(He), 85E68(He), 86E29(He), 86E38(He,H_2)

q = 25 : 85E67(He), 85E68(He), 86E29(He), 86E38(He,H_2)

q = 26 : 85E67(He), 85E68(He), 86E29(He), 86E38(He,H_2)
q = 27 : 85E67(He), 85E68(He), 86E29(He), 86E38(H_2)
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)
; 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)

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)

q = 14 : 83E13(Ar,Xe), 83E34(Xe), 87E36(Ne,Ar,Xe), 88E1(He)

q = 15 : 83E13(Ar,Xe), 83E34(Xe), 87E36(Ne,Ar,Xe), 88E1(He), 89E14(Xe)

q = 16 : 87E36(Ne,Ar,Xe), 88E1(He), 89E14(Xe)

q = 17 : 87E36(Ne,Ar,Xe), 88E1(He), 89E14(Xe)

q = 18 : 87E36(Ne,Ar,Xe), 88E1(He), 89E14(Xe)

q = 19 : 87E36(Ne,Ar,Xe), 88E1(He), 89E14(Xe)

q = 20 : 87E36(Ne,Ar,Xe), 88E1(He), 89E14(Xe)

q = 21 : 88E1(He), 89E14(Xe)

q = 22 : 88E1(He), 89E14(Xe)

q = 23 : 88E1(He), 89E14(Xe)

q = 24 : 88E1(He), 89E14(Xe)

q = 25 : 88E1(He), 89E14(Xe)

q = 26 : 88E1(He), 89E14(Xe)

q = 27 : 88E1(He), 89E14(Xe)

q = 28 : 88E1(He), 89E14(Xe)

q = 29 : 88E1(He), 89E14(Xe)

q = 30 : 88E1(He), 89E14(Xe)

q = 31 : 88E1(He), 89E14(Xe)

q = 32 : 89E14(Xe)

q = 33 : 89E14(Xe)

q = 34 : 89E14(Xe)

q = 35 : 89E14(Xe)

q = 51 : 88E36(H_2)

q = 52 : 85E52(Be,Al,Cu,Ag,Au,Mylat), 86E71(Be,U), 87E4(Al,Cu,Ag,Au)
; 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)

La

q = 40 : 87E9(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 = 37 : 87E55(Ar,Xe)

Er

q = 1 : 73E2(He,N_2)

q = 2 : 73E2(He,N_2)

Ta

q = 73 : 89T31(Be)

W

q = 74 : 83T22(H)

Au

q = 2 : 81E14(He)

q = 3 : 81E14(He)

q = 4 : 81E14(He)

q = 5 : 81E14(He), 83E10(He,Ne)

q = 6 : 81E14(He), 83E10(He,Ne)

q = 7 : 81E14(He), 83E10(He,Ne)
; 84T38(He)

q = 8 : 81E14(He), 83E10(He,Ne)

q = 9 : 81E14(He), 83E10(He,Ne)
; 84T38(He)

q = 10 : 81E14(He), 83E10(He,Ne)
; 84T38(He)

q = 11 : 81E14(He), 83E10(He,Ne), 86E30(He)

q = 12 : 81E14(He), 83E10(He,Ne), 83E18(H_2), 84E41(H_2)
; 84T38(He)

q = 13 : 81E12(H_2), 81E14(He), 83E10(He,Ne), 83E18(H_2), 84E41(H_2)
; 84T38(He),

q = 14 : 81E14(He), 83E10(He,Ne), 83E18(H_2), 84E41(H_2)
; 84T38(He),

q = 15 : 81E12(H_2), 81E14(He), 83E10(He,Ne), 83E18(H_2), 84E1(He), 84E41(H_2)
; 84T38(He)
q = 16 : 81E14(He), 83E10(He,Ne), 83E18(H_2), 84E41(H_2)
; 84T38(He)
q = 17 : 81E14(He), 83E10(He,Ne), 83E18(H_2)
q = 18 : 81E14(He), 83E10(He,Ne), 83E18(H_2), 84E41(H_2)
; 84T38(He)
q = 20 : 81E14(He), 83E10(He,Ne)
; 84T38(He)
q = 21 : 81E14(He), 83E10(He,Ne)
; 84T38(He)
q = 22 : 81E14(He)
; 84T38(He)
q = 23 : 81E14(He)
; 84T38(He)
q = 24 : 81E14(He)
q = 25 : 84T38(He)
q = 79 : 89T43(Au^{79+})

Hg

q = 1 : 62T1(Hg)

Pb

q = 79 : 88E36(H_2)

U

q = 1 : 82E39(U)
; 88T46(U)
q = 2 : 78T6(Ne)
q = 32 : 89T40(Ne)
q = 36 : 87E55(Ne,Ar,Kr,Xe)
; 78T6(N,Ne,Ar.Kr)
q = 41 : 87E55(Ar)
q = 44 : 86E7(Ar), 87E55(Ne,Ar,Kr,Xe)
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 = 89 : 87E4(Al,Cu,Ag,Au)
; 87T26(C,H_2)

q = 90 : 87E4(Al,Cu,Ag,Au)

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)

Molecular 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)
; 84T50(Mg), 86T19(H_2), 87T66(Ar)

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)
; 86T64(Ar), 89T53(Ar)

q = 2 : 87E51(N_2), 89E22(He,Ne)

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_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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BIBLIOGRAPHY OF ELECTRON TRANSFER IN ION-ATOM COLLISIONS

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Abstract

A bibliographic compilation is given of theoretical and experimental investigations on electron transfer involving multiply charged ions with the emphasis on their final state (n, ℓ) distributions. The references are surveyed up to mid-1986. Each reference is accompanied with a short description of the collision partners, their charge states, their energy range and some important results.

Contents

Introduction

The charge transfer processes are attracting not only a number of atomic physicists because of the interest in basic research but also those in other fields such as astrophysics, accelerator development and fusion research because of a variety of their possible applications[1]. As one of the immediate applications of charge transfer, for example, the electron transfer processes involving hydrogen ions and atoms play a key role in production of intense neutral beam for heating plasmas in fusion research[2), 3].

More recently, multiply charged ions, present copiously in plasmas, have been found to play a crucial role in achieving high temperature plasmas for realization of nuclear fusion because the radiation loss from these multiply charged ions through electron capture followed by decay into the ground state with light emission becomes considerable amount of the input energy. Thus, total electron transfer cross sections have to be known to estimate the energy loss through such radiations[4]. It is now well known that the electron capture into multiply charged ions at low energies usually occurs into relatively highly excited states[1].

These radiations can also be used for diagnosing and monitoring the distribution of impurity ions in plasmas and for modelling and understanding the overall behavior of high temperature plasmas. For such purposes, it is prerequisite to have more detailed information of the final state distributions, so called (n, ℓ) distributions, in the electron-captured ions.

Some aspects on the (n, ℓ) distributions of multiply charged ions in charge transfer have been reviewed by Janev and Winter[5].

This bibliography is intended to supply more new information on the

investigations of electron transfer, in particular relevant to the (n, ℓ) distributions of the electron-captured multiply charged ions. In each reference, a short description is given on important parameters such as the collision partners, their charge states before and after electron transfer, the energy range, and some important results. To cover other references on the charge transfer, we include a copy of references appeared in our previous compilations[3, 4]. Only a few important references published before 1975 are listed in this bibliography.

Following this bibliography, we plan to compile theoretical and experimental numerical data on the (n, ℓ) distributions in electron transfer involving typical impurity ions, C^{q+} and O^{q+} ions in plasmas.

The authors would like to thank Dr. S. Ohtani and Dr. T. Kato for their useful suggestions and comments. Dr. T. Kato also helped computer-programming for bibliography and Miss M. Ohnishi made a list of the present bibliography. Their contribution was essential for the present compilation. During the course of compiling data, Oak Ridge National Laboratory Bibliographic Database and IAEA International Bulletin of Atomic and Molecular Data for Fusion were quite helpful in finding the references.

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Charge exchange processes involving multicharged ions; the quasi-molecular approach

82R 2 Briggs,J.S. Macek,J. Taulbjerg,K.
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State-selected electron capture in atom-highly charged ion collisions

85R 3 Morgan,T.J. Olson,R.E. Schlachter,A.S. Gallagher,J.W.
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Charge transfer of hydrogen ions and atoms in metal vapors

68E 1 Belyaev,V A. Brezhnev,B G. Ercstov,E.M.
Sov. Phys.-JETP 27 (1968) 924-926
Resonant charge transfer of low-energy carbon and nitrogen ions
$C^+ + C \rightarrow C + C^+$; $N^+ + N \rightarrow N + N^+$
merging beam technique
6×10^{-4} - 8×10^{-3} keV/amu
total cross sections

69E 1 Lockwood,G.J.
Phys. Rev 187 (1969) 161-166
Charge transfer cross sections for H^+, Li^+ and Na^+ on N_2
$A^+ + N_2 \rightarrow A^0$ (A = H, Li, Na)
growth
0.2 - 100 keV/amu
total cross sections

70E 1 Cobic,B Vujovic,M. Matic,M
J. Phys B 3 (1970) 660-666
A study of charge-changing collisions involving Mg^+, Fe^+ and Cu^+ in the energy range 5-30 keV
$A^+ + Ne, Kr, N_2 \rightarrow A^{2+}, A, A^-$ (A = Mg, Fe, Cu)
growth
0.08 - 1.25 keV/amu

70E 2 Lockwood,G.J.
Phys. Rev. A 2 (1970) 1406-1410
Total cross sections for charge transfer of noble-gas ions in N_2
$A^+ + N_2 \rightarrow A^0$ (A = He, Ne, Ar, Kr, Xe)
growth
0.07 - 20 keV/amu

70E 3 Winter,G.J.M. Bieman,D.J. van der Weg,W.F.
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$Ne^{q+} + Ar \rightarrow Ne^{(q-1)+}, Ne^{(q-2)+}$ (q=1-4)
growth + fitting
3 keV/amu

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Single-electron capture by C^{4+} in helium, neon and argon below 40 keV
$C^{4+} + He, Ne, Ar \rightarrow C^{3+}$
growth
0.03 - 3.3 keV/amu
total cross sections; spark source

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$B^{3+} + He \rightarrow B^{2+}(nl) + He^+$
E. energy-loss/gain, T. LZ
3×10^{-2} - 0.46 keV/amu
total cross sections measured

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$A^{z+} + B \rightarrow A^{(z-1)+}(1s) + h\nu + B^+$ (A = N, Ne, Ar; B = He, Ne)

x-ray spectroscopy
7.2×10^3 - 1.8×10^4 keV/amu

73E 2 Lockwood,G.J.
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Total cross sections for charge transfer and stripping of Al, Cr and Er ions in He and N_2
Al^+, Cr^+, Er^+, Er^{2+} + He, N_2 -> Al^0, Cr^0, Er^0, Er^{2+}, Er^+
growth
0.12 - 3.6 keV/amu
total cross section

74E 1 Macdonald,J.R. Cocke,C.L. Eidson,W.W.
Phys. Rev. Letters 32 (1974) 648-651
Capture of argon K-shell electrons by 2.5 to 12 MeV protons
H^+ + Ar -> H^0 + $Ar^+(1s^{-1})$
x-ray coincidence
2500 - 12000 keV/amu

74E 2 Meyer,F.W. Anderson,L.W.
Phys. Rev. A 9 (1974) 1909-1915
Charge-exchange cross sections for Ne^+ and Ar^+ incident on Cs
Ne^+, Ar^+ + Cs -> Ne^0, Ar^0
growth
0.09 - 2.0 keV/amu

75E 1 Afrosimov,V.V. Leiko,G.A. Manaev,Yu.A. Panov,M.N.
Sov. Phys.-JETP 40 (1975) 661-666
Elementary processes of variation of particle charge states in He^{2+} - He interaction
He^{2+} + He -> He^0 + He^{2+}; He^+ + He^+; He^{2+} + He^+ + e;
He^{2+} + He^{2+} + 2e; He^+ + He^{2+} + e
coincidence technique
0.25 - 25 keV/amu

75E 2 Bayfield,J.E. Khayrallah,G.A.
Phys. Rev. A 12 (1975) 869-875
Electron transfer in keV-energy $^4He^{++}$ collisions. III. Experimental tests of the close-coupling calculations for $^4He^{++}$ - H(1s) collisions
He^{2+} + H -> $He^+(2s)$ + H^+
Energy-loss/gain + field-quenching
1.75 - 36 keV/amu

75E 3 Chen,Y.H. Johnson,R.E. Humphris,R.R. Siegel,M.W. Boring,J.W.
J. Phys. B 8 (1975) 1527-1543
Differential scattering of He^{2+} from He
He^{2+} + He -> He^{2+} + He, He^+ + He^+
Translational energy method
5×10^{-2} - 1.5×10^{-1} keV/amu

75E 4 Klinger,H. Muller,A. Salzborn,E.
J. Phys. B 8 (1975) 230-238
Electron capture processes of multiply charged argon ions in argon at energies from 10 to 90 keV
Ar^{q+} + Ar -> $A^{(q-i)+}$ (q=2-7; i=1-4)
growth method
0.25 - 2.25 keV/amu

75E 5 Meyer,F.W. Anderson,L.W.
Phys. Rev. A 11 (1975) 586-588

Charge-exchange cross sections for Kr^+ and Xe^+ incident on Cs
Kr^+, Xe^+ + Cs -> Kr^0, Xe^0
growth
0.012 - 0.34 keV/amu

75E 6 Muller,A. Klinger,H. Salzborn,E.
Phys. Letters 55A (1975) 11-12
Multiple-electron transfer to highly charged noble gas ions in single ion-atom collisions
Ar^{6+} + Ne, N_2, Ar, Kr, Xe -> Ar^{2+}
0.2 - 1.8 keV/amu

76E 1 Crandall,D.H. Olson,R.E. Shipsey,E.J. Browne,J.C.
Phys. Rev. Letters 36 (1976) 858-860
Single and double charge transfer in C^{4+} - He collisions
C^{4+} + He -> C^{3+}, C^{2+}
E. growth; T. MO
0.21 - 7.5 keV/amu

76E 2 Eisele,F.L. Nagy,S.W.
J. Chem. Phys. 65 (1976) 752-756
Attenuation and single electron charge-exchange cross sections of He^+ on He in the energy range 500 - 5000 eV
He^+ + He -> He^0
attenuation + condenser plate technique
0.125 - 1.25 keV/amu
total attenuation and charge changing cross section

76E 3 Goldbar,J. Mariella,R. Javan,A.
Appl. Phys. Letters 29 (1976) 96-98
Observation of one- and two-electron transfer from noble-gas atom to highly stripped carbon ions
C^{q+} + He, Ne, Ar -> $C^{(q-1)+}$, $C^{(q-2)+}$ (q=3-5)
growth
laser source

76E 4 Hird,B. Suk,H.C.
Phys. Rev. A 14 (1976) 928-936
Single-electron stripping cross sections of N_1^+ in Ne, Ar and Kr between 35 and 140 keV
N^+ + Ne, Ar, Kr -> N^0
2.5 - 10 keV/amu
total cross sections

76E 5 Hvelplund,P.
J. Phys. B 9 (1976) 1555-1565
Electron capture and loss by ground state and metastable Li^+ in helium and argon targets
$Li^+(1s^2)$ + He, Ar -> Li^0, $Li^{+*}(1s2s)$ + He, Ar -> $Li^+(1s^2)$; Li^{0*}
growth + attenuation methods
5.7 - 12.9 keV/amu
effect of metastable states

76E 6 Klinger,H. Muller,A. Salzborn,E.
J. Chem. Phys. 65 (1976) 3427-3430
Electron capture cross sections for multiply charge argon ions passing through nitrogen and krypton targets at energies from 10 to 110 keV
Ar^{q+} + N_2, Kr -> $Ar^{(q-i)+}$ (q=2-7 ; i=1-4)
0.25 - 2.75 keV/amu

76E 7 Latypov,Z.Z. Shaporenko,A.A.

