ISSN 0915-6364

NATIONAL INSTITUTE FOR FUSION SCIENCE

Bibliography of Electron and Photon Cross Sections
with Atoms and Molecules
Published in the 20th Century
– Halogen Molecules –

M. Hayashi

(Received - Sep. 25, 2003)

NIFS-DATA-80 Dec. 2003

TOKI, JAPAN

Bibliography of Electron and Photon Cross Sections with Atoms and Molecules Published in the 20th Century

—— Halogen Molecules ——*

Makoto Hayashi

(Gaseous Electronics Institute)

A bibliographies of original and review reports of experiments or theories of electron and photon cross sections and also electron swarm data are presented for atomic or molecular species with specified targets. These works covered 17 atoms and 51 molecules. The present bibliography is only for halogen molecules (F_2, Cl_2, Br_2, I_2). About 190 (F_2), 360 (Cl_2), 140 (Br_2) and 240 (I_2) papers were compiled respectively. A comprehensive author indexes for each molecule are included. The bibliography covers the period 1901 through 2000 for F_2-I_2. Finally, author's comments for F_2-I_2 electron collision cross sections are given.

Keywords : F_2, Cl_2, Br_2, I_2 molecules, collision cross sections, electron, elastic scattering, rotational, vibrational and electronic excitations, dissociation, ionization photon, photoabsorption, photodissociation, photoexcitation, photoionization, electron swarm, drift velocity, diffusion coefficient, ionization coefficient, excitation and ionization energies, transition probabilities, lifetimes of excited states

---

* This work was carried out under the collaboration research program at National Institute for Fusion Science.

Introduction

History

This bibliography is the result of a continuing literature survey which was begun around 1970 and originally encompassed only electron collision cross section and electron swarm data. The organization responsible for continuing this survey is Nagoya Institute of Technology, Nagoya. From 1994, the work continued to Gaseous Electronics Insititute, Nagoya. In 1997, the collection of photon cross section references was begun. The search for references in both cases was retrospective and included all papers reporting measurements, theoretical calculations or reviews and data compilations of such cross sections and electron swarm data.

Scope

This bibliography contains references to original research papers which report experiments or theoretical calculations of cross sections for electron and photon collisions with halogen molecules F_2, Cl_2, Br_2, and I_2. The review papers on this subject are also included. Some halogen molecule cluster papers are included. Some conference reports, company or agency reports and PhD thesis are included. Halogen molecules ion papers and positron collision papers are not included in principle.

Papers reporting the following data are included.

For electron collision cross section :

1) elastic scattering
2) rotational excitation
3) vibrational excitation
4) electronic excitation
5) dissociation
6) ionization
7) attachment
8) grand total scattering (sum of elastic and inelastic cross sections)
9) electron swarm parameters (drift velocity, diffusion coefficient)
10) excitation and ionization coefficients

For photon collision cross section :

1) photoabsorption
2) photoexcitation and fluorescence
3) photodissociation
4) photoionization

For some related data :

1) excitation and ionization energies
2) transition probabilities
3) lifetimes of excited states
4) others

The energy range for electron cross section data is usually 0 - 10 keV, but some higher electron energy papers are included. The wavelength range for photon cross section data is from microwave to X-ray. Most papers are concerned with infrared, visible and ultraviolet ray region.

The bibliography includes the papers published in the 20th century, from 1901 to 2000. Oldest paper in this list is given by E.R.Laird (1901) for Cl_2. Oldest papers for other halogen molecules are shown in each molecules. So for this bibliography, published papers from 1901 to 1999 are compiled by alphabetical order of the first author's surname of the paper. And the references published in 2000 and plus some old papers found very recently after compilation are added as "Addenda of References for each Halogen Molecule". In total, about 190 for F_2, 360 foe Cl_2, 140 for Br_2 and 240 for I_2 papers are compiled in the four halogen molecules bibliography.

Organization

This report consists of four parts : introduction, the bibliography and its addenda, author index, and some comments on electron collision cross sections.

Bibliography

In this section the complete citation for all references are given. At first following classifications are shown :

E : Elastic collision
R : Rotational excitation
V : Vibrational excitation
EX : electronic EXcitation
D : Dissociation
I : Ionization
A : Attachment
ME : MEtastable molecules
S : electron Swarm
O : Others (photon cross sections and the others)

All authors' initials and surname, journal name, volume, inclusive pages and year of publication are given as well as the title, and some additional information in the square bracket [ ]. E and T in the square bracket mean experiment and theory.