Sov. Phys.-JETP 42 (1976) 986-988
Ionization and capture of electrons in collisions of Na^+ ions with Ne atoms
$Na^+ + Ne \rightarrow Na + Ne^+$, $Na^+ + Ne^+ + e$
growth
0 - 0.02 keV/amu
total cross sections

76E 8 Lindskog,J. Phil,J. Sjodin,R. Marelius,A. Sharma,K. Hallin,R.
Phys. Scripta 14 (1976) 100-104
Radiative electron capture by multiply ionized chlorine atoms
$Cl^{q+} + C \rightarrow Cl^{(q-1)+}(1s) + h\nu + C^+$
x-ray spectroscopy
857-1714 keV/amu
solid target, angular distribution, energy shift

76E 9 Muller,A. Klinger,H Salzborn,E.
J. Phys. B 9 (1976) 291-293
Role of metastable argon ions in Ar^{i+} + Ar charge-exchange collisions
$Ar^{2+} + Ar \rightarrow Ar^+$; $Ar^+ + Ar \rightarrow Ar^{2+}$
0.53, 0.9 keV/amu
effect of metastable beams

76E10 Muller,A. Salzborn,E
Phys. Letters 59A (1976) 19-20
Single and double electron transfer in Ar^{i+} - He collisions
$Ar^{q+} + He \rightarrow Ar^{(q-i)+}$ (q=3-8 ; i=1,2)
0.075-1.75 keV/amu

76E11 Shah,M.B. Gilbody,H.B.
J. Phys. B 9 (1976) 1933-1941
Redetermination of cross sections for formation of metastable $He^+(2s)$ ions in fast collisions using an improved calibration procedure
$He^{2+} + B \rightarrow He^+(2s)$ (B = H, H_2, He, N_2, O_2, Ar Kr, K);
$He^+(1s) + B \rightarrow H^+(2s)$ (B = H_2, He, N_2, O_2, Ar, Kr)
ion chamber
3.3 - 20 keV/amu (He^{2+}); 2 - 10 keV/amu (He^+)

76E12 Shah,M.B. Gilbody,H.B.
J. Phys. B 9 (1976) 2685-2692
Electron capture, loss and de-excitation in collisions involving fast metastable $He^+(2s)$ ions
$He^+(2s) + B \rightarrow He^0$, He^{2+} (B = H_2, He, N_2, O_2, Ar, Kr)
5 - 18.3 keV/amu

76E13 Sohval,A.R. Delvaille,J.P. Kalata,K. Kirby-Docken,K. Schnopper,H.W.
J. Phys. B 9 (1976) L25-29
Model for radiative electron capture; an interpretation of the line width
$O^{8+} + B \rightarrow O^{7+}(1s) + h\nu + B^+$ (B = H_2, He, N_2, O_2, C_3H_8)
x-ray spectroscopy
1875 - 4062 keV/amu
line width

76E14 Sohval,A.R. Delvaille,J.P. Kalata,K. Schnopper,H.W.
J. Phys. B 9 (1976) L47-51
Cross section ratio for radiative electron capture to inner and outer atomic shells
$O^{8+} + B \rightarrow O^{7+}(1s) + h\nu + B^+$ (B = H_2, N_2, He, O_2, C_3H_8)
x-ray spectroscopy
1875 - 4062 keV/amu

77E 1 Cocke,C.L. Gardner,R.K. Curnutte,B. Bratton,T. Saylor,T.K.
Phys. Rev. A 16 (1977) 2248-2255
K-shell capture by protons from O_2, N_2 and Ne
$H^+ + B \rightarrow H^0 + B^+(1s^{-1})$ (B = N, O, Ne)
Auger electron spectroscopy
750 - 5000 keV/amu

77E 2 Crandall,D.H.
Phys. Rev. A 16 (1977) 958-963
Electron transfer between He-like ions and He
B^{3+}, C^{4+}, N^{5+}, O^{6+} + He -> B^{2+}, B^{1+}, C^{3+}, C^{2+}, N^{4+}, N^{3+}, O^{5+}, O^{4+}
growth
1.3 - 7.5 keV/amu
H-oven

77E 3 Eisele,F.L. Nagy,S.W.
J. Chem. Phys. 66 (1977) 883-885
Attenuation and single electron charge-exchange cross sections of He^+ on Ne and Ar in the 500 - 5000 eV energy range
$He^+ + Ne, Ar \rightarrow He^0$
attenuation + parallel plate technique
0.125 - 1.25 keV/amu
total attenuation and charge changing cross section

77E 4 Guffey,J.A. Ellsworth,L.D. Macdonald,J.R.
Phys. Rev. A 15 (1977) 1863-1870
X-ray cross sections in helium for electron capture to excited states by bare nuclei with $5 \leq z_1 \leq 9$
B^{5+}, C^{6+}, N^{7+}, O^{8+}, F^{9+} + He -> B^{4+}, C^{5+}, N^{6+}, O^{7+}, F^{8+} + He^+
x-ray spectroscopy
250 - 2300 keV/amu

77E 5 Meyer,F.W. Anderson,C.J. Anderson,L.W.
Phys. Rev. A 15 (1977) 455-462
Total charge-transfer cross sections for H^+, H_2^+, H_3^+, He^+, N^+, N_2^+, Ne^+, Ar^+, Kr^+ and Xe^+ incident on Cs
$A^+ + Cs \rightarrow A^0$ (A = H, H_2, H_3, He, N, N_2, Ne, Ar, Kr, Xe)
0.23 - 160 keV/amu

77E 6 Muller,A. Salzborn,E.
Phys. Letters 62A (1977) 391-394
Scaling of cross sections for multiple electron transfer to highly charged ions colliding with atoms and molecules
< 25 keV/amu
scaling law

77E 7 Schuch,R. Schmidt-Bocking,H. Tserruya,I.
J. Phys. B 10 (1977) 889-898
Radiative electron capture by ^{32}S ions
$S^{q+} + B \rightarrow S^{(q-1)+} + h\nu + B^+$ (B = Be, C, Ni)
x-ray spectroscopy
156-3594 keV/amu
solid targets; angular distribution; energy shift; width

77E 8 Spindler,E. Betz,H.D. Bell,F.
J. Phys. B 10 (1977) L561-564
Radiative electron capture and momentum distributions of target electrons
$Cu^{q+} + Al \rightarrow Cu^{(q-1)+} + h\nu + Al^+$
x-ray spectroscopy

7031 keV/amu

77E 9 Suk,H.C. Guilband,A. Hird,B.
Can. J. Phys. 55 (1977) 1594-1600
Single electron capture by Ar^{2+} in Ne, Ar and Kr gases
Ar^{2+} + Ne, Ar, Kr -> Ar^{+}
growth
1.27 - 4.8 keV/amu

77E10 Winter,H. Bloemen,E. de Heer,F.J.
J. Phys. B 10 (1977) L453-457
Electron capture into excited projectile states in collisions of 100 keV Ne^{z+} (z=1,2,3,4) with He, H_2 and Ar
Ne^{q+} + He -> $Ne^{(q-1)+}$ + He^{+} (q=1-4)
Photon emission spectroscopy
5 keV/amu

77E11 Winter,H. Bloemen,E. de Heer,F.J.
J. Phys. B 10 (1977) L599-605
VUV radiation, slow ions and electrons produced in collisions of multiply charged Ne ions with He and Ar
Ne^{q+} + He -> $Ne^{(q-1)+}$ + He^{+} (q=1-4)
Photon emission spectroscopy
1.24 - 39.6 keV/amu

78E 1 Afrosimov,V.V. Basalaev,A.A. Panov,M.N. Leiko,G.A.
JETP Letters 26 (1978) 537-539
Electron capture in different electronic states by multiply charged Ar^{z+} ions in He atoms
Ar^{q+} + He -> $Ar^{(q-1)+}$ + He^{+} (q=3-7); Ar^{6+} + He -> Ar^{5+}(nl);
Ar^{3+} + He -> Ar^{2+}(nl)
energy gain spectroscopy
0.1 - 0.5 keV/amu
total one-electron capture cross sections; partial cross sections for Ar^{6+} and Ar^{3+}

78E 2 Berkner,K.H. Graham,W.G. Pyle,R.V. Schlachter,A.S. Stearns,J.W. Olson,R.E.
J. Phys. B 11 (1978) 875-885
Electron capture and impact ionization cross sections for partially stripped iron ions colliding with atomic and molecular hydrogen
Fe^{q+}(q=9-25) + H, H_2 -> $Fe^{(q-1)+}$
E. growth; T. CTMC method
50 - 1200 keV/amu
total cross sections

78E 3 Hinds,E.A. Novick,R.
J. Phys. B 11 (1978) 2201-2207
Precise resonant charge-transfer cross sections for He - He^{+} between 2 and 100 eV
He^{+} + He -> He + He^{+}
attenuation method
$5x10^{-4}$ - $2.5x10^{-2}$ keV/amu
total cross sections

78E 4 Maier,II.W.B. Stewart,B.
J. Chem. Phys. 68 (1978) 4228-4232
Electron transfer in collisions of doubly charged atomic ions with rare-gas atoms for primary-ion energies below 100 eV
N^{2+}, O^{2+}, Ar^{2+}, Ar^{3+} + He -> N^{+}, O^{+}, Ar^{+}, Ar^{2+};
He^{2+}, Ne^{2+}, Ar^{2+} + Ne -> He^{+}, Ne^{+}, Ar^{+};

Ne^{2+}, Ar^{+} + Ar -> Ne^{+}, Ar^{+}; Ar^{2+} + Kr -> Ar^{+}
$1x10^{-3}$ keV/amu
total cross sections

78E 5 Nutt,W.L. McCullough,R.W. Brady,K. Shah,M.B. Gilbody,H.B.
J. Phys. B 11 (1978) 1457-1462
Electron capture by He^{2+} ions in collisions with H and H_2 at impact energies below 10 keV
He^{2+} + H, H_2 -> $He^{+}(\Sigma nl)$ + H^{+}, H_2^{+}
furnace-target technique
0.1 - 2.5 keV/amu

78E 6 Okuno,K. Koizumi,T. Kaneko,Y.
Phys. Rev. Letters 40 (1978) 1708-1710
Symmetric resonance double charge transfer in Kr^{2+} + Kr and Xe^{2+} + Xe systems
A^{2+} + A -> A + A^{2+} (A = Kr, Xe)
drift tube technique
$5x10^{-7}$ - $2x10^{-4}$ keV/amu
total cross section

78E 7 Pedersen,E H. Mikkelsen,J.V. Vaaben,J. Taulbjerg,K.
Phys. Rev. Letters 41 (1978) 1541-1544
Interference effect in resonant double-charge transfer
Mg^{+}; Mg^{2+} + Mg -> Mg; Mg^{+}, Mg^{0}
E. growth; T. LZ
0.05 - 42 keV/amu

78E 8 Shah,M.B. Gilbody,H.B.
J. Phys. B 11 (1978) 121-131
Electron capture and $He^{+}(2s)$ formation in fast He^{2+} - H and He^{+} + H collisions
He^{2+} + H, H_2 -> $He^{+}(2s,\Sigma nl)$ + H^{+}, H_2^{+};
He^{+} + H -> $He^{+}(2s)$ + $H(\Sigma)$
Photon emission spectroscopy + field-qunching
1 - 100 keV/amu

78E 9 Suk,H.C. Guilband,A. Hird,B.
J. Phys. B 11 (1978) 1463-1474
Cross sections for electron capture by Ne^{2+} in He, Ne, Ar, Kr and Xe
Ne^{2+} + He, Ne, Ar, Kr, Xe -> Ne^{+}
2 - 10 keV/amu
total cross section

78E10 Tanis,J.A. Shafroth,S.M.
Phys. Rev. Letters 40 (1978) 1174-1177
Target thickness dependence of radiative electron capture in heavy ion collisions
Cl^{q+} + Cu -> $Cl^{(q-1)+}$ + $h\nu$ + Cu^{+}
x-ray spectroscopy
2285 keV/amu

78E11 Tawara,H. Richard,P. Gray,T.J. Newcomb,J. Jamison,K.A. Schmiedekamp,C. Hall,J.M.
Phys. Rev. A 18 (1978) 1373-1380
Si K-shell ionization and electron transfer cross sections; solid targets
F^{9+} + Si -> $F^{8+}(1s)$ + $Si^{+}(1s^{-1})$
x-ray measurement
400 - 2200 keV/amu

78E12 Tawara,H. Richard,P. Jamison,K.A. Gray,T.J.

J. Phys. B 11 (1978) L615-620
Experimental differentiation between electron excitation and electron capture by one electron (F^{8+}) ions in He
F^{8+} + He -> F^{7+} + $He^{+}(1s)$
x-ray spectroscopy
395 - 1840 keV/amu

78E13 Winter,H. El-Sherbini,Th.M. Bloemen,E. de Heer,F.J. Salop,A.
Phys. Letters 68A (1978) 211-214
A comparison between radiative and non-radiative de-excitation after electron capture by multiply charged ions
Ne^{q+} (q=1-4), Ar^{q+}(q=1-8) + B -> $Ne^{(q-1)+}$, $Ar^{(q-1)+}$
(B = He, Ne, Ar, Kr, Xe)
photon spectroscopy
5 keV/amu

79E 1 Adams,N.G. Smith,D. Grief,D.
J. Phys. B 12 (1979) 791-800
Single charge transfer reactions of the ground and metastable states of Xe^{2+} at 300 K
$Xe^{2+}(^3P, ^1D_2, ^1S_0)$ + B -> Xe^{+} (B = H_2, N_2, O_2, CO_2, Ar, Xe)
selected ion drift tube technique
$3x10^{-5}$ keV/amu
rate coefficient

79E 2 Beuhler,R.J. Friedman,L. Porter,R.F.
Phys. Rev. A 19 (1979) 486-494
Electron-transfer reactions of fast Xe^{q+} ions with Xe in the energy range 15 keV to 1.6 MeV
Xe^{q+} + Xe -> $Xe^{(q-1)+}$, $Xe^{(q-2)+}$, $Xe^{(q-3)+}$, $Xe^{(q-4)+}$, $Xe^{(q+1)+}$
growth
0.38 - 1.5 keV/amu

79E 3 Dowek,D. Krutein,J. Thielmann,V. Barat,M.
J. Phys. B 12 (1979) 2553-2563
Collision spectroscopy of open-shell systems I. C^{+} - Ne collisions
C^{+} + Ne -> C^{0}
energy loss spectroscopy
0.04 - 0.17 keV/amu
no absolute cross section

79E 4 El-Sherbini,T.M. Salop,A. Bloemen,E. de Heer,F.J.
J. Phys. B 12 (1979) L579-582
Target dependence of excitation resulting from electron capture in collisions of 200 keV Ar^{6+} ions with noble gases
Ar^{6+} + He, Ne, Ar, Kr, Xe -> Ar^{5+} + He^{+}, Ne^{+}, Ar^{+}, Kr^{+}, Xe^{+}
photon emission spectroscopy
5 keV/amu

79E 5 Gray,T.J. Richard,P. Gealy,G. Newcomb,J. Tawara,H.
IEEE NS-26 (1979) 1127-1129
X-ray production and electron transfer cross sections for 0.4 - 2.2 MeV/amu N, O, and F ions on Al
A^{z+} + Al -> $A^{(z-1)+}$ + $Al^{*}(1s^{-1})$
x-ray spectroscopy
400 - 2200 keV/amu

79E 6 Hill,J. Geddes,J. Gilbody,H.B.
J. Phys. B 12 (1979) L653-656
H^{-} formation in electron capture by 4 - 25 keV metastable hydrogen atoms in the inert gases

H(2s) + B -> H^- + B^+ (B = He, Ne, Ar, Kr)
growth
4 - 25 keV/amu

79E 7 Johnsen,R. Biondi,M.A.
Phys. Rev A 20 (1979) 87-97
Thermal energy charge transfer quenching and association reactions of doubly charged ions in the rare gases
A^{2+} + B -> A^+ + B^+ (A, B = He, Ne, Ar, Kr, Xe)
drift tube mass-spectrometer
10^{-5} keV/amu
rate coefficient

79E 8 Jones,J.D.C. Lister,D.G. Twiddy,N.D.
J. Phys. B 12 (1979) 2723-2726
Charge transfer reaction rate coefficients for He^+ and Ne^+ with Ar at 300 K
He^+, Ne^+ + Ar -> He^0, Ne^0 + Ar
selected-ion-flow tube technique
$1x10^{-5}$ keV/amu
rate coefficient

79E 9 Kita,S Inoue,H.
J. Phys. B 12 (1979) 2338-2349
Charge exchange reactions in collisions of Li^+ - Li
Li^+ + Li(2s) -> Li(2s, 2p) + Li^+
TOF spectroscopy
0.07 - 0.14 keV/amu

79E10 Loyd,D.H. Dawson,H.R.
Phys. Rev. A 19 (1979) 948-951
Electron capture into the n=3 states of hydrogen by proton impact on Co, Co_2 and N_2O
H^+ + B -> H^0 (3s, 3p, 3d)
photon spectroscopy
2.2 - 8.2 keV/amu

79E11 Morgan,T.J Eriksen,F.J.
Phys. Rev. A 19 (1979) 1448-1456
Single- and double-electron capture by 1 - 100 keV protons in collisions with magnesium and barium
H^+ + B -> H^0, H^- (B = Ar, Mg, Ba)
growth
1 - 100 keV/amu

79E12 Morgan,T.J. Eriksen,F.
Phys. Rev. A 19 (1979) 2185-2191
Formation of metastable hydrogen atoms by charge exchange of fast protons in magnesium and barium
H^+ + Ar, Mg, Ba -> H(2s)
quenching technique
1.5 - 90 keV/amu

79E13 Morgan,T.J. Stone,J. Mayo,M. Kurose,J.
Phys. Rev. A 20 (1979) 54-57
D^- production by multiple electron transfer collisions in alkaline-earth metal vapors
D^+ + B -> D^- (B = Mg, Ca, Sr, Ba)
equilibrium charge distribution
1.25 - 100 keV/amu

79E14 Muller,A. Achenbach,C. Salzborn,E.
Phys. Letters 70A (1979) 410-412
Dependence of the charge transfer between atoms and highly charged ions on the ionization potential of the atoms
Xe^{10+} + He, Ne, Ar, Kr, Xe, Cd, Na, Cs -> Xe^{9+}
0.75 keV/amu

79E15 Nagata,T.
J. Phys. Soc. Japan 46 (1979) 1302-1306
Charge changing collisions of atomic beams in alkali-metal vapors. II. total cross sections for one-electron capture by C^+, O^+, S^+ ions and C, O, S atoms
A^+, A^0 + B -> A^0, A^- (A = H, C, O, S; B = Cs, K, Na)
growth
0.5 - 5 keV/amu (H^+); 0.015 - 0.15 keV/amu (S^+)
total cross sections

79E16 Olsen,J.O. Andersen,T. Barat,M. Gaussorgues,Ch.C. Sidis,V. Pommier,J. Agusti,J. Andersen,N. Russek,A.
Phys. Rev. A 19 (1979) 1457-1484
Excitation and charge transfer in low-energy Na^+ - Ne collisions
Na^+ + Ne -> Na^0 + Ne^+
energy loss and photon spectroscopy
0.01 - 0.52 keV/amu

79E17 Olsen,J.O. Vedel,K. Dahl,P.
J. Phys. B 12 (1979) 929-944
Differential cross sections for charge transfer and excitation in low energy Be^+ - He, Ne collisions
Be^+ - He, Ne -> Be^0
energy loss spectroscopy
0.22 - 0.55 keV/amu
angular dependence

79E18 Pradel,P. Spiess,G. Sidis,V. Kubach,C.
J. Phys. B 12 (1979) 1485-1505
Differential cross sections for the near-resonant charge-transfer process H^+ + Cs -> H(2s) + Cs^+ at low energies
H^+ + Cs -> H(2s) + Cs^+
E. Lyman line; T. CC
0.025 - 0.1 keV/amu
θ = 1-7

79E19 Rodbro,R. Pedersen,E.H. Cocke,C.L. MacDonald,J.R.
Phys. Rev. A 19 (1979) 1936-1947
Innershell electron capture by H^+, He^{2+} and Li^{3+} projectiles from CH_4, Ne and Ar
A^{z+} + B -> $A^{(z-1)+}$ + $B^+(1s^{-1})$ (A = H, He, Li; B = CH_4, Ne, Ar)
coincidence method
400 - 3000 keV/amu

79E20 Rundel,R.D. Nitz,D.E. Smith,K.A. Geis,M.W. Stebbings,R.F.
Phys. Rev. A 19 (1979) 33-42
Resonant charge transfer in He^+ - He collisions studied with the merging-beams technique
He^+ + He -> He + He
merging-beams technique
2.5×10^{-5} - 4.7×10^{-2} keV/amu
total cross section

79E21 Sato,Y. Moore,J.H.

Phys. Rev. A 19 (1979) 495-503
Electron capture in N^{2+} - He and N^{2+} - Ne collisions
N^{2+} + He, Ne -> N^{+} + He^{+}, Ne^{+}
energy loss spectroscopy
0.014 - 0.17 keV/amu

79E22 Sharma,S. Awod,G.L. Hasted,J.B. Mathur,D.
J. Phys. B 12 (1979) L163-160
Energy loss spectra of production ions in electron capture
N^{2+} + B -> N^{+} + B^{+} (B = He, Ne, Ar)
0.1 keV/amu
energy loss spectra only; no cross sections

79E23 Tawara,H.
Phys. Letters 71A (1979) 208-210
On a scaling of electron capture by fully ionized heavy ions in light gas targets at low energies
scaling for low MeV energy region

80E 1 Agagu,A. Oluwole,A.F.
J. Phys. B 13 (1980) 1429-1432
K - K^{+} charge exchange cross section
K^{+} + K -> K^{0} + K^{+}
polarized K target
$3x10^{-5}$ keV/amu

80E 2 Andersen,T. Bisgaard,P. Pedersen,E.H.
Phys. Rev. A 22 (1980) 818-821
Formation of excited Mg^{+} states in Mg^{++} - Mg collisions (20-500 keV)
Mg^{2+} + Mg -> Mg^{+}(3p) + Mg^{+}(3p)
photon spectroscopy
0.8 - 21 keV/amu

80E 3 Aubert,J. Bliman,S. Geller,R. Jacquot,B. van Houtte,D.
Phys. Rev. A 22 (1980) 2403-2407
Charge-changing collisions of argon ions on argon gas. one-electron capture
Ar^{q+}(q=2-12) + Ar -> $Ar^{(q-1)+}$
growth method
(1-10)xq/M keV/amu
ECR ion source

80E 4 Bayfield,J.E. Gardner,L.D. Gulkok,Y.Z. Saylor,T.K. Sharma,S.D.
Rev. Sci. Instr. 51 (1980) 65-654
Charge exchange measurements in helium using a double tandem accelerator-decelerator source of low energy highly stripped oxygen ions
O^{q+} + He -> $O^{(q-1)+}$ + He^{+} (q=5-8)
15 - 100 keV/amu
deceleration with two tandems

80E 5 El-Sherbini,T.M. Salop,A. Bloemen,E. de Heer,F.J.
J. Phys. B 13 (1980) 1433-1449
Excitation and ionization resulting from electron capture in Ar^{6+} + H_2 collisions at ion projectile energies of 200 - 1200 keV
Ar^{6+} + H_2 -> Ar^{5+} + H_2^{+}, Ar^{5+} + H^{+} + H, Ar^{6+} + H_2^{+} + e^{-}
photon emission spectroscopy
5 - 30 keV/amu

80E 6 Huber,B.A.
J. Phys. B 13 (1980) 809-818
Charge transfer of Ar^{2+} in He, Ne and Ar

Ar^{2+} + He, Ne, Ar -> Ar^{+}, Ar^{0}
translational spectroscopy
0.06 - 0.1 keV/amu
cross sections for exothermic and endothermic channels

80E 7 Jones,J.D. Lister,D.G. Birkinshaw,K. Twiddy,N.D.
J. Phys. B 13 (1980) 799-808
Quasi-resonant charge transfer at thermal energies in the rare gases
A^{+} + A -> A + A^{+} (A = Ne, Ar, Kr, Xe)
selected ion flow tube method
$3x10^{-5}$ keV/amu
rate constant

80E 8 Matic,M. Sidis,V. Vujovic,M. Cobic,B.
J. Phys. B 13 (1980) 3665-3676
Near-resonant charge transfer in collisions of N^{+} and O^{+} ions with inert gases
A^{+}, A^{++} + B -> A^{0}, A^{0*} (A = O, N; B = He, Ne, Ar, Kr, Xe)
E. growth; T. Demkov model
0.14 - 2.1 keV/amu

80E 9 Matsumoto,A. Tsurubuchi,S. Iwai,T. Ohtani,S. Okuno,K. Kaneko,Y.
J. Phys. Soc. Japan 48 (1980) 567-574
Single-electron capture into Ar^{+} excited states in Ar^{2+} + Na collision below 12 keV I. Absolute measurement of emission cross-sections
Ar^{2+} + Na -> A^{+}(nl) + Na^{+}
photon emission spectroscopy
$5x10^{-3}$ - 0.3 keV/amu

80E10 Matsumoto,A. Tsurubuchi,S. Iwai,T. Ohtani,S. Okuno,K. Kaneko,Y.
J. Phys. Soc. Japan 48 (1980) 575-582
Single-electron capture into Ar^{+} excited states in Ar^{2+} + Na collisions below 12 keV II. Relative population distribution in Ar^{+} excited states
Ar^{2+} + Na -> Ar^{+}(nl) + Na^{+} (nl=4p, 4p', 4d)
E. photon emission spectroscopy; T. LZ
$5x10^{-3}$ - 0.3 keV/amu

80E11 McAfee,K.B. Hozack,R.S. Johnson,R.E.
Phys. Rev. Letters 44 (1980) 1247-1250
Σ oscillation and spin change during charge exchange in Ar^{+} on Ar
Ar^{+} + Ar -> Ar + Ar^{+}
crossed beam
0.005 keV/amu

80E12 Meyer,F.W.
J. Phys. B 13 (1980) 3823-3828
Single electron capture and loss by H^{+}, H^{0} and H^{-} in Cs vapor in the energy range 0.1 - 2.0 keV
H^{+} + Cs -> H^{0}
growth
0.1 - 2.0 keV/amu

80E13 Morgenstern,R. Niehaus,A. Zimmermann,G.
J. Phys. B 13 (1980) 4811-4831
Autoionizing states formed by electron capture in collisions of multiply charged Ne ions with He, H_2 and Xe
Ne^{+}, Ne^{2+}, Ne^{3+} + He, H_2, Xe -> Ne, Ne^{+}, Ne^{2+} + He^{2+}, H_2^{2+}, Xe^{2+} + e^{-}
electron emission spectroscopy

$5x10^{-2}$ - $5x10^{-1}$ keV/amu

80E14 Nagata,T.
J. Phys. Soc. Japan 48 (1980) 2068-2075
Charge changing collisions of atomic beams in alkali-metal vapors. IV. Total cross sections for single electron capture by H^+ ion and H(1s) atom
$H^+ + B \rightarrow H^-$; $H^0(1s) + B \rightarrow H^-$ (B = Cs, Rb, K, Na)
growth
0.4 - 5 keV/amu
total cross sections

80E15 Panov,M.N.
Electronic and Atomic Collisions (eds. N.Oda and K.Takayanagi, North-Holland, Amsterdam) (1980) 437
Electron capture into different excited states of multiply charged ions
$Ar^{6+} + He \rightarrow Ar^{5+}(nl) + He^+$

80E16 Rille,E. Winter,H.
J. Phys. B 13 (1980) L531-536
Excitation in electron capture collisions of Ne^{2+}(15-20 keV) with Xe
$Ne^{2+} + Xe \rightarrow Ne^+(nl) + Xe^+(nl)$
photon emission spectroscopy
0.74 - 2.5 keV/amu

80E17 Schlachter,A.S. Stalder,K.R. Stearns,J.W.
Phys. Rev. A 22 (1980) 2494-2509
D^- production by charge transfer of 0.3 - 10 keV D^+, D^0, and D^- in cesium, rubidium and sodium vapor targets
$D^0 + Cs \rightarrow D^-$
growth
1.25 - 5 keV/amu
charge equilibrium fractions for Cs, Rb, Na

80E18 Shah,M.B. Geddes,J. Gilbody,H.B.
J. Phys. B 13 (1980) 4049-4058
Absolute cross sections for H(2s) formation in electron capture by protons in gases
$H^+ + B \rightarrow H^0(2s) + B^+$ (B = He, Ne, N_2, O_2, Ar, H_2)
photon counting
12 - 18 keV/amu

80E19 Smith,D. Adams,N.G. Alge,E. Villinger,H. Lindinger,W.
J. Phys. B 13 (1980) 2787-2799
Reactions of Ne^{2+}, Ar^{2+}, Kr^{2+} and Xe^{2+} with the rare gases at low energies
$A^{2+} + B \rightarrow A^+ + B^+$ (A = Ne, Ar, Kr, Xe; B = He, Ne, Ar, Kr, Xe)
selected ion-flow tube method
$3x10^{-5}$ eV

80E20 Sofield,C.J. Cowern,N.E.B. Draper,J. Bridwell,L. Freeman,J.M. Woods,C.J. Spencer-Harper,M.
Nucl Instr. Meth. 170 (1980) 257-260
Charge-exchange cross sections of nearly fully stripped ^{16}O ions in solid targets
O^{q+} + B(solid) $\rightarrow O^{(q-1)+}(q=7,8)$; $O^{(q+1)+}(q=6,7)$ (B = C, Al)
foil thickness dependence
2500 keV/amu

80E21 Tanis,J.A. Jacobs,W.W. Shafroth,S.M.
Phys. Rev. A 22 (1980) 483-495

Systematics of target and projectile K x-ray production and radiative capture for 20 - 80 MeV Cl^{q+} ions incident on 25 - 200 mg/cm^2 Cu targets
$Cl^{z+} + Cu \rightarrow Cl^{(z-1)+} + H\nu + Cu^{*}$
x-ray spectroscopy
571 - 2285 keV/amu

80E22 Thielmann,U. Krutein,J. Barat,M.
J. Phys. B 13 (1980) 4217-4232
Collisions spectroscopy of open-shell systems II. N^{+} - Ne collisions
$N^{+} + Ne \rightarrow N^{0}$
TOF-energy loss spectroscopy
0.036 - 0.14 keV/amu
energy loss spectra

80E23 Van Zyl,B. Rothwell,H.L. Neumann,H.
Phys. Rev. A 21 (1980) 730-737
Balmer-α and Balmer-β emission cross sections for H^{+} + Ar collisions
$H^{+} + Ar \rightarrow H^{0}(3l, 4l)$
photon spectroscopy
0.05 - 2.5 keV/amu

80E24 Varghese,S.L. Bissinger,G. Joyce,J.M. Laubert,R.
Nucl. Instr. Meth. 170 (1980) 269-273
The electron capture cross section of 1.5 - 3 MeV protons from carbon
$H^{+} + B \rightarrow H^{0}$ (B = CH_4, C_2H_2, C_2H_4, C_2H_6, C_3H_6, C_4H_8)
growth
1500 - 3000 keV/amu

81E 1 Afrosimov,V.V. Basalaev,A.A. Gordeev,Yu.S. Donets,E.D. Zinov'ev,A N. Ovchinnikov,S.Yu. Panov,M.N.
Sov. Phys.-JETP Lett. 34 (1981) 316-318
X radiation accompanying electron capture by oxygen and carbon nuclei in molecular hydrogen
$C^{6+}, O^{8+} + H_2 \rightarrow C^{5+}, O^{7+}$
photon emission spectroscopy
0.6 - 8 keV/amu

81E 2 Barret,J.L. Leventhal,J.J.
Phys. Rev. A 23 (1981) 485-490
Selective formation of He^{+}(n=3) in He^{2+} - Li collisions
$He^{2+} + Li \rightarrow He^{+}$ (n=3)
photon spectroscopy
0.125 - 1.75 keV/amu
emission cross section

81E 3 Beyer,H.F. Mann,R. Folkmann,F.
J. Phys. B 14 (1981) L377-381
High-charge-low-velocity electron capture studied by x-ray line quenching
$Ne^{8+}(1s2p\ ^3P_1) + Ne \rightarrow Ne^{7+}$
Kα x-ray observation
5.1×10^{-4} keV/amu
recoil ions

81E 4 Bloemen,E.W.P. Winter,H. Mark,T.D. Dijkkamp,D. Barends,D. de Heer,F.J.
J. Phys. B 14 (1981) 717-725
Absolute emission cross sections at 30.4 nm for e - He collisions and at 20.8 nm for Ne^{4+} - He collisions
$e + He \rightarrow 2e + He^{+*} \rightarrow 2e + He^{+} + h\nu$;

Ne^{4+} + He -> Ne^{3+} + He^{+} -> Ne^{3+} + hν + He^{+}
photon emission spectroscopy
9.9 (Ne^{4+}-He) keV/amu

81E 5 Campbell,F.M. Browning,R. Latimer,C.J.
J. Phys B 14 (1981) 1183-1195
Symmetric charge transfer in argon, krypton and xenon; the effect of spin-orbit coupling studied using photoelectron-photoion coinidence spectroscopy
$A^{+}(^2P_{3/2\,1/2})$ + A -> $A(^1S_0)$ + $A^{+}(^2P_{3/2,1/2})$
photoion-photoelectron coincidence
1.25×10^{-4} - 2.5×10^{-2} keV/amu
cross section ratios for initial states ($^2P_{3/2}$ and $^2P_{1/2}$)

81E 6 Chetioui,A. Rozet,J.P. Briand,J.P. Stephan,C.
J. Phys. B 14 (1981) 1625-1638
K excitation and K-K transfer cross sections for intemediate-velocity nearly symmetric collisions
Kr^{36+} + B -> $Kr^{35}(1s)$ + $B^{+}(1s^{-1})$ (B = Ti, Mn, Ni, Cu, Zr, Ag)
x-ray spectroscopy
3614 keV/amu

81E 7 Cocke,C.L. Dubois,R. Gray,T.J. Justiniano,E.
IEEE NS-28 (1981) 1032-1035
Capture by highly-charged low-energy ions studied with a secondary recoil ion source
Ne^{q+}(q=2-6), Ar^{q+}(q=2-10), Kr^{q+}(q=2-10) + He -> $Ne^{(q-1)+}$, $Ar^{(q-1)+}$, $Kr^{(q-1)+}$
TOF
(0.1-1.1)xq/M keV/amu
oscillation of cross section over q

81E 8 Cocke,C.L. DuBois,R. Gray,T.J. Justiniano,E. Can,C.
Phys. Rev. Letters 46 (1981) 1671-1674
Coincidence measurements of electron capture and ionization in low-energy Ar^{q+} + (He, Ne, Ar, Xe) collisions
Ar^{q+} + A -> $Ar^{(q-1)+}$, $Ar^{(q-2)+}$ + A^{i+} (A = He, Ne, Ar, Xe; i=1-2)
coincidence technique
(0.25-0.66)xq/M (keV/amu)
recoil ion source; total cross section

81E 9 Dillingham,T.R. McDonald,J.R. Richard,P.
Phys. Rev. A 24 (1981) 1237-1248
Ionization of one-electron ions and capture by bare and one-electron ions of C, N, O and F on He
$A^{z+,(z-1)+}$ + He -> $A^{(z-1)+}$, $A^{(z-2)+}$ (A = C, N, O, F)
growth
500 - 2500 keV/amu

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)

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

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 beiween multiply charged ions and H_2
$Au^{13+,15+} + H_2 \rightarrow Au^{12+,14+}$
optical measurement
100 keV/amu
$\Delta n=1$; dominant transitions; no cross section given

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
$Ar^{q+}(q=2-9) + Ne \rightarrow Ar^{(q-1)+}, Ar^{(q-2)+}, Ar^{(q-3)+} + Ne^{i+}$ (i=1-3)
coincidence techinique
(0.1-1.1)xq/M (keV/amu)
recoil ion source; total cross section