Bibliography for F_2, Cl_2, Br_2, and I_2 are divided into two parts :

F_2
Part 1. 1900 - 1999 p. 1 - 16
Part 2. Addenda of References some old papers p. 17

Cl_2
Part 1. 1900 - 1999 p. 1 - 29
Part 2. Addenda of References published in 2000, plus some old papers p. 30 - 32

Br_2
Part 1. 1900 - 1999 p. 1 - 14
Part 2. Addenda of References published in 2000, plus some old papers p. 14 - 14

I_2
Part 1. 1900 - 1999 p. 1 - 23
Part 2. Addenda of References published in 2000, plus some old papers p. 24 - 24

Author Index

In this section all authors are listed alphabetically by surname. After each author's name is a list of page numbers indicating which references he or she authored or coauthored.

F_2 p. 1 - 4
Cl_2 p. 1 - 7 Addenda p. 8
Br_2 p. 1 - 4
I_2 p. 1 - 4

Each author index of four halogen molecules follows each bibliography.

Some Comments on Electron Collision Cross Sections for F_2, Cl_2, Br_2 and I_2

Acknowledgments

The author would like to say many thanks to :
Kazuo Takayanagi and Yukikazu Itikawa of ISAS, Tokyo and Sagamihara,
Hiroyuki Tawara of NIFS, Nagoya and Toki,
Yoshiharu Nakamura of Keio University, Kanagawa,
Yoshihiko Hatano of Tokyo Institute of Technology, Tokyo
for continuous support and encouragement.

The author also would like to say many thanks to the librarians of the following organizations :
Nagoya Institute of Technology, Nagoya
Nagoya University, Nagoya (five libraries)
Institute of Plasma Physics, Nagoya University
National Institute for Fusion Science, Toki
Institute for Molecular Science, Okazaki

Finally, the author would like to say many thanks to Kayo Hirono for longstanding support for the preparation of these bibliographies.

Fluorine Molecule F_2

References for F_2 (1900 - 1999)

(Fluorine)

[Halogen]

E	: Elastic collision,	R	: Rotational excitation,
V	: Vibrational excitation,	EX	: Electronic excitation,
D	: Dissociation,	I	: Ionization,
A	: Attachment,	QT	: Grand total cross section,
S	: Swarm,	α	: Ionization coefficient,
O	: The others,	[ ]	: Additional informations, E : Exp., T : Theory.

The oldest paper in this list is given by H. G. Gale (1924).

O J. Aars : Z. Phys. 79, 122-138 (1932)
Uber eine photometrische Untersuchung der starksten Emissionsbanden von Fluor. [E, $h\nu$, F_2]

S N. L. Aleksandrov, I. V. Kochetov, A. P. Napartovich, V. G. Pevgov and A. N. Starostin : Sov. J. Plasma Phys. 6, 748-751 (1980)・
Electron kinetic coefficients in a weakly ionized plasma with high attachment rates. [T, F_2 + He]

O W. D. Allen and A. G. Csaszar : J. Chem. Phys. 98, 2983-3015 (1993)
On the ab initio determination of higher-order force constants at nonstationally reference geometries. [T, F_2, N_2, N_2O, F_2O]

O D. Andrychuk : J. Chem. Phys. 18, 233-233 (1950)
Raman spectrum of fluorine. [E, $h\nu$, F_2; 892 cm^{-1}]

O D. Andrychuk : Can. J. Phys. 29, 151-158 (1951)
The Raman spectrum of fluorine. [E, F_2; B_0 = 0.8828 cm^{-1}, r_0 = 1.418 A]

A K. A. Ashtiani, J. L. Shohet and R. E. P. Harvey : J. Vac. Sci. Tech. A11, 1136-1141
D (1993)・
Computer calculation of neutral-radical densities in a CF_4 electron cyclotron resonance plasma processing system. [T, F_2, CF_4]

A J. A. Ayala, W. E. Wentworth and E. C. M. Chen : J. Phys. Chem. 85, 768-777 (1981)
Electron attachment to halogens.
[E, F_2 - I_2; thermal electron attachment]