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

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
$A^{q+} + B \rightarrow A^{(q-1)+}(n) + B^+$ ($A = Ne^{8+}, Ne^{10+}, N^{5+}$;
B = He, Ne, Ar, H_2, CH_4, NH_3)
x-ray spectroscopy
10^{-4} keV/amu
recoil ions; no cross section

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
$He^+ + B \rightarrow He^0$ (B = Cs, Rb, K, Na)
growth
0.1 - 1.25 keV/amu

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
$A^{1+}, A^{2+} + O_2 \rightarrow A^{2+}, A^{3+}$ A= Ne,Ar
growth
0.25 - 1.7 keV/amu
metastable state effect

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
$S^{q+} + Ar \rightarrow S^{(q-1)+}, S^{(q-2)+}$ (q=13-16)
coincidence with K x-rays

2180 keV/amu

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 -> $Cu^{(z-1)+}$ + hν + C^*, Cu^*
x-ray spectroscopy
1142 - 2285 keV/amu

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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
$He^{2+} + Li \rightarrow He^{+}(nl)$
optical spectroscopy
3.75 - 37.5 keV/amu

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
$Ne^{10+} + H_2, He, CH_4, N_2, O_2, Ne \rightarrow Ne^{9+} + h\nu$
x-ray spectroscopy
5500 keV/amu

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
$Ar^{2+} + B \rightarrow Ar^{+}(nl)$ (B = Ar, Kr, Xe)
energy loss spectroscopy
0.013 keV/amu
no cross sections

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
$^3He^{2+} + C \rightarrow He^{+}$
foil thickness dependence
22000 - 43000 keV/amu

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
$A^{q+} + He \rightarrow A^{(q-1)+} + He^{+}$ ($A^{q+}=C^{3+}, N^{4+}, O^{5+}$)
energy-loss/-gain spectroscopy
2.5×10^{-1} (C^{3+}), 2.85×10^{-1} (N^{4+}), 3.12×10^{-1} (O^{5+}) keV/amu

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
$He^{2+} + Ne \rightarrow He^{+}, He^{0}$
growth
0.2 - 0.75 keV/amu

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
$Ne^{9+}, Ne^{10+} + He, Ne, Ar, Xe \rightarrow Ne^{8+}(n), Ne^{9+}(n)$
energy-gain spectroscopy
0.025- keV/amu
crossing radius; n-distribution only

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
$Ar^{2+}(^1D, ^3P) + Na \rightarrow Ar^{+} + Na^{+}$
optical attenuation method
3.75×10^{-2} keV/amu

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
$He^{2+}, He^{+} + Li \rightarrow He^{+}, He^{0}$
growth
1.7 - 200 keV/amu
total cross section

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
$H + N_2, Cs \rightarrow H^{+}, H^{0-}$
growth
0.1 - 5 keV/amu
scattering effect in cross sections (θ = 0.8, 2.6)

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
$He^{2+} + Li \rightarrow He^{+}, He^{0}$
total cross section

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
$H^{+} + Cs, Rb, K, Na \rightarrow H$
attenuation method
0.3 - 5 keV/amu

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
$C^{6+}, O^{8+} + He \rightarrow C^{5+}(nl), O^{7+}(nl) + He^{+}$
Energy-loss/gain spectroscopy
0.45 keV/amu

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

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
$H^{+} + B \rightarrow H + B^{+}(1s^{-1})$ (B = C, Ne)
Auger electron coincidence
200 - 600 keV/amu (C), 500 - 1500 keV/amu (Ne)

impact parameter dependence

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
$A^{z+} + B \rightarrow A^{(z-1)+} + B^{*}(1s)$ (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

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)
$H^{+} + C \rightarrow H + C^{*}(1s^{-1})$
Auger electron coincidence
200 - 2000 keV/amu
Impact parameter dependence

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
$F^{8+}(1s) + Ne \rightarrow F^{7+}$
x-ray spectroscopy
526 - 2100 keV/amu

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
$H^{+}, D^{+} + H, D \rightarrow H^{0}, D^{0}$
E. growth with high temperature oven; T. CTMC
40 keV/amu
projectile dependence at small angles; no target isotope dependence; scaling law

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)
$Ne^{q+} + Li \rightarrow Ne^{(q-1)+}(3l, 4l)$ (q=1,2)
photon spectroscopy
0.25 - 1.5 keV/amu (Ne^{+}); 1 - 3 keV/amu (Ne^{2+})
total and partial cross sections

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
$S^{13+} + Ar \rightarrow S^{12+}$
coincidence with x-ray
2180 - 5000 keV/amu

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
$F^{8+}, F^{9+} + He \rightarrow F^{7+}, F^{8+} + He^{+} + h\nu$
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+})

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

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%)

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

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

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

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

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 -> $Fe^{25+}(nl)$ + $B^{+}(1s^{-1})$ (B = He, N, Ar)
E. x-ray spectroscopy, T. continuum-distorted wave, strong-potential Born, impulse
7000 keV/amu
x-ray (1s->np, nd)

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 -> $Ne^{(q-1)+}$ (q=2-6)
trapping method
q x 10^{-4} keV/amu
rate coefficients

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 -> $Ar^{(q-1)+}$(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

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

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

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

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

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

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

83E16 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

83E17 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

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
$Au^{q+} + H_2 \rightarrow Au^{(q-1)+}(n) + H_2^{+}$ ($12 \leq q \leq 18$)
photon emission spectroscopy
100 keV/amu

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
$3x10^{-5}$ keV/amu

rate coefficient

83E20 Kähler,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

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

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

83E23 Kuen,I. Stori,H. Howorka,F.
Phys. Rev. A 28 (1983) 119-126
Measurement of direct and charge exchange excitation cross sections in 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

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
$A^{q+} + B \rightarrow A^{(q-k)+} + B^{k+}$ (A = Ne, Ar, Kr, Xe; q=2-11; B = He, Ne, Ar, Kr, Xe; k=1-5)
growth
0.15 - 3 keV/amu

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
$Ne^{q+} + B \rightarrow Ne^{(q-k)+} + B^{k+}$ (q=2-5; B = He, H_2; k=1-2)
growth
0.15 - 3 keV/amu

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
$Kr^{q+}(q=2-9)$, $Xe^{q+}(q=2-10) + H_2$, He $\rightarrow Kr^{(q-k)+}$, Xe(q-k)+ (k=1-2)
growth
0.29 keV/amu
total cross section

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 .

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

83E29 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

83E30 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

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

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

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

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
$Xe^{q+} + Xe \rightarrow Xe^{(q-i)+} + Xe^{k+} + (k-i)e$ (q=3-15)
statistical model for transfer ionization and multiple-ionization

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
$H^{+} + C^{+}, N^{+} \rightarrow H^{0} + C^{2+}, N^{2+}$
crossed beam technique
65 - 470 keV/amu

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

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
$C^{4+}, C^{5+}, N^{5+}, N^{6+}, O^{6+} + He \rightarrow$ (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

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

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

83E40 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

83E41 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

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

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
5×10^{-5} - 3.5×10^{-3} keV/amu
trapped recoil ion

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

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

83E46 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

83E47 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

83E48 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

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 -> Ar^{+} (^2P) + $Ar^{+}(3s^2 3p^4 nl)$
energy loss/gain spectroscopy
0.0725 keV/amu
scattering angle 0-1; relative cross section

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 -> $F^{6+}(1s2s2p\ ^4P)$
x-ray spectroscopy
315 - 2100 keV/amu
total cross section

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

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

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

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 -> Au^{14+} + He^{+}; Au^{13+} + He^{2+}
Electron emission spectroscopy coincidence with final projectile charge state
3939.0 keV/amu

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 -> $A^{(q-1)+}$ + $h\nu$ + B^{+} (q = z, z-1; A = Xe, La, U;

B = Be-Ta)
x-ray spectroscopy
10^5 keV/amu
REC cross sections; angular distribution

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

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
$H^+ + Li(2s) \rightarrow H(2p), H(3s, 3p, 3d)$
photon spectroscopy
2 - 20 keV/amu

84E 5 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

84E 6 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

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

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

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 $n' \geq n$ 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 -> $N^{5+}(nln'l')$ + He^{2+}, H_2^{2+} (n=2,3,4; n'≥ n)
electron emission spectroscopy
4.9 keV/amu

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'≥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 -> $N^{4+}(1snln'l')$ + He^{2+}, H_2^{2+} (n=2,3,4 ;n'≥ n)
electron emission spectrosocpy
4.2 keV/amu

84E11 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 -> 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

84E12 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

84E13 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 -> H_2^* (B = Ar, Mg, Na, Cs)
growth
0.75 - 3.75 keV/amu

84E14 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

84E15 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

84E16 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

84E17 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
$H^+ + Mg(2p) \rightarrow H^0 + Mg(2p^{-1})$; $H + Mg(2p^{-1})$
growth
25 - 80 keV/amu

84E18 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+}, $U^{92+} + B \rightarrow U^{90+}$, U^{91+} (B = C, Cu, Ta)
growth method
4×10^5 - 9.6×10^5 keV/amu

84E19 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

84E20 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

84E21 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

84E22 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
$H(1s) + Na \rightarrow H^+, H^-$
growth
1 - 25 keV/amu
total cross section

84E23 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

$2x10^{-2}$, $5x10^{-2}$ keV/amu

84E24 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

84E25 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

84E26 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

84E27 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

84E28 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

84E29 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

84E30 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

84E31 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

84E32 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

84E33 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

84E34 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

84E35 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

84E36 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

84E37 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

84E38 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

84E39 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

84E40 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
3.5×10^{-3} - 2.6×10^{-2} keV/amu

84E41 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

84E42 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
5×10^{-3} - 2 keV/amu

84E43 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

84E44 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

84E45 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

84E46 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

84E47 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

84E48 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

84E49 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

84E50 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

84E51 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

85E 1 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 -> H^-
growth
1.0 - 5.0 keV/amu

85E 2 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^{5+}, O^{8+} + Au -> C^{5+}, O^{7+} + Au^* ($3l^{-1}$)
x-rcy coincidence
2000 keV/amu

85E 3 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 -> $H^0(1s)$ + $Kr^+(3l^{-1})$
E. x-ray coincidence; T. CDW
2000 - 3000 keV/amu

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) -> H(2s)
photon spectroscopy
2 - 20 keV/amu

85E 5 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) -> A^0 (A = H, H_2, He, Ne)
growth
2 - 20 (H) keV/amu; 0.1 - 1 keV/amu
total cross section

85E 6 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) -> He(total, 2p, 3p)
photon spectroscopy
0.5 - 5 keV/amu

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 -> 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

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

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+}, $Al^{8+} + H_2$, $\rightarrow Ne^{7+}(nl)$, $O^{7+}(nl)$, $Al^{7+}(nl)$
x-ray, VUV photon spectroscopy
1.56 - 3.84 keV/amu
grazing incidence spectrometer; cystal spectrometer

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
$Ne^{8+} + He, H_2 \rightarrow Ne^{7+}(nl) + He^+, H_2^+$
photon emission spectroscopy
1 - 4 keV/amu

85E12 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
$N^{6+,7+} + H_2, He \rightarrow N^{4+,5+}$ (nl, n'l'), n=2,3,4
electron spectroscopy
0.75xq keV/amu

85E13 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
$N^{5+} + He, H_2 \rightarrow N^{4+}$ (1s2ln'l')
electron spectroscopy
3.42 keV/amu

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
$C^{4+} + Li(2s) \rightarrow C^{4+}$ (n,l)
1.67 - 6.67 keV/amu

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

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

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

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

85E19 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

85E20 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

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

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

85E23 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

85E24 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

85E25 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+} ($1s^2nl$)
UV spectroscopy
0.8 - 3.57 keV/amu

85E26 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

85E27 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

85E28 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

85E29 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

85E30 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

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

85E32 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

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

85E34 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)

85E35 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

85E36 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 $x10^{3}$ keV/amu

85E37 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

85E38 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
$4.6x10^{-5}$, $2.3x10^{-4}$ (Xe^{2+}); $1.5x10^{-1}$, 0.75 (Ar^{3+}) keV/amu

85E39 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

85E40 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

85E41 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

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

85E43 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

85E44 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
$H^+ + H_2, D_2 \rightarrow H(2s)$
photon measurement
8 - 16 keV/amu
no isotope effect found

85E45 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 $Ne^{8+} + Na \rightarrow Ne^{7+}(nl)$
0.2 keV/amu

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

85E47 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

85E48 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

85E49 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

85E50 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

85E51 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 -> $A^{(z-1)+,(z-2)+}$ (A = C, N, O, F, Ne)
H-oven
0.18 - 8.5 keV/amu

85E52 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 -> $Xe^{(q-i)+}$ (q=52-54 ; B=Be-Au ; i=1-3)
solid target
82000 - 200000 keV/amu

85E53 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

85E54 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 -> $Ar^{(q-i)+}$ (q=6-10)
energy-gain/-loss spectroscopy
$1x10^{-2}$ - $5x10^{-2}$ keV/amu

85E55 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^+)

85E56 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

85E57 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

85E58 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)

85E59 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

85E60 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

85E61 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

85E62 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

85E63 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

85E64 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

85E65 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
$H^+, He^{2+} + Li \rightarrow H^0, He^+$
growth method
22 - 2100 keV/amu
Li-oven

85E66 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

85E67 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

85E68 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

85E69 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 -> H^0; H^- + Hg -> H^0
growth
23.8 - 134.2 keV/amu

85E70 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)

85E71 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

85E72 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

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

86E 2 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
1.25×10^{-4} - 0.05 keV/amu

86E 3 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

86E 4 DuBois,R.D.
Phys. Rev. A 33 (1986) 1595-1601
Ionization and charge transfer in He^{2+} - rare gas collisions
He^{2+} + B -> He^{+}, He^{0} + B^{i+} (B = He, Ne, Ar, Kr)
coincidence technique
3.75 - 50 keV/amu

86E 5 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 -> $Ca^{(q-1)+}$ (q=16-19)
growth method
2425 - 9200 keV/amu
two bumps near 200-300 MeV

86E 6 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

86E 7 Muller,A. Schuch,B. Groh,W. Salzborn,E. Beyer,H.F. Mokler,P.H. Olson,R.E.
Rev. 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 -> $Fe^{(q-i)+}$, $U^{(q-i)+}$(i=0-4) + Ar^{r+}(r=1-4)
E. recoil ion-projectile ion coincidence ; T. CTMC
1400 keV/amu

86E 8 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
$Ar^{q+} + B \rightarrow Ar^{r+} + B^{s+}$ (q=1-8 ; r=0-8 ; s=1-6 ; B=Ne, Ar, Kr)
TOF + coincidence
0.045xq keV/amu

86E 9 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
$Ar^{17+} + H, H(n) \rightarrow Ar^{16+}$
photon spectroscopy
$4x10^{-2}$ keV/amu (maxellian)

86E10 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
$Ne^{q+} + Ne \rightarrow Ne^{r+} + Ne^{s+}$ (q=2, 3 ; r=1-6)
coincidence technique
75 - 360 keV/amu

86E11 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

54T 1 Bates,D.R. Moiseiwitsch,B.L.
Proc. Phys. Soc. 67 (1954) 805-812
Inelastic heavy particle collisions involving the crossing of potential curves I; charge transfer from H atoms to Be^{2+}, Si^{2+} and Mg^{2+} ions
$A^{2+} + H \rightarrow A^{+} + H^{+}$ (A = Be, Si, Mg)
Landau-Zener model
1×10^{-2} - 10 keV/amu
total cross section

67T 1 Nikolaev,V.S.
Sov. Phys. -JETP 24 (1967) 847-857
Calculation of the effective cross sections for proton charge exchange in collisions with multielectron atoms
modified OBK

71T 1 Olson,R.E. Smith,F.T. Bauer,E.
Appl. Optics 10 (1971) 1848-1855
Estimation of the coupling matrix elements for one-electron transfer systems
H_{12} for Landau-Zener model

73T 1 Halpern,A.M. Law,J.
Phys. Rev. Letters 31 (1973) 4-6
K-vacancy creation by high Z heavy ion impact
$A^{z+} + Ar \rightarrow A^{(z-1)+} + Ar^{*}(1s^{-1})$ (A = H, C, N, O, F)

74T 1 Briggs,J.S. Dettmann,K.
Phys. Rev. Letters 33 (1974) 1123-1125
Radiative charge transfer from H atoms by fast ions
$H^{+} + H(1s) \rightarrow H(1s) + h\nu + H^{+}$
IP
analytic expressions at asymptotic region

74T 2 Piacentini,R.D. Salin,A.
J. Phys. B 7 (1974) 1666-1678
Molecular treatment of the He^{2+}-H collisions
$He^{2+} + H \rightarrow He^{+} + H^{+}$; $He^{+}(2s)$
PSS
0.25-12.5

75T 1 Halpern,A.M. Law,J.
Phys. Rev. A 12 (1975) 1776-1780
Full first Born approximation for innershell pickup in heavy ion collisions
$A^{z+} + Ar \rightarrow A^{(z-1)+} + Ar^{*}(1s^{-1})$ (A = H, C, N, O, F)
first Born approximation
2500 - 12000 keV/amu (H), 1050 - 1800 keV/amu (C, N, O, F)

75T 2 Kleber,M. Jakubassa,D.H.
Z. Phys. A 252 (1975) 152-162
Radiative electron capture in heavy ion collisions
$A^{z+} + B^{(z-1)} \rightarrow A^{(z-1)+}(1s) + B^{z+} + h\nu$
IA
analytic formula

75T 3 McCarrol,R. Valiron,P.
Astron. & Astrophys. 44 (1975) 465-467
Electron capture by C^{2+} from intersellar atomic hydrogen
$C^{2+} + H \rightarrow C^{+} + H^{+}$
model potential method
no cross sections given

75T 4 Omidvar,K.
Phys. Rev. A 12 (1975) 911-926
Asymptotic form of the charge-exchange cross section in three-body rearrangement collisions
$H^+ + H(1s) \rightarrow H(n) + H^+$
first Born approximation
scaling for any Z

75T 5 Presnyakov,L.P. Ulantsev,A.D.
Sov. J. Quant. Electron. 4 (1975) 1320-1324
Charge exchange between multiply charged ions and atoms
10^{-3} - 10^2 keV/amu

76T 1 Blint,R.J. Watson,W.D. Christensen,R.B.
Astrophys. J. 205 (1976) 634-637
Calculation of the cross section for CIV - H charge exchange; significance for interstellar x-rays and cosmic-ray particles
$C^{3+} + H \rightarrow C^{2+} + H^+$
Landau-Zener model/two-state perturbation method
10^{-4} - 1.75 x 10^{-3} keV/amu

76T 2 Chibisov,M.I.
JETP Letters 24 (1976) 46-49
Charge exchange and ionization in the collision of atoms and multiply charged ions

76T 3 Olson,R.E. Salop,A.
Phys. Rev. A 14 (1976) 579-585
Electron transfer between multicharged ions and neutral species
$A^{z+} + B \rightarrow A^{(z-1)+}$ (z = 5 - 50, B = H, H_2, He, Ne, Kr, Xe)
absorbing sphere model (Landau-Zener model)
$\leq$ 0.2 keV/amu
total cross section

76T 4 Omidvar,K. Golden,J.E. McGuire,J.H.
Phys. Rev. A 13 (1976) 500-503
Single electron Born approximations for charge transfer from multielectron atoms to protons
$H^+ + He, Ar \rightarrow H + He^+(1s), Ar^+(1s^{-1})$
Born approximation
1000 - 12000 keV/amu

76T 5 Salop,A.
Phys. Rev. A 13 (1976) 1321-1325
Charge exchange between H(2s) and fully stripped carbon and nitrogen ions at low-keV impact energies
$C^{6+}, N^{7+} + H(2s) \rightarrow C^{5+}$
multichannel Landau-Zener model
0.014 - 3.3 keV/amu
weak energy-dependence

76T 6 Salop,A. Olson,R.E.
Phys. Rev. A 13 (1976) 1312-1320
Charge exchange between H(1s) and fully stripped heavy ions at low-keV impact energies
$A^{z+} + H \rightarrow A^{(z-1)} + H$ (A = C, N, O, Ne, Si, Ar)
multichannel Landau-Zener model
0.01 - 3 keV/amu
scaling ($Z^{3/2}$) law of total cross setion

77T 1 Belkic,Dz.
J. Phys. B 10 (1977) 3491
High-energy behaviour of the transition probabilities and total cross sections for charge exchange
$H^+ + H(1s) \rightarrow H(nl) + H^+$
continuum intermediate state approximation
25 - 10000

77T 2 Belkic,Dz. Gayet,R.
J. Phys. B 10 (1977) 1911-1921
Electron capture from atomic hydrogen by fast protons and alpha particles
$H^+ + H(1s) \rightarrow H(nl) + H^+$
CDW
25 - 10^4 keV/amu

77T 3 Belkic,Dz. Gayet,R.
J. Phys. B 10 (1977) 1923-1932
Charge exchange in fast collisions of H^+ and He^{2+} with helium
$H^+ + He(1s^2) \rightarrow H(1s, 2s, 2p, 3s, 3p, 3d, 4s) + He^+(1s)$;
$He^{2+} + He(1s^2) \rightarrow He^+ + He^+(1s)$
CDW
25 - 10×10^3 keV/amu

77T 4 Belkic,Dz. McCarroll,R.
J. Phys. B 10 (1977) 1933-1943
Projectile charge dependence of electron capture cross sections
$A^{z+} + H \rightarrow A^{(z-1)+} + H^+$ (z = 1, 2, 4, 6, 8, 10, 20, 30) ;
$F^{9+} + H \rightarrow F^{8+}(nl) + H^+$
CDW
500 - 5×10^3 keV/amu

77T 5 Bottcher,C.
J. Phys. B 10 (1977) L213-217
Charge transfer to highly stripped ions from hydrogen atoms
$A^{z+} + H(1s, 2s) \rightarrow A^{(z-1)+}(nl) + H^+$ (z=2-18)
0 - 225 keV/amu
only total cross sections given

77T 6 Bulter,S.E. Guberman,S.L. Dalgarno,A.
Phys. Rev. A 16 (1977) 500-507
Radiative charge transfer between H and C^{2+}, C^{3+} and N^{2+}
$C^{2+}, C^{3+}, N^{2+} + H \rightarrow C^+, C^{2+}, N^+ + H^+ + h\nu$
ab initio calculation
10 - 10^5 (K)

77T 7 Christensen,R.B. Watson,W.D. Blint,R.J.
Astrophys. J. 213 (1977) 712-715
Calculation of the cross section for N IV - H charge-exchange; significance for the intercloud gas
$N^{3+} + H \rightarrow N^{2+} + H^+$
OBK, Landau-Zener approximation
1×10^{-6} - 5×10^{-4} keV/amu

77T 8 Dewangan,D.P.
J. Phys. B 10 (1977) 1083
Electron capture in high-energy approximation
$H^+ + H(1s) \rightarrow H(1s, 2s, 2p_x, 2p_z) + H^+$
eikonal approximation
40 - 5000 keV/amu

77T 9 Harel,C. Salin,A.
J. Phys. B. 10 (1977) 3511-3522
Charge exchange in collisions of highly ionized ions and atoms
$A^{q+} + H \rightarrow A^{(q-1)}(nl) + H^+$ ($A^{q+} = O^{8+}, B^{5+}, Be^{4+}$)
Impact parameter
0.25 - 25 keV/amu

77T10 Koyama,K. Ohtsuki,Y.H.
Phys. Rev. B 15 (1977) 61-63
Theory of radiative electron capture by channeled ions
O^{8+} + Ag(single crystal) -> $O^{7+}(1s) + h\nu + Ag^+$
statistical model
100 - 4000 keV/amu

77T11 Lapicki,G. Losonsky,W.
Phys. Rev. A 15 (1977) 896-905
Electron capture from innershells by fully stripped ions
$A^{z+} + B \rightarrow A^{(z-1)+} + B^+(1s^{-1})$
scaling law

77T12 Msezane,A.Z.
Phys. Letters 59A (1977) 435-437
Electron capture by completely stripped positive ions in collisions with atomis hydrogen
$A^{z+} + H \rightarrow A^{(z-1)+} + H^+$
semiclassical impact parameter method

77T13 Olson,R.E. Salop,A.
Phys. Rev. A 16 (1977) 531-541
Charge transfer and impact-ionization cross sections for fully and partially stripped positive ions colliding with atomic hydrogen
$A^{q+} + H \rightarrow A^{(q-1)+} + H^+$; $A^{q+} + H^+ + e$ ($A^{q+} = H^+$, He^{2+}, Li^{3+}, Be^{4+}, B^{3+-5+}, C^{3+-6+}, N^{3+-7+}, O^{3+-8+}, Ne^{10+}, Si^{14+}, Ar^{18+}, Fe^{26+}, Kr^{36+})
CTMC
37.5 - 200 keV/amu
total cross sections

77T14 Piacentini,R.D. Salin,A.
J. Phys. B 10 (1977) 1515-1522
Molecular treatment of He^{2+} - H collisons II
$He^{2+} + H \rightarrow He^+ + H^+$; $He^+(2s)$
PSS (MO)
0.25 - 12.5 keV/amu

77T15 Salop,A. Olson,R.E.
Phys. Rev. A 16 (1977) 1811-1916
Electron removal from atomic hydrogen by collisions with fully stripped carbon
$C^{6+} + H(1s) \rightarrow C^{5+} + H^+$; $C^{6+} + H^+ + e$
PSS (low energies), CTMC (high energy)
0.05 - 500 keV/amu

77T16 Shipsey,E.J. Brown,J.C. Olson,R.E.
Phys. Rev. A 15 (1977) 2166-2172
Theoretical charge-exchange total cross sections for B^{+3} + He and C^{+4} + He collisions
$C^{4+} + He \rightarrow C^{3+} + He^+$, $C^{2+} + He^{2+}$; $B^{3+} + He \rightarrow B^{2+} + He$
Impact-parameter classical-coupled equation
0.25 - 25 keV/amu

77T17 Vaaben,J. Briggs,J.S.
J. Phys. B 10 (1977) L521-526
Charge transfer in C^{6+} - H(1s) collisions at low velocity
C^{6+} + H(1s) -> C^{5+} + H^+
MO basis calculation
0.05 - 5 keV/amu

78T 1 Abramov,U.A. Baryshnikov,F.F. Lisita,V.S.
JETP Letters 27 (1978) 464-467
Change of intensity of spectral lines of multiply charged ions as a result of charge exchange with atomic hydrogen
O^{8+} + H -> O^{7+} (nl)
Analytic expression of l-distribution for slow and fast collisions, no cross section but distribution.

78T 2 Banyard,K.E. Moore,J.C.
J. Phys. B 11 (1978) 3899
Electron capture from H^- by fast alpha particles
He^{2+} + $H^-(1s^2)$ -> He^+(nl) + H(n'l') (n,n' ≤ 2) ;
μ^+ + $H^-(1s^2)$ ->$(\mu e)(1s)$ + H(n'l')
CDW
25- 2000 (He^{2+}), 90 - 9000 (μ^+) keV/amu

78T 3 Golden,J.E. McGuire,J H. Omidvar,K.
Phys. Rev. A 18 (1978) 2373
Electron capture from atomic hydrogen into excited n, l levels of projectiles with Z_1; I
p + H -> H(nlm) + p ; He^{2+} + H -> He^+(nlm) + p ;
Be^{4+} + H -> Be^{3+}(nlm) + p ; O^{8+} + H -> O^{7+}(nlm) + p
full Born (Jackson-Schiff) ; BK
100, 200 keV/amu

78T 4 Grozdanov,T.P. Janev,R.K.
Phys. Letters 66A (1978) 191-194
One-electron capture in slow collisions of highly charged ions with atoms
$Ar^{6+,7+}$ + He, Ar -> $Ar^{5+,6+}$
tunnelling model
0.05 - 5 keV/amu
Preferential n-values as a function of q and of targets. dependence on target ionization energy

78T 5 Grozdanov,T.P. Janev,R.K.
Phys. Rev. A 17 (1978) 880-888
Charge-exchange collisions of multiply charged ions with atoms
A^{z+} + B -> $A^{(z-1)+}$ + B^+ (z = 5-40; B = H, Li, Na, K, Rb, Cs)
tunnelling model
0.002 - 500 keV/amu

78T 6 Lee,C.M.
Phys. Rev. A 17 (1978) 566-569
Radiative charge exchange process in high energy ion-atom collisions
U^{36+} + B -> U^{35+} + hν + B^+ (B = N, Ne, Ar, Kr);
U^{q+} + Ne -> $U^{(q-1)+}$ + hν + Ne^+ (q = 2, 36, 92)
IA
$1x10^4$ - $3x10^5$ keV/amu

78T 7 Lin,C.D.
J. Phys. B 11 (1978) L185-190
Electron capture for ion-atom collisions at intermediate energies
A^{z+} + B -> $A^{(z-1)+}$ + $B^+(1s^{-1})$ (A = C, N, O, F, Cl ;

B = Ne, Ar, Kr)
two-state two-center AO
1000 - 4500 keV/amu
K-K transfer

78T 8 Lin,C.D. Soong,S.C. Tunnell,L.N.
Phys. Rev. A 17 (1978) 1646-1654
Two-state atomic expansion methods for electron capture from multielectron atoms by fast protons
$H^+ + B \rightarrow H + B^+$ (B = C, N, O, Ne, Ar)
Two-state atomic expansion
200 - 12000 keV/amu

78T 9 Moore,J.C. Banyard,K.E.
J. Phys. B 11 (1978) 1613
Continuum-distorted-wave calculations for electron capture from hydrogen negative ions by fast protons
$H^+ + H^-(1s^2) \rightarrow H(nl) + H(n'l')$ $(n, n' \leq 2)$
CDW
5 - 2000 keV/amu

78T10 Morrison,H.G. Opik,U.
J. Phys. B 11 (1978) 473-492
An impact-parameter method for heavy-particle collisions involving one electron I. Theory and sample results on $H^+ - H$ and $He^{2+} - H$ collisions
$H^+ + H \rightarrow H(2s, 2p) + H^+$; $He^{++} + H \rightarrow He^+$
modified close-coupling
8, 25, 49, 60 (H^++H), 10, 18.33 (He^{++}+H) keV/amu

78T11 Olson,R.E.
Phys. Rev. A 18 (1978) 2464-2469
Electron-capture and impact-ionization cross sections for multiply charged ions colliding with helium
$H^+, He^{2+}, Li^{3+}, Be^{4+}, B^{5+}, C^{6+}, N^{7+}, O^{8}, + He \rightarrow$
$H^0, He^+, Li^{2+}, Be^{3+}, B^{4+}, C^{5+}, N^{6+}, O^{7+} + He^+$
CTMC
100 - 500 keV/amu

78T12 Olson,R.E. Shipsey,E.J. Browne,J.C.
J. Phys. B 11 (1978) 699-708
Charge transfer cross sections for B^{3+}, C^{4+} + H collisions
$B^{3+}, C^{4+} + H \rightarrow B^{2+}, C^{3+} + H^+$
impact parameter PSS
0.05 - 5 keV/amu
total cross section, C^{4+} nearly constant, B^{3+} oscillatory

78T13 Ryufuku,H. Watanabe,T.
Phys. Rev. A 18 (1978) 2005-2015
Charge transfer in collisions of atomic hydrogen with O^{8+}, He^{2+} and H^+
$H^+, He^{2+}, O^{8+} + H \rightarrow H^0, He^+, O^{7+} + H^+$
UDWA, absorption model, DWBA
0.025 - 200 keV/amu
total cross section

78T14 Shakeshaft,R. Spruch,L.
J. Phys. B 11 (1978) L457-463
Possibility of observing the second Born contribution to electron capture at high impact velocities
$A^{z+} + B^{(z-1)+} \rightarrow A^{(z-1)+}$
second Born approximation

$2.5x10^4$ - $8x10^4$ keV/amu

78T15 Shevelko,V.P.
Z. Phys. A 287 (1978) 19-26
One-electron capture in collisions of fast ions with atoms
H^+ + Cs, Cd, Ar -> H(nl) ; F^{7+} + Ar -> F^{6+}(nl) ;
$O^{3+,5+,8+}$ + He, N -> $O^{2+,5+,7+}$
Born approximation + close-coupling at low energies
1 - $5x10^4$ keV/amu
analytic expression

78T16 Shipsey,E.J. Redman,L.T. Browne,J.C. Olson,R.E.
Phys. Rev. A 18 (1978) 1961-1966
Electron-capture and ionization cross sections for collisions of He^{2+} with Li ; production of He^+(3l) at low velocities
He^{2+} + Li -> He^++ Li^+
PSS (low E), CTMC (high E)
0.05 - 500 keV/amu
preferential capture to He^+(3l); total cross sections

78T17 Sidis,V. Kubach,C.
J. Phys. B 11 (1978) 2687-2703
Theoretical study of the elastic and charge exchange processes in H^+ + Cs collisions
H^+ + Cs -> H^0 (total, 2s, 2p)
CC
0.05 - 4.0 keV/amu

78T18 Winter,T.G. Lane,N.F.
Phys. Rev. A 17 (1978) 66-79
Electron transfer in collisions of He^{++} ions with H atoms at $^4He^{++}$ impact energies of 0.1-20.0 keV
He^{2+} + H -> He^+
PSS (20 MO)
$2.5x10^{-2}$ - 5 keV/amu

79T 1 Abramov,V.A. Baryshnikov,F.F. Lisita,V.S.
Sov. Phys. -JETP 47 (1979) 469-477
Charge transfer between hydrogen atoms and the nuclei of multicharged ions with allowance for the degeneracy of the final states
C^{6+}, O^{8+} + H -> C^{5+}, O^{7+}
Landau-Zener model with rotation of nuclear axis
total cross section; valid in $v<1$

79T 2 Banyard,K.E. Shirtcliffe,G.W.
J. Phys. B 12 (1979) 3247-3256
Electron capture from lithium and its ions by high-energy protons
H^+ + Li -> H(nl) + Li^+ (1^1S, 2^1S, 2^3S) ($n \leq 2$)
CDW
200 - 10000 keV/amu

79T 3 Bardsley,J.N. Cohen,J.S. Wadera,I.M.
Phys. Rev. A 19 (1979) 2129-2130
Resonant contributions to single charge transfer between He^{2+} and He
He^{2+} + He -> He^+ + He^+ + $h\nu$
quantum and JWKB
10^{-7} - 10^{-2} keV/amu

79T 4 Becker,R.L. Mackellar,A.D.
J. Phys. B 12 (1979) L345-350
Classical four-body calculations of He^+ + H and H + H collisions