O G. G. Balint-Kurti and M. Karplus : J. Chem. Phys. 50, 478-488 (1969)
Multistructure valence-bond and atoms-in-molecules calculations for LiF, F_2, and F_2^-. [T, F_2, F_2^-, LiF]

V J. N. Bardsley : in Electron-Molecule and Photon-Molecule Collisions, Plenum
A 297-280 (1979)
Molecular resonance phenomena. [review, F_2, Cl_2, I_2, H_2, N_2, O_2, NO, HCl]

A J. N. Bardsley and J. M. Wadehra : J. Chem. Phys. 78, 7227-7234 (1983)・
Dissociative attachment in HCl, DCl, and F_2. [T, F_2, HCl, DCl]

O R. F. Barrow and A. D. Caunt : Proc. Roy. Soc. London A219, 120-140 (1953)
The ultra-violet absorption spectra of some gaseous alkali-metal halides and the dissociation energy of fluorine. [E, $h\nu$, F_2, NaF, etc.]

O O. M. Batovskii and V. I. Gurev : Opt. Spectrosc. 41, 185-187 (1976)
Temperature dependence of the continuous ultraviolet absorption spectrum of molecular fluorine. [E and T, $h\nu$, F_2; 300 - 990 K]

A E. M. Belenov, V. A. Isakov, A. N. Oraevskii and V. I. Romanenko : Sov. J. Quantum Elect. 4, 758-760 (1974)
Dissociation of fluorine molecules by electron impact.
[T, F_2; $F_2 + e \rightarrow F^- + F$ or $F^+ + F^- + e$, 0 - 32 eV]

O J. Berkowitz, W. A. Chupka, P. M. Guyon, J. H. Holloway and R. Spohr : J. Chem. Phys. 54, 5165-5180 (1971)
Photoionization mass spectrometric study of F_2, HF, and DF.
[E, $h\nu$, F_2, HF, DF; V_i of F_2 15.686 eV]

O J. Blauer and W. Solomon : J. Chem. Phys. 57, 3587-3589 (1972)
Shock tube calorimeter for the dissociation energy of fluorine.
[E, F_2 + HF + Ar; 1400 - 3200 K]

O J. F. Borns : Report K-1147, Carbon Chemicals Co. (1954)
The heat of dissociation of N_2 and the appearance potentials of some ions formed in F_2 and HF by electron impact. [, F_2, HF, N_2; from F. I. Vilesov]

A C. A. Brau, A. E. Greene, S. D. Rockwood and B. I. Schneider : 31st GEC, Buffalo, MA-8 (1978)・; Bull. Am. Phys. Soc. 24, 134-134 (1979)
Dissociative attachment of electrons to F_2. [E and T, F_2]

QT M. Breitenstein, A. Endesfelder, H. Meyer and A. Schweig : Chem. Phys. Lett. 108, 430-434 (1984)
CI calculations of electron-scattering cross sections for some linear molecules. [T, F_2, N_2, O_2, CO, C_2H_2, ; first Born approx.]

EX C. E. Brion : in Physics of Electronic and Atomic Collisions, 12th ICPEAC, Gatlinberg, North-Holland 579-593 (1982)
Electron scattering at high and intermediate energies. — Quantitative measurements in molecular spectroscopy.
[review, F_2, HF, COS, CS_2, CO_2, N_2O, etc.]

E M. Capitelli, R. Celiberto and M. Cacciatore : in Advances in Atomic, Molecular
V and Optical Physics, Vol. 33, Academic 321-372 (1994)
EX Needs for cross sections in plasma chemistry.
I [review, F_2, Cl_2, HF, HCl, H_2, N_2, O_2, CO, CO_2, etc.]