$He^+ + H \rightarrow He^0$
four-body CTMC
9 - 250 keV/amu

79T 5 Briggs,J.S. Taulbjerg,K.
J. Phys. B 12 (1979) 2565-2573
Charge transfer by a double-scattering mechanism involving target electrons
$H^+ + He(1s^2) \rightarrow H(1s) + He^{2+} + e$
quantum mechanical description of Thomas peak
asymptotic forms (v^{-11} a.u)

79T 6 Butler,S.E. Bender,C.F. Dalgarno,A.
Astrophys. J. 230 (1979) L59-61
Charge transfer of O^{2+} and Ne^{2+} with H
$O^{2+}, Ne^{2+} + H \rightarrow O^+, Ne^+ + H^+$
Landau-Zener
10^{-5} keV/amu
Thermal energy; rate coefficient

79T 7 Butler,S.E. Dalgarno,A.
Astrophys. J. 234 (1979) 765-767
Charge transfer between N^+ and H
$N^+ + H \rightarrow N + H^+$
quantal distorted wave approximation
10^{-5} - 10^{-2} keV/amu
rate coefficient

79T 8 Chan,F.T. Eichler,J.
Phys. Rev. Letters 42 (1979) 58-61
Approximation scheme for electron capture into arbitrary principal shells of energetic bare projectiles
$A^{z+} + H \rightarrow A^{(z-1)+}(n) + H^+$
eikonal approximation
500 - 5000 keV/amu
analytic expression for any n, normalized to OBK

79T 9 Chan,F.T. Eichler,J.
Phys. Rev. A 20 (1979) 1841-1847
Electron capture into arbitrary n, l levels of fast projectiles
$O^{8+} + He \rightarrow O^{7+}(nl) + He^+$; $O^{8+} + H \rightarrow O^{7+}(nl) + H^+$;
$H^+ + H(1s) \rightarrow H(nl) + H^+$; $H^+ + He \rightarrow H(nl) + He^+$
eikonal-Brinkman-Kramers
100 (O^{8+}), 30 - 1000 (H^+) keV/amu

79T10 Chan,F.T. Eichler,J.
J. Phys. B 12 (1979) L305-308
Charge exchange between H(2s) and enegetic projectiles
$A^{z+} + H(2s) \rightarrow A^{(z-1)+} + H^+$
eikonal approximation
10 - 1000 keV/amu

79T11 Duman,E.L. Menshikov,L.I.
Sov. Phys.-Dokl. 24 (1979) 116-117
Radiative capture of an electron of a traget atom by multiply charged ions
analytic cross sections

79T12 Duman,E.L. Menshikov,L.I. Smirnov,B.M.
Sov. Phys.-JETP 49 (1979) 260-266
Destruction of hydrogen atom by collisions with multiply charged ions

$A^{q+} + H \rightarrow A^{(q-1)+}(n,l) + H^+$; $A^{q+} + H^+ + e$ (A>>1)
perturbation theory
Analytic expressions for electron capture ($v<<e^2/h$) and ionization ($v>>Z^{1/2}e^2/h$) in some cases (high Z).

79T13 Duman,E.L. Smirnov,B.M.
Sov. Phys.-J. Plasma Phys. 4 (1979) 650-652
Charge exchange of hydrogen atoms with multiply charged ions
$A^{z+} + H \rightarrow A^{(z-1)+} + H^+$ (z = 4 - 30)
Tunneling model
1 - 10^2 keV/amu

79T14 Eichler,J. Chan,F.T.
Phys. Rev. A 20 (1979) 104-112
Approach to electron capture into arbitrary principal shells of energetic projectiles
$C^{6+} + H \rightarrow C^{5+}(n) + H^+$
eikonal approximation
50 - 500 keV/amu
Analytical expression scaled to OBK for any projectile-target combination.

79T15 Ford,A.L. Reading,J.F. Becker,R.L.
J. Phys. B 12 (1979) 2905-2912
Charge transfer and ionization in collosions of 2.5 to 9 MeV protons with argon
target-centered basis expansion method
2500 - 9000 keV/amu

79T16 Hatton,G.J. Lane,N.F. Winter,T.G.
J. Phys. B 12 (1979) L571-577
Charge transfer for He^{2+} on H using molecular bases with plane-wave translational factors
$He^{2+} + H \rightarrow He^+(2s) + H^+$
MO close-coupling witn plane-wave ETF
0.25 - 25 keV/amu

79T17 Kumar,A. Roy,B.N.
J. Phys. B 12 (1979) 2025-2030
Modified binary encounter calculations for electron capture from noble gas atoms by He^+ ions II
$He^+ + B \rightarrow He^0$ (B = He, Ne, Ar, Kr, Xe)
modified BEA
20 - 250 keV/amu

79T18 Lin,C.D.
Phys. Rev. A 19 (1979) 1510-1516
Double K-shell electron capture for ion-atom collisions at intermediate energies
$H^+ + He \rightarrow H^- + He^{2+}$; $He^{2+} + He \rightarrow He + He^{2+}$;
$A^{z+} + Ne \rightarrow A^{(z-2)+} + Ne^{2+}$ ($1s^{-2}$)
Two-state, Two-center AO
10 - 200 keV/amu (H), 50 - 250 keV/amu (He), 500 - 4000 keV/amu (F)

79T19 Lin,C.D. Tunnell,L.N.
J. Phys. B 12 (1979) L485-490
Subshell electron capture cross sections of argon atoms by protons
$H^+ + Ar \rightarrow H + Ar^+$ (nl^{-1}) (n = 2, 3)
two-sate AO close-coupling
2 - 10000 keV/amu

79T20 McCarroll,R. Valiron,P.
Astron. Astrophys. 78 (1979) 177-180
Charge exchange of N^{3+} ions with atomic hydrogen in the interstellar gas
$N^{3+} + H \rightarrow N^{2+} + H^+$
molecular model/Landau-Zener model
10^{-7} - $2x10^{-3}$ keV/amu

79T21 Moisewitsch,B.L. Stockman,S.G.
J. Phys. B 12 (1979) L591-595
Electron capture at relativistic energies
$H^+ + H(1s) \rightarrow H(1s) + H^+$
OBK with Dirac wave functions
100 - 1000000 keV/amu
total cross section with and without spin change

79T22 Moiseiwitsch,B.L. Stockman,S.G.
J. Phys. B 12 (1979) L695-698
Relativistic classical theory of electron capture
$H^+ + H(1s) \rightarrow H(1s) + H^+$
relativistic classical theory
10^5 - 10^7 keV/amu

79T23 Morrison,H.G. Opik,U.
J. Phys. B 12 (1979) L685-688
Excitation and charge transfer to the 2s and 2p states in H^+ - H collisions in the energy range 49 to 125keV
$H^+ + H \rightarrow H(2s, 2p) + H^+$
modified close-coupling
49 - 125 keV/amu

79T24 Mukherjee,S. Sil,N.C. Basu,D.
J. Phys. B 12 (1979) 1259-1265
Electron capture by protons from some hydrogen-like ions
$H^+ + He^+, Li^{2+} \rightarrow H + He^{2+}, Li^{3+}$
Coulomb-Born
5 - 1000 (H^+) keV/amu

79T25 Omidvar,K.
Phys. Rev. A 19 (1979) 65-71
Scaling of cross sections for K-shell capture by high energy protons and alpha-particles from the multi-electron atoms
$H^+, He^{2+} + B \rightarrow H^0, He^+ + B^+(1s^{-1})$ (B = H, He, Ar)
scaling law

79T26 Ray,P.P. Saha,B.C.
Phys. Letters 71A (1979) 415-419
Electron capture in $H^+ - H_2$ collisions
$H^+ + H_2 \rightarrow H^0$
first Born approximation
50 - 5000 keV/amu

79T27 Reading,J.F. Ford,A.L. Swafford,G.L. Fritchard,A.
Phys. Rev. A 20 (1979) 130-144
Innershell charge transfer in asymmetric ion-atom collisions
$A^{z+} + Cu \rightarrow A^{(z-1)+} + Cu^+(1s^{-1}, 2l^{-1})$ (A = He, C, O)
HF
6000 keV/amu

79T28 Roy,A. Ghosh,A.S.
J. Phys. B 12 (1979) 99-104

The capture of electrons by fast protons from hydrogen atoms
$H^+ + H \rightarrow H(1s, 2s, 2p) + H^+$
fixed scatterer approximation (frozen target-second Born)
30 - 2000 keV/amu

79T29 Roy,B.N. Rai,D.K.
J. Phys. B 12 (1979) 2015-2030
Modified binary-encounter calculations for electron capture from noble-gas atoms by protons I
$H^+ + B \rightarrow H^0$ (B = He, Ne, Ar, Kr, Xe)
modified BEA
10 - 500 keV/amu

79T30 Ryufuku,H. Watanabe,T.
Phys. Rev. A 19 (1979) 1538-1549
Charge transfer cross sections for collisions of Li^+, Be^{4+}, and C^{6+} ions with atomic hydrogen
Li^{3+}, Be^{4+}, B^{5+}, $C^{6+} + H \rightarrow Li^{2+}$, Be^{3+}, B^{4+}, C^{5+}
UDWA
0.025 - 2000 keV/amu
total cross sections

79T31 Ryufuku,H. Watanabe,T.
Phys. Rev. A 20 (1979) 1828-1837
Total and partial cross sections for charge transfer in collisions of multicharged ions with atomic hydrogen
Ne^{10+}, Si^{14+}, Ca^{20+}, $C^{6+} + H \rightarrow Ne^{9+}$, Si^{13+}, Ca^{19+}, $C^{5+} + H^+$
UDWA
0.025 - 2000 (Ne^{10+}), 0.025 - 5000 (Si^{14+}), 0.1 - 10 (Ca^{20+}) keV/amu
also H^+, He^{2+}, Li^{3+}, Be^{4+}, B^{5+}, C^{6+}, O^{8+}

79T32 Salop,A.
J. Phys. B 12 (1979) 919-928
The distribution of excitation resulting from electron capture in stripped-ion-hydrogen-atom collisions
C^{6+}, O^{8+}, $B^{5+} + H \rightarrow C^{5+}(nl)$, $O^{7+}(nl)$, $B^{4+}(nl) + H^+$
CTMC
25 - 72 keV/amu
no cross section

79T33 Salop,A. Olson,R.E.
Phys. Letters 71A (1979) 407-410
Electron removal from atomic hydrogen by collisions with fully stripped iron ions
$Fe^{26+} + H \rightarrow Fe^{25+} + H^+$; $Fe^{26+} + H^+ + e$
PSS (low energies); CTMC (high energies)
0 35 - 535 keV/amu

79T34 Salop,A. Olson,R.E.
Phys. Rev. A 19 (1979) 1921-1929
Electron removal from atomic hydrogen by collisions with fully stripped oxygen ions
$O^{8+} + H \rightarrow O^{7+} + H^+$; $O^{8+} + H^+ + e$
impact parameter PSS (low energies); CTMC (high enegies)
0.06 - 300 keV/amu

79T35 Shakeshaft,R.
Phys. Rev. A 20 (1979) 779-786
Relativistic effects in electron capture from a hydrogenlike atom by a fast-moving bare ion
H^+, $Ne^{10+} + H \rightarrow H(1s)$, $Ne^{9+}(1s)$

first Born with relativistic correction, Thomas model at relativistic energy
10000 - 10000000 keV/amu
Thomas peak - E^{-3}, first Born - E^{-1}, REC - E^{-1}

79T36 Sinha,C. Mukherjee,S. Sil,N.C.
J. Phys. B 12 (1979) 1391-1397
Electron capture in an arbitrary excited S state by protons passing through hydrogenic ions
$H^+ + X^{z+} \rightarrow H(ns) + X^{(z-1)+}$ (X^{z+} = He^+, Li^{2+}, C^{5+} , n=2, 3, 4, 6, ∞)
Coulomb-Born
50 - 400

79T37 Spruch,L. Shakeshaft,R.
Phys. Rev. A 19 (1979) 1023-1028
Classical cross section for charge transfer via "knock-on" capture from high Rydberg states at asymptotically high impact velocities
$A^{z+} + B^{(z-1)+}(1s) \rightarrow A^{(z-1)+} + B^{z+}$

79T38 Theisen,T.C. McGuire,J.H.
Phys. Rev. A 20 (1979) 1406-1408
Single and double electron capture in the independent electron approximation at high velocities
$He^{2+} + He \rightarrow He^+, He^{0+}$
Independent electron model with Bates-Born theory
25 - 250 keV/amu

79T39 Watson,W.D. Christensen,R.B.
Astrophys. J. 231 (1979) 627-631
Quantal calcualtions for charge transfer in collisions of C^{3+} and N^{3+} with H atoms
$A^{3+} + H \rightarrow A^{2+} + H^+$ (A = C, N)
quantal calculation/Landau-Zener model
10^{-6} - 10^{-2} keV/amu

80T 1 Amundsen,P.A. Jakubassa,D.H.
J. Phys. B 13 (1980) L467-472
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.

80T 2 Banyard,K.E. Shirtcliffe,G.W.
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

80T 3 Becker,R.L. Ford,A.L. Reading,J.F.
J. Phys. B 13 (1980) 4059-4077
Contributions of multi-electron processes to innershell charge transfer and vacancy production; projectile charge dependence in collisions of bare nuclei with argon
$He^{2+}, C^{6+} + Ar \rightarrow He^+, C^{5+} + Ar^+(1s^{-1})$
CC
1000 - 5000 keV/amu
Z_p-scaling

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

80T 5 Briggs,J S. Dube,L.
J. Phys. B 13 (1980) 771-784
The second Born approximation to the electron transfer cross section
A^{z1+} + $B^{(z2-1)+}(n'l'm')$ -> $A^{(z1-1)+}(nlm)$ + B^{z2+}
second Born (approximate)

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
$5x10^{3}$ - $5x10^{4}$ (K)
rate coefficient

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 -> $A^{(q-1)+}$ + 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} - $4x10^{-3}$ keV/amu
rate coefficients

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^{+} + $O(^3P_2)$ -> H^{0} + O^{+} ($^4S_{3/2}$)
CC
10 - 1000 K

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
$2.5x10^{-3}$ - 25 (Zn^{2+}, Cd^{2+}), 0.25 - $2.5x10^{3}$ (B^{2+}), 400 - 1225 (Mg), 0 - 25 (C^{6+}) keV/amu

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

80T11 Datta,S. Mukherjee,S.C.
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

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.

80T13 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 -> $A^{(z-1)+}$ + H^{+} (z = 8, 10, 14, 18, 26, 36)
classical over-barrier model
0.5 - 100 keV/amu
total cross sections

80T14 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
$Kr^{4+->7+}$ + H_2 -> $Kr^{3+->6+}$
tunnelling model
0.012 - 0.24 keV/amu
total cross section

80T15 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

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

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

80T18 Jakubassa-Amundsen,D.H. Amundsen,P.A.
Z. Phys. A 298 (1980) 13-19
Charge transfer in heavy ion collisions at relativistic velocities

impulse approximation

80T19 Lapicki,G. McDaniel,F.D.
Phys. Rev. A 22 (1980) 1896-1905
Electron capture from K shell by fully stripped ions
modified OBK with corrections
scaling law

80T20 Lin,C.D. Tunnell,L.N.
Phys. Rev. A 22 (1980) 76-85
Improved atomic model for charge transfer in multielectron ion-atom collisions at intermediate energies
$H^+ + Ar \rightarrow H^0(1s) + Ar^+(1s^{-1})$; $H^+ + Ne, Kr \rightarrow H(1s) + Ne^+(2s^{-1}, 2p^{-1}), Kr^+(4s^{-1}, 4p^{-1})$; $F^{q+} + Ar \rightarrow F^{8+}(1s) + Ar^+(1s^{-1})$
Two-center AO expansion method
1 - 200 keV/amu (H); 1000 - 24000 keV/amu (F)

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
$H^+ + B^{(z-1)+}(1s) \rightarrow H(1s)$ (B = Ne, Ca)
second Born approximation
2500 - 10000 keV/amu

80T22 McCarroll,R. Valiron,P.
Electric and Atomic Collisions (North-Holland) (1980) 453- 456
Thermal charge exchange reaction with multicharged ions of astrophysical interest; application to the N^{3+} - H system
$N^{3+} + H \rightarrow N^{2+} + H^+$
quantal calculation/Landau-Zener model
10^{-7} - 10^{-3} keV/amu

80T23 Moiseiwitsch,B.L. Stockman,S.G.
J. Phys. B 13 (1980) 2975-2981
Electron capture by charged particles at relativistic energies
$H^+, Ne^{10+} + H(1s) \rightarrow H(1s), Ne^{9+}(1s) + H^+$
OBK with Dirac wave function
10000 - 10000000 keV/amu
analytic expression

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
$A^{z+} + B^{(z-1)+}(1s) \rightarrow A^{(z-1)+}(1s)$ (A = H, Ne, Ar; B = H, Cu)
relativistic OBK
$1x10^6$ - $1x10^{37}$ keV/amu

80T25 Mukherjee,S. Sil,N.C.
J. Phys. B 13 (1980) 3421-3430
Ion-ion capture collisions in continuum distorted-wave approximation
$H^+ + He^+, Li^{2+}, Be^{3+}, C^{5+} \rightarrow H(1s, 2s) + He^+, Li^{3+}, Be^{4+}, C^{6+}$
CDW
400 - 2000 keV/amu

80T26 Olson,R.E.
J. Phys. B 13 (1980) 483-492
Ion-Rydberg atom collisions cross sections
$A^{q+} + B^{(z-1)+}(n) \rightarrow A^{(q-1)+}(n^*) + B^{Z+}$ (q=1, 2, 5, 10 ; n=1, 2, 5, 10, 20)
CTMC

80T27 Reading,J.F. Ford,A.L.
Phys. Rev. A 21 (1980) 124
K-shell hole production, multiple hole production, charge transfer and antisymmetry

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
$H^+ + He(1s^2) \rightarrow H(1s) + He^+(1s)$
CDW
293 keV/amu

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
$H^+ + H(1s) \rightarrow H(nlm) + H^+$
Born approx.; distorted-wave (Bassel-Gerjuoy) approx.;
time-dependent two-state(Band) approx.
25 - 4000 keV/amu

80T30 Ryufuku,H. Sasaki,K. Watanabe,T.
Phys. Rev. A 21 (1980) 745-750
Oscillatory behavior of charge transfer cross sections as a function of the charge of projectiles in low energy collisions
$A^{z+} + H \rightarrow A^{(z-1)+} + H^+$ ($A^{z+} = B^{2+}$-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

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
$H^+ + H \rightarrow H(3s) + H^+$, $He^{++} + H \rightarrow He^+(3s) + H^+$
Bates formula
25 - 800 (H^+), 6.25 - 200 (He^{++}) keV/amu

80T32 Shakeshaft,R.
Phys. Rev. Letters 44 (1980) 442-444
Innershell electron capture by a swift bare ion; second Born effects
$A^{z+} + B^{(z-1)+} \rightarrow A^{(z-1)+} + B^{z+}$
second Born approximation
Second and higher-order Born terms needed for innershell electron capture.

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
$He^{2+} + H \rightarrow He^+(nl) + H^+$
CC (3,4,10 MO) with ETF
0.25 - 17.5

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

81T 2 Bransden,B.H. Ermolaev,A.M.
Phys. Lett. 84A (1981) 316-318
Charge exchange in He^{++} - Li collisions
He^{2+} + Li -> $He^{+}(n)$ + Li^{+}
CC (2-AO)
1.25 - 16.0 keV/amu

81T 3 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^{+} -> H + He^{2+}; He^{2+} + H -> He^{+} + H
Impact parameter
0.5 - 50 keV/amu

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) -> $A^{(z-1)+}$(nlm)

81T 5 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 -> O^{7+}(n=2);
C^{6+} + He -> C^{5+}(n=2)
modified OBK
50 - 400 keV/amu

81T 6 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 -> Li^{2+}(nl) + H^{+}
impact parameter molecular approximation
1 - 5.7 keV/amu

81T 7 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

81T 8 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

81T 9 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

81T10 Devi,K.R.S. Koonin,S.E.
Phys. Rev. Letters 47 (1981) 27-30
Mean-field approximation to P + He scattering
$H^+ + He \rightarrow H^0$
time-dependent Hartree-Fock method
4 - 100 keV/amu

81T11 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
$A^{z+} + B^{(z-1)+}(nlm) \rightarrow A^{(z-1)+}(n'l'm')$
first and second Born approximations
25 - 10000 keV/amu

81T12 Eichler,J.
Phys. Rev. A 23 (1981) 498-509
Eikonal theory of charge exchange between arbitrary hydrogenic states of target and projectile
$A^{z+} + H(nl) \rightarrow A^{(z-1)+}(n'l') + H^+$ (A = H, He, Li, B, C, Fe)
eikonal approximation
10 - 3000 keV/amu

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

81T14 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)

81T15 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

81T16 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)

81T17 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

81T18 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

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

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, $O_2 \rightarrow H$; He^{2+} + He, C $\rightarrow He^{+}$;
Li^{3+} + C, Ne $\rightarrow Li^{2+}$
eikonal approximation
500 - 10000 keV/amu

81T21 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
$A^{z+} + B^{(z-1)+}(nlm) \rightarrow A^{(z-1)+}(n'l'm') + B^{z+}$
Eikonal, OBK
20 - 200 keV/amu

81T22 Jakubassa-Amundsen,D.H.
J. Phys. B 14 (1981) 2647-2656
Semiclassical impulse approximation for L-shell electron capture in asymmetric heavy ion collisions
$H^{+} + B \rightarrow H + B^{+}(2l^{-1})$ (B = Ne, Ar)
semiclassical impulse approximation
50 - 4000 keV/amu
capture probability

81T23 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
$H^{+} + H(1s) \rightarrow H(2s, 2p) + H^{+}$
MO with ETF
1 - 7 keV/amu

81T24 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
$He^{2+} + H(1s) \rightarrow He^{+}$(total, 2l); $H^{+} + He^{+}(1s) \rightarrow H(1s; n=2)$
CC
0.25 - 5 keV/amu

81T25 Kubach,C. Sidis,V.

Phys. Rev. A 23 (1981) 110-118
Theoretical study of near-resonant charge exchange collisions of H^+ with alkali atoms
$H^+ + B \rightarrow H^0(2s+2p)$ (B = Rb, K, Na)
CC
0.2 - 6 keV/amu

81T26 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
$H^+ + H \rightarrow H(total, 2s, 2p) + H^+$
numerical solution of time-dependent Schroedinger equation
2 - 8 keV/amu

81T27 Macek,J. Taulbjerg,K.
Phys. Rev. Letters 46 (1981) 170-174
Correction to Zp/Zt expansions for electron capture
$H^+ + Ar \rightarrow H^0 + Ar^+(1s^{-1})$
second Born approximation
2000 - 15000 keV/amu

81T28 Macias,A. Riera,A. Yonez,M.
Phys. Rev. A 23 (1981) 2941-2949
Molecular treatment of He^{2+} + H collisions
$He^+(1s) + H(1s) \rightarrow He(1s2p, {}^{1,3}P)$
MO with IP
0.125 - 7.25 keV/amu

81T29 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
$Li^{3+} + H \rightarrow Li^{2+}(1s, 2s, 2p, 3s, 3p, 3d) + H^+$
Coulomb-Born, Born
14.4 - 288 keV/amu

81T30 Olson,R.E.
Phys. Rev. A 24 (1981) 1726-1733
n, l distribution in A^{q+} + H electron-capture collisions
$Z^{z+} + H \rightarrow Z^{(z-1)+} + H^+$ (Z = 1-20)
CTMC
50, 100 keV/amu

81T31 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
$A^{z+} + H \rightarrow A^{(z-1)+}(nl) + H^+$ (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.

81T32 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
$Li^+ + Li \rightarrow Li(2s) + Li^+$
MO with ETF
0.015 - 0.14 keV/amu

differential in angle

81T33 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

81T34 Sidis,V. Kubach,C. Fussen,D.
Phys. Rev. Letters 47 (1981) 1280-1284
Developments in the H^+ + H^- problem
H^+ + H^- -> $H^0(n)$ + H^0
IPM
0 02 - 10 keV/amu

81T35 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 -> H(2s+2p) (B = Cs, Rb, K, Na)
CC
0.013-0.3 keV/amu

81T36 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) -> H(1s)
second Born approximation
10000, 50000 keV/amu
angular differential cross section

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

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
$1.0x10^{-4}$ - 0.1 keV/amu
total cross section

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

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

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

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

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

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+} ($n \leq 3$)
two-state AO close-coupling
4.5 - 75 keV/amu

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

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^+ ($n \leq 3$);
Li^{3+} + H(1s) -> Li^{2+}(nl) + H^+ ($n \leq 4$)
perturbed one-and-a-half center
70, 86 - 400 keV/amu

82T11 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

82T12 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
$H^+ + H \rightarrow H(2s, 2p)$
AO
1 - 20 keV/amu

82T13 Fritsch,W. Lin,C.D.
J. Phys. B 15 (1982) 1255-1268
Close-coupling calculations for inelastic processes in intermediate energy ion-atom collisions
$H^+ + A^{(z-1)+} \rightarrow H + A^{z+}$ (A = H, He)
two-center atomic orbital expansion method
1.5 - 100 keV/amu

82T14 Fritsch,W. Lin,C.D.
J. Phys. B 15 (1982) L281-288
Electron transfer in Li^{3+} + H collisions at low and intermediate energies
$Li^{3+} + H \rightarrow Li^{2+}(nl) + H^+$ ($n \leq 3$)
AO close-coupling
0.2 - 20 keV/amu

82T15 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
$C^{6+} + H(1s) \rightarrow C^{5+}$
Landau-Zener + close-coupling
3×10^{-4} - 2×10^{-2} keV/amu
total cross section

82T16 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
$C^{6+} + H \rightarrow C^{5+}$
semiclassical approximation
3×10^{-3} - 1.3 keV/amu
total cross section

82T17 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 $C^{6+} + H(1s) \rightarrow C^{5+}(nl) + H^+$
$C^{6+} + H \rightarrow C^{5+}(nl) + H^+$
Close coupling; PSS (MO) with variationally optimized ETF
1×10^{-3} - 2.25 keV/amu

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
$H^+ + H(1s) \rightarrow H(nlm) + H^+$
optical eikonal approximation
25 - 125 keV/amu
angular differential for 1s->nlm capture

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

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

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

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) -> 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.

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^+ ($n \leq 3$)
pseudo state close-coupling
1 - 50 keV/amu

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^+ ($n \leq 3$);
Li^{3+},Be^{4+}, B^{5+} + H -> Li^{2+}, Be^{3+}, B^{4+} + H^+
pseudo state close-coupling
2 - 50 keV/amu

82T25 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+} + $B^{(z-1)+}$ -> $A^{(z-1)+}$ + B^{z+}
strong potential Born approximation

82T26 Moiseiwitsch,B.L.
J. Phys. B 15 (1982) 3103-3110
Second Born approximation for electron capture at ultrahigh relativistic impact energies
A^{z+} + $B^{(z-1)+}$ -> $A^{(z-1)+}$
relativistic second Born approximation
asymptotic formula (E^{-1})

82T27 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

82T28 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

82T29 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

82T30 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^+ ($n \leq 5$);
H^+ + He^+(1s, 2s, 2p) -> H(1s) + He^{2+}
perturbed one-and-a-half-center
75.5 (He^{2+}); 20 - 400 (H^+) keV/amu

82T31 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) -> H(1s) + H^+
CDW, second Born-Kramers approximations
10000; 50000 keV/amu

82T32 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 -> H^0, Li^{2+}, B^{4+}, C^{5+}, Si^{13+} + H^+
UDWA
0.01 - 5000 keV/amu

82T33 Salin,A.
Phys. Letters 91A (1982) 61-63
Charge exchange in Li^{3+} - H collisions
Li^{3+} + H -> Li^{2+} + H^+
OEDM
1.29 - 50 keV/amu
total cross section

82T34 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($1s^2$) -> H(1s)
second Born approximation
1000 - 100000 keV/amu
angular differential cross sections

82T35 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) -> He^{+}(1s) + H^{+} + hν
optical potential method
$1x10^{-4}$ - 1 keV/amu

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

83T 2 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

83T 3 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 N^{3+} + H -> N^{2+}(3s) + H^{+}
quasi-molecule with polarization force; no cross sections given

83T 4 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

83T 5 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

83T 6 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

83T 7 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

83T 8 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

83T 9 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

83T10 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

83T11 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

83T12 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 (4O-AO)
0.5 - 20 (H^{+}), 0.1 - 2.0 (He^{2+}) keV/amu

83T13 Fritsch,W. Lin,C.D.
Phys. Scripta T3 (1983) 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

83T14 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

83T15 Gorriz,M. Briggs,J.S. Alston,S.
J. Phys. B 16 (1983) L665-670
Strong potential Born theory of radiative electron capture
$Ne^{10+} + H \rightarrow Ne^{9+} + H^+ + h\nu$
strong potential Born approximation
5625 keV/amu

83T16 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
$Li^{3+} + H \rightarrow Li^{2+}$
finite difference method
1.5 keV/amu
P(b) dependent on magnetic substates (m=0, 1, 2)

83T17 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
$X^{q+} + H \rightarrow X^{(q-1)+} + H^+$; $X^{q+} + H^+ + e^-$ (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)

83T18 Harel,C. Salin,A.
J. Phys. B 16 (1983) 55-70
Application of OEDM orbitals to many electron systems; He^+ - H collisions
$He^+ + H(1s) \rightarrow He(1s^2, 1s2p)$
OEDM
0.19 - 7.5 keV/amu
total cross sections included

83T19 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

83T20 Janev,R.K.
Phys. Scripta T3 (1983) 208-221
Excited states created in charge transfer collisions between atoms and highly charged ions
$A^{z+} + H \rightarrow A^{(q-1)+}(n,l) + H^+$ (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

83T21 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

83T22 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
$A^{z+} + H \rightarrow A^{(z-1)+}(nl) + H^+$ (z = 5-54, A^{z+} fully stripped ion)
0.03 - 80 keV/amu
Multichannel Landau-Zener theory with rotational coupling included.

83T23 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
$C^{6+}, O^{8+} + H \rightarrow C^{5+}, O^{7+}$
strong coupling
0.25 - 4.0 keV/amu
total cross section

83T24 Kimura,M. Sato,H. Olson,R.E.
Phys. Rev. A 28 (1983) 2085-2090
Molecular treatment of charge transfer in Li^+ + Ca collisions
$Li^+ + Ca \rightarrow Li(2s, 2p) + Ca^+$
PSS with ETF
0.1 - 20 keV/amu

83T25 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
$Li^{3+}, Be^{4+}, B^{5+} + H \rightarrow Li^{2+}, Be^{3+}, B^{4+}$
MO switching function
1 - 15 keV/amu
total cross section

83T26 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
$H^+ + H \rightarrow H^0$ (1s, 2l)
time-dependent Schroedinger equation
1 - 2 keV/amu

83T27 Ludde,H.J. Dreizler,R.M.
J. Phys. B 16 (1983) 3971-3981
Method for the calculation of global probabilities for many electron systems
$He^{2+} + He \rightarrow He^+, He^0$
IP

83T28 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
$He^+(1s) + H(1s) \rightarrow He(1s2p\ ^{1,3}P)$
Impact parameter formalism
0.125 - 7.5 keV/amu

83T29 McCarroll,R. Valiron,P.
Phys. Scripta T3 (1983) 226-232
Charge exchange of highly charged ions at low energy
$C^{4+} + H \rightarrow C^{3+}(nl) + H^+$; $N^{3+} + H \rightarrow N^{2+}(nl) + H^+$
CC (MO)

$8x10^{-7}$ - $4x10^{-2}$ (C^{4+}); $7x10^{-7}$ - $3.5x10^{-2}$ (N^{3+}) keV/amu

83T30 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

83T31 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

83T32 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

83T33 Salin,A.
J. Phys. B 16 (1983) L661-664
Comments on adiabatic switching factors in slow atomic collisions

83T34 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

83T35 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

83T36 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

83T37 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

83T38 Tan,C.K. Lee,A.R.
J. Phys. B 16 (1983) 1445-1459
Electron capture into excited states of hydrogen
$H^+ + H \rightarrow H(n) + H^+$ ($n \leq 4$); $H^+ + He \rightarrow H(n) + He^+$ ($n \leq 5$)

83T39 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

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

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
$H^+ + Ni, C \rightarrow H^0$
strong potential Born approximation
3110 - 3200 keV/amu (Ni); 350 - 550 keV/amu (C)

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
$H^+ + C, Ni \rightarrow H(1s)$
strong-potential Born approximation
3×10^3 - 20×10^3 keV/amu
angular distribution

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
$Si^{q+} + Ar \rightarrow Si^{(q-1)+}, Si^{(q-2)+}, Si^{(q-3)+}$ (q=14, 13)
T. molecular model ; E. x-ray coincidence
4000 - 5450 keV/amu

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
$Li^+(1s^2)$, $Li^{2+}(1s)$, $Li^{3+} + H \rightarrow Li(1s^2, nl)$, $Li^+(1s, nl)$, $Li^{2+}(nl)$
continuum intermediate state approximation
28 - 1428 keV/amu

84T 6 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
$N^{3+} + H \rightarrow N^{2+}(nl,n'l'n''l'') + H^+$
CC (MO) with unitarized, multichannel distorted-wave approximation
0.278×10^{-3} - 5 keV/amu

84T 7 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

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

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

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

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

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

84T13 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

84T14 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)

84T15 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

84T16 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)

84T17 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

84T18 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

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

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^{5+}, O^{7+} (n, l)
semi-classical close-coupling with AO basis
4 - 25 keV/amu
partial cross section (n, l)

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

84T22 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
$Z^{z+} + H \rightarrow Z^{(z-1)+}(nl) + H^+$ (Z=2, 4-8)
CC (AO)
0.133 - 25 keV/amu

84T23 Gerrat,J.
Phys. Rev. A 30 (1984) 1643-1660
R-matrix theory of charge transfer
R-matrix theory
formalisms

84T24 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
$H^+ + H(2l) \rightarrow H(3l') + H^+$
continuum intermediate state approximation
25 - 1000 keV/amu
arbitrary (nlm)->(n'l'm')

84T25 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
$H^+ + H(1s)$, $C^{5+}(1s)$, $He(1s^2) \rightarrow H^0$
CDW
1000 - 200000 keV/amu

84T26 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
$C^{6+} + H(1s) \rightarrow C^{5+}(4l) + H^+$
MO with Stark mixing
0.05 - 20 keV/amu