O D. C. Cartwright and P. J. Hay : J. Chem. Phys. 70, 3191-3203 (1979)・
Theoretical studies of the valence electronic states and the $^1\Pi_u \leftarrow X^1\Sigma_g^+$ absorption spectrum of the F_2 molecules. [T, F_2]

EX D. C. Cartwright, P. J. Hay and S. Trajmar : Chem. Phys. 153, 219-231 (1991)○
D Estimate of the integral cross section for dissociative excitation of F_2 by electron impact. [estimation, F_2; th. - 500 eV]

I R. E. Center and A. Mandl : J. Chem. Phys. 57, 4104-4105 (1972)
Ionization cross sections of F_2 and Cl_2 by electron impact.
[E, F_2, Cl_2; th. - 100 eV]

A P. J. Chantry : Westinghouse Rep. 78-9C6-ATACH-RI (1978)
Attachment measurements in halogen bearing molecules. [E, F_2,]

A P. J. Chantry : Bull. Am. Phys. Soc. 24, 134-134 (1979)・
Dissociative attachment cross section measurements in F_2 and NF_3.
[E, F_2, NF_3]

A P. J. Chantry : in Applied Atomic Collision Physics, Vol. 3 : Gas Lasers, H. Massey, et al. (Ed), Academic Press 35-70 (1982)○
Negative ion formation in gas lasers. [review, F_2, NF_3, HCl, $HgBr_2$, etc.]

A H. -L. Chen, R. E. Center, D. W. Trainor and W. I. Fyfe : Appl. Phys. Lett. 30, 99-101 (1977a)
Dissociative attachment of electrons to F_2. [E, F_2]

A H. -L. Chen, R. E. Center, D. W. Trainor and W. I. Fyfe : J. Appl. Phys. 48, 2297-2305 (1977b)
Dissociation of fluorine by electron impact.
[E, F_2; dissociative attach. rate const.]

O M. S. Child and R. B. Bernstein : J. Chem. Phys. 59, 5916-5925 (1973)
Diatomic interhalogens : Systematics and implications of spectroscopic interatomic potentials and curve crossings. [T, F_2 - I_2, IBr, etc.]

A L. G. Christophorou : Contrib. Plasma Phys. 27, 237-281 (1987)
Electron attachment detachement processes in electronegative gases.
[E, F_2, Cl_2, SF_6, perfluoroalkanes]

O W. A. Chupka and J. Berkowitz : J. Chem. Phys. 54, 5126-5132 (1971a)
Kinetic energy of ions produced by photoionization of HF and F_2.
[E, $h\nu$, F_2, HF; $D_0(F_2)$ 1.58 eV, EA(F) 3.400 eV]

O W. A. Chupka, J. Berkowitz and D. Gutman : J. Chem. Phys. 55, 2724-2733 (1971b)
Electron affinities of halogen diatomic molecules as determined by endoergic charge transfer. [E, F_2 - I_2]

A A. Chutjian and S. H. Alajajian : Phys. Rev. A35, 4512-4514 (1987)○
Electron attachment in F_2 : Conclusive demonstration of nonresonant, s-wave coupling in the limit of zero electron energy.
[E, F_2; 15th ICPEAC, Brighton 315 (1987)]

O E. A. Colbourn, M. Dagenais, A. E. Douglas and J. W. Raymonda : Can. J. Phys. 54, 1343-1359 (1976)
The electronic spectrum of F_2.
[E, F_2; 780 - 1020 A, v = 1, 893.90 cm^{-1}, v = 2, 1764.15 cm^{-1}]

O J. L. Cole and J. L. Margrave : J. Mol. Spectrosc. 43, 65-86 (1972)
The vacuum ultraviolet spectrum of molecular fluorine. [E, $h\nu$, F_2]

I J. E. Collin : Can. J. Chem. 40, 2172-2175 (1962)
The Franck-Condon principle and the ionization of molecules.
[compilation, F_2 - I_2, HF - HI, H_2, N_2, O_2, CO, NO, CO_2]

O A. B. Cornford, D. C. Frost, C. A. McDowell, J. L. Ragle and I. A. Stenhouse : J. Chem. Phys. 54, 2651-2657 (1971)・
Photoelectron spectra of the halogens. [E, $h\nu$, F_2 - I_2]

O G. Das and A. C. Wahl : J. Chem. Phys. 44, 87-96 (1966)
Extended Hartree-Fock wavefunctions : Optimized valence configurations for H_2 and Li_2, optimized double configurations for F_2. [T, F_2, H_2, Li_2]

O G. Das and A. C. Wahl : Phys. Rev. Lett. 24, 440-443 (1970)
Optimized valence configurations and the F_2 molecule. [T, F_2]

O G. Das and A. C. Wahl : J. Chem. Phys. 56, 3532-3540 (1972)
Theoretical study of the F_2 molecule using the method of optimized valence configurations. [T, F_2; potential energy curve]