84T27 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+}, $O^{6+}(1s^2) + H \rightarrow C^{3+}$, N^{4+}, $O^{5+} + H^+$
Molecular approximation
0.25 - 25 keV/amu
total cross section

84T28 Humphries,W.J. Moiseiwitsch,B.L.
J. Phys. B 17 (1984) 2655-2669
Relativistic second Born approximation for electron capture
$H^+ + H(1s) \rightarrow H(1s) + H^+$
relativistic second Born approximation
$1x10^3$ - $1x10^6$ keV/amu

84T29 Jakubassa-Amundsen,D.H. Hoppler,R. Betz,H.D.
J. Phys. B 17 (1984) 3943-3949
Radiative electron capture in fast ion-atom collisions
$S^{16+} + C \rightarrow S^{15+}(1s)$
E. x-ray spectroscopy; T. strong-potential Born approximation
3900 keV/amu

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
$H^+ + H(n) \rightarrow H(n) + H^+$ (n=10-50)
under-and over-barrier model
$10^{-5} - 10^{-2}$ keV/amu

84T31 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
$A^{q+} + H, He \rightarrow A^{(q-1)+} + H^+, He^+$; $A^{q+} + H^+, He^+ + e$
CTMC
50, 100 keV/amu
scaling for electron removal; total cross section

84T32 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 $\rightarrow A^{(q-1)+}(n)$
multichannel Landau-Zener
1xq/M keV/amu
total and partial(n) cross sections

84T33 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
$C^{4+} + He \rightarrow C^{3+}$, $C^{2+} + He$; $C^{6+} + He \rightarrow C^{5+}$, $C^{4+} + He$
PSS with ETF
20 keV/amu

84T34 Kocbach,L. Briggs,J.S.
J. Phys B 17 (1984) 3255-3270
Theory of electron capture by fast projectiles scattered through large angles
$H^+ + Ne \rightarrow H^0$
IP
200 - 550 keV/amu
capture probabilities as a function of scattering angle

84T35 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
$A^{6+} + H(1s) \rightarrow A^{5+}$ (A = Ar, Cr, Mg)
CC with ETF
0.015 - 4 keV/amu

84T36 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
$H^+ + H(1s), He(1s) \rightarrow H(1s)$; $H^+ + He^+(1s) \rightarrow H(1s)$
symmetric eikonal approximation
500 - 100000 keV/amu
K-K total and partial (in angle) cross sections

84T37 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
$A^{z+} + H \rightarrow A^{(z-1)+} + H^+$ (A = Be, B, C, N, O)
continuum-intermediate state approximation
47 - 1111 keV/amu
total cross sections

84T38 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
$Au^{q+} + He \rightarrow Au^{(q-1)+} + He^+$; $Au^{(q-1)+} + He^{2+} + e^-$ (q = 7-25)
CTMC
20 - 300 keV/amu
n-distribution

84T39 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
$H^+ + H, He \rightarrow H^0$
T. strong potential Born approximation; E. growth
2820 - 3000 keV/amu
H_2 instead of H in experiment; angular differential cross sections

84T40 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

84T41 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
$H^+ + H, He^+ \rightarrow H(2s, 2p) + H^+, He^{2+}$; $He^{2+} + H \rightarrow He^+$(total, 2s, 2p) + H^+
new impact-parameter method
25 (H^+), 19.4, 25, 41,7, 50 (He^{2+}) keV/amu

84T42 Olson,R.E. Kimura,M. Sato,H.
Phys. Rev. A 30 (1984) 1692-1696
Molecular-state cross section calculations for $H + Cs \rightarrow \leftarrow H^- + Cs^+$
$H + Cs(6s, 6p, 5d) \rightarrow H^- + Cs^+$
pseudo-potential molecular-structure calculation
0.1 - 10 keV/amu

84T43 Presnyakov,L.P. Uskov,D.B.
Sov. Phys. JETP 59 (1984) 515-522
Ionization and charge exchange in atom collision with multicharged ion
$A^{q+} + H \rightarrow A^{(q-1)+}(nl) + H^+$; $A^{q+} + H^+ + e$ ($q \geq 3$)
Keldysh quasi-classical method
10 - 400 keV/amu
analytic expression for (n, l) distribution

84T44 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 $N^{3+} + H \rightarrow N^{2+} + H^+$ reaction
$N^{3+} + H \rightarrow N^{2+}(3s) + H^+$

10^{-8} - 10^{-3} keV/amu
rich resonance

84T45 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

84T46 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

84T47 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 -> H^0
CDW
2820 - 7400 keV/amu

84T48 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 -> C^{5+}(4l) + H^+; O^{8+} + H -> O^{7+}(5l) + H^+;
Ne^{10+} + H -> Ne^{9+}(6l) + H^+
PSS
1 - 16 keV/amu

84T49 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) -> Li(2s) + Li^+; Li(2p) + Li^+
JWKB
0.07 - 0.14 keV/amu
angular distribution

84T50 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 -> H_2^+
IPM
0.75 - 3.75 keV/amu

84T51 Spruch,L. Shakeshaft,R.
Phys. Rev. A 29 (1984) 2283-2285
Simple heuristic derivation of some charge transfer probabilities at asymptotically high incident velocities

84T52 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 -> $He^{+}(n)$;
Li^{3+} + H, He, Li, Be, B, C, Ne, Na, Mg, K, Ar, Cs -> $Li^{2+}(n)$
Landau-Zener model
0.05 - 5.18 keV/amu

84T53 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 -> $A^{(q-1)+}$ + He^{+} (A = H^{+}, Li^{3+}, Be^{4+}, C^{6+}, O^{8+})
UDWA
.1 - 10^3 keV/amu
total cross section

84T54 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 -> $A^{(q-1)+}$ + H^{+} (A = He^{2+}, Li^{3+}, Be^{4+}, B^{5+}, C^{6+})
exponential UDWA
0.1 - 1000 keV/amu
total cross section

84T55 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

84T56 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

84T57 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

84T58 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

84T59 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

85T 1 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

85T 2 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

85T 3 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

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

85T 5 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

85T 6 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

85T 7 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

85T 8 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

85T 9 Crothers,D.S.F.

J. Phys. B 18 (1985) 2893-2906
Second-order continuum-distorted-wave double scattering nlm transitions
$A^{z+} + B^{(z-1)+}(1s) \rightarrow A^{(z-1)+}(nlm)$
second-order CDW double scattering

85T10 Crothers,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
$H^+ + H(1s) \rightarrow H(1s) + H^+$
CDW, travelling AO
1 - 500 keV/amu

85T11 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
$H^+ + H(1s) \rightarrow H(1s)$
symmetric eikonal approximation, CDW
500 - 200000 keV/amu

85T12 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

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
$C^{6+} + H(1s) \rightarrow C^{5+}(nlm) + H^+$
CDW, CDW-PCI
25 - 900 keV/amu
multiple scattering effect; partial cross section

85T14 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

85T15 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
$C^{4+} + H_2, He \rightarrow C^{3+}(1s^2\ nl)$
T. CDW, B1; E. photon spectroscopy
166 - 417 keV/amu

85T16 Eicher,J.
Phys. Rev. A 32 (1985) 112-121
Relativistic eikonal theory of electron capture
$Ne^{10+} + B^{(z-1)+} \rightarrow Ne^{9+}(1s) + B^{z+}$
relativistic eikonal
10000 - 100000000 keV/amu
analytic expression

85T17 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
$He^{2+} + H \rightarrow {}^{1}He^{+}(nl) + H^{+}$
CC (MO) with ETF
0.25 - 25 keV/amu

85T18 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
$Li^{2+}(1s) + H(1s) \rightarrow Li^{+}(1s2s)$, $Li^{+}(1s2p)$, Li^{+}(total)
8 MO expansion method with ETF
0.5 - 25 keV/amu

85T19 Fritsch,W. Lin,C.D.
Phys. Rev. A 31 (1985) 1164-1167
Close-coupling study of K-shell vacancy production in near-symmetric collisions
$F^{8+} + Ne \rightarrow F^{7+} + Ne^{+}(1s^{-1})$; $S^{15+} + Ar \rightarrow S^{14+} + Ar^{+}(1s^{-1})$
modified AO
231 - 520 keV/amu (F); 500 - 2800 keV/amu (S)

85T20 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, $H_2 \rightarrow N^{2+}$, C^{3+}, $N^{4+} + H^{+}$, H_2^{+}
CC (MO)
1.0 keV/amu

85T21 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^{5+} + H $\rightarrow C^{3+}$, N^{4+}, $O^{5+} + H^{+}$
Molecular calculation
0.25 - 25 keV/amu

85T22 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
$He^{2+} + Li \rightarrow He^{+}(nl) + Li$; $He^{0} + Li^{2+}$
CDW approximation
200 - 500 keV/amu

85T23 Gorzdanov,T.P. Janev,R.K. Lazur,V.Yu.
Phys. Scripta 32 (1985) 64-68
Two-electron exchange in slow ion-atom collisions
$A^{2+} + A \rightarrow A + A^{2+}$ (A = Ne, Ar, Kr, Xe)
asymptotic expansion
3.8×10^{-3} - 0.25 keV/amu
total cross section

85T24 Humphries,W.J. Moiseiwitsch,B.L.
J. Phys B 18 (1985) 1209-1222
Third Born approximation for electron capture at relativistic energies
$A^{z+} + B^{(z-1)+} \rightarrow A^{(z-1)+} + B^{z+1}$
third Born approximation
analytic expression; no cross sections given

85T25 Humphries,W.J. Moiseiwitsch,B.L.
J. Phys. B 18 (1985) 2295-2301

Total cross sections for electron capture at relativistic energies
$A^{z+} + B^{(z-1)+}(1s) \rightarrow A^{(z-1)+}(1s) + B^{z+}$ (A = C, Ne, Ar; B = Al, Cu, Ag)
relativistic second Born approximation
140000 - 1050000 keV/amu

85T26 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)

85T27 Jakubassa-Amundsen,D.H.
Phys. Rev. A 32 (1985) 2166-2174
Nonadiabatic sliding model for rearrangement collisions
$O^{8+} + C \rightarrow O^{7+} + C + h\nu$;
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sliding model

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Exact relativistic second Born approximation for electron capture
relativistic second Born approximation
scaling at asymptotic region, $(\ln E)^2/E$

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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

85T30 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
$A^{z+} + B(n>>1) \rightarrow A^{(z-1)+} + B^{+}$ (A>>B)
Tunneling theory

85T31 Kimura,M.
Phys. Rev. A 31 (1985) 2158-2161
Molecular-state treatment of excitation and charge transfer processes in H^{+} + $He(1s^2)$ collisions
$H^{+} + He(1s^2) \rightarrow H(nl) + He^{+}(1s)$; H^{+} + He(1s, 2l)
MO expansion with IP
1 - 30 keV/amu

85T32 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
$H^{+} + H_2 \rightarrow H(1s) + H_2$
MO expansion with ETF
0.2 - 20 keV/amu
cross section ratios between H and H_2 targets

85T33 Kimura,M. Lin,C.D.
Phys. Rev. A 31 (1985) 590-592
Unified treatment of slow atom-atom and ion-atom collisions

$H^+ + He^+ \rightarrow H + He^{2+}$; $H^+ + He^{2+} + e$
MO (at inner region) + AO (at large nuclear distance)
2 - 5 keV/amu
no cross sections given for charge transfer

85T34 Kimura,M. Lin,C D.
Phys. Rev. A 32 (1985) 1357-1362
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

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

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

85T37 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

85T38 Kobayashi,K. Toshima,N. Ishihara,T.
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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

85T39 Kocbach,L. Taulbjerg,K.
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On the theory of electron capture from innershells in intermediate and high-energy collisions
IA
no absolute cross sections given

85T40 Macek,J.
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Treatment of divergent terms in the strong potential Born approximation
strong potential Born approximation
modified Coulomb Green's function to avoid divergence

85T41 Martiarena,M.L. Garibott,C.R.
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Radiative electron capture to the continuum

radiative electron capture to continuum in H^+ + He; Ne^{10+} + He, Ar^{17+} + He
first Born
RECC spectra in Ne^{10+}, Ar^{17+} + He collisions

85T42 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

85T43 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

85T44 McGuire,J.H.
J. Phys. B 18 (1985) L75-77
Non-orhtogonality in the strong potential Born approximation
strong potential Born approximation

85T45 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

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

85T47 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)

85T48 Olson,R.E. Kimura,M.
Phys. Rev. A 32 (1985) 3092-3094
Molecular-state cross section calculations for H + Na -> <- H^- + Na^+
H + Na -> H^- + Na^+; H^- + Na^+ -> H + Na (3s, 3p, 4s)
pseudo potential MO
0.1 - 5 keV/amu

85T49 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

85T50 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

85T51 Shingal,R. Bransden,B.H. Flower,D.R.
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Neutralization in H^+ + H^- collisions
H^+ + H^- -> H(1s) + H(nl)
two-center AO expansion method
8 - 50 keV/amu

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Calculation of charge-changing cross sections in collisions of H^+, He^{2+} and Li^{3+} with He atoms
A^{z+} + He -> $A^{(z-1)+}(1s)$, $A^{(z-2)+}(1s^2)$
independent-electron model
25 - 4000 keV/amu
also single and double ionization of He; ionization with electron capture into ground state

85T53 Stallcop,J.R. Partridge,H.
Phys. Rev. A 32 (1985) 639-642
N^+ - N long-range interaction energies and resonance charge exchange
N^+ + N -> N + N^+
self-consistent field method
$7x10^{-5}$ - $7x10^{-3}$ keV/amu

85T54 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
$7x10^{-5}$ - $7x10^{-3}$ keV/amu

85T55 Thylwe,K.E. Barany,A.
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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

85T56 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

85T57 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
$He^{2+} + H \rightarrow He^{+}(ln) + H^{+}$
CC (2O-MO)
$5x10^{-3}$ - $1.25x10^{-1}$ (quantum), $2.5x10^{-2}$ - 2.5 (semiclassical) keV/amu

85T58 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
$Be^{4+} + H(1s) \rightarrow Be^{3+}$
MO close-coupling method
2.0 - 25.0 keV/amu

85T59 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
$He^{+} + H \rightarrow He + H^{+}$; $He^{+} + H^{+} + e$;
$He^{+} + He^{+} \rightarrow He + He^{2+}$; $He^{+} + He^{2+} + e$
classical theory

86T 1 Allan,R.J.
J. Phys. B 19 (1986) 321-334
Charge transfer in H^{+} - Na^{0} collisions; molecular orbital calculations
$H^{+} + Na(3s) \rightarrow H(nl) + Na^{+}$
PSS with ETF

86T 2 Allan,R.J. Singal,R. Flower,D.R.
J. Phys. B 19 (1986) L251-256
Charge transfer in H^{+} - Na(3p) collisions; a possible ultraviolet laser mechanism
$H^{+} + Na(3p) \rightarrow H(nl) + Na^{+}$
AO (>0.2 keV/amu) ; MO (<0.4 keV/amu)
0.02 - 10 keV/amu

86T 3 Bienstock,S. Dalgarno,A. Heil,T.G.
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Charge transfer in N^{2+} + H collisions at slow to intermediate velocities
$N^{2+} + H \rightarrow N^{+} + H^{+}$
CC + UDWA
$5.4x10^{-3}$ - 5.36 keV/amu

86T 4 Burgdorfer,J. Taulbjerg,K.
Phys. Rev. A 33 (1986) 2959-2969
Distorted-wave methods for electron capture in ion-atom collisions
$A^{z+} + B^{(z-1)+} \rightarrow A^{(z-1)+} + B^{z+}$
distorted-wave with strong potential Born ; CDW

86T 5 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) -> Na^{+} + H^{-}; Na^{+} + H^{-} -> Na(3s, 3p, 4s) + H(1s)
5 MO with ETF
0.16 - 5.0 keV/amu

86T 6 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)
$H^+ + H^- \rightarrow H + H(n=2, 3)$
quantum close-coupling treatment
$2x10^{-5} - 2x10^{-2}$ keV/amu
n=3 dominant, particularly at low energies

86T 7 Horbatsch,M.
J. Phys. B 19 (1986) L193-198
Calculation of transfer ionization processes in ion-atom collisions
$C^{6+}, O^{8+} + Ne \rightarrow C^{5-3+}, O^{7-5+} + Ne$ (i=1-8)
quantum statistical time-dependent mean-field theory
1000 keV/amu

86T 8 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
$7.5x10^{-3} - 0.25$ keV/amu

86T 9 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
$H^+ + H(1s) \rightarrow H(1s) + H^+$
Fock-Tani transformation of second-quantized Hamiltonian
2 - 800 keV/amu
angular distribution

86T10 Shingal,R. Bransden,B.H. Ermolaev,A.M. Flower,D.R. Newby,C.W. Noble,C.J.
J. Phys. B 19 (1986) 309-320
Charge transfer in $H^+ - Na^0$ collisions; atoms orbital calculations
$H^+ + Na(3s) \rightarrow H(nl) + Na^+(n=1,2,3)$;
$Na^+ + H(1s) \rightarrow Na(3l) + H^+$ (l=0, 1, 2)
two-center expansion in travelling AO
0.5 - 20 keV/amu

86T11 Toshima,N. Watanabe,T.
Phys. Rev. A 33 (1986) 1382-1384
Simplified distorted-wave treatment for asymmetric electron capture processes
$A^{z+} + H(1s) \rightarrow A^{(z-1)+} + H^+$ (A = C, Ne)
DWBA
$10^{-1} - 10^3$ keV/amu

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