O V. V. Datsyuk, I. A. Izmailov and V. A. Kochelap : Phys. Usp. 41, 379-402 (1998)・
Vibrational relaxation of excimers. [review, F_2, Cl_2, HCl, He - Xe]

I J. J. de Corpo, R. P. Steiger, J. L. Franklin and J. L. Margrave : J. Chem. Phys. 53,
A 936-938 (1970)
Dissociation energy of F_2. [E, F_2; 0 - 32 eV]

O D. DeMoulin and M. Jungen : Chem. Phys. 16, 311-318 (1976)
Expanded electronic states of the fluorine molecule. [T, F_2]

I H. Deutsch, P. Scheier and T. D. Mark : Int. J. Mass Spectrom. Ion Process. 74, 81-95 (1986)・
Calculation of electron impact ionization cross-sections. The fluorine anomaly. [T, F_2, CF_4, CCl_2F_2, SF_6, UF_6, N_2]

O V. H. Dibeler, J. A. Walker and K. E. McCulloh : J. Chem. Phys. 50, 4592-4593 (1969)
Dissociation energy of fluorine. [E, $h\nu$, F_2]

O V. H. Dibeler, J. A. Walker and K. E. McCulloh : J. Chem. Phys. 51, 4230-4235 (1969)
Photoionization study of the dissociation energy of fluorine and the heat of formation of hydrogen fluoride. [E, $h\nu$, F_2, HF]

O M. Diegelmann, K. Hohla, F. Rebentrost and K. L. Kompa : J. Chem. Phys. 76, 1233-1247 (1982)
Diatomic interhalogen laser molecules : Fluorescence spectroscopy and reaction kinetics. [E, $h\nu$, F_2, Cl_2, ClF, etc.]

A J. G. Dillard : Chem. Rev. 73, 589-643 (1973)・
Negative ion mass spectrometry. [review, F_2 - I_2, CCl_4, CH_3Cl, etc.]

O G. Di Lonardo and A. E. Douglas : J. Chem. Phys. 56, 5185-5186 (1972)
Electronic spectra of HF and F_2. [E, $h\nu$, F_2, HF]

O J. G. Dojahn, E. C. M. Chen and W. E. Wentworth : J. Phys. Chem. 100, 9649-9657 (1996)・
Characterization of homonuclear diatomic ions by semiempirical Morse potential energy curves. 1. The halogen anions. [T, F_2 - I_2, At_2]

V W. Domcke : Phys. Rep. 208, 97-188 (1991)・
A Theory of resonance and threshold effects in electron-molecule collisions : The projection-operator approach.
[review, F_2, HCl, N_2, H_2, CO_2]

A G. F. Drukarev and S. A. Pozdneev : 11th ICPEAC, Kyoto 346-347 (1979)・
Calculation of dissociative attachment cross section to F_2, Cl_2, and I_2 molecules. [T, F_2, Cl_2, I_2; 3.2 - 5 eV for F_2]

O D. Edelson and D. L. Flamm : J. Appl. Phys. 56, 1522-1531 (1984)
Computer simulation of a CF_4 plasma etching silicon. [T, F_2, CF_4, C_2F_6]

O H. G. M. Edwards, E. A. M. Good and D. A. Long : J. Chem. Soc. Faraday Trans. II 72, 984-987 (1976)
Pure rotational Raman spectrum of fluorine. [E, $h\nu$, F_2]

O A. V. Eletskii, B. M. Smirnov and G. V. Shlyapnikov : Opt. Spectrosc. 36, 630-634 (1974)
Photodissociation and photorecombination emission of diatomic molecules. [T, $h\nu$, F_2 - I_2, etc.]

O A. V. Eletskii and B. M. Smirnov : Sov. Phys. Usp. 28, 956-971 (1985)
Dissociative attachment of an electron to a molecule.
[review, F_2 - I_2, etc.]

O J. C. Ellenbogen, O. W. Day, D. W. Smith and R. C. Morrison : J. Chem. Phys. 66, 4795-4801 (1977)
Extension of Koopmans' theorem. IV. Ionization potentials from correlated wavefunctions for molecular fluorine. [T, F_2]

O D. J. Ellis, K. E. Banyard, A. D. Tait and M. Dixon : J. Phys. B6, L233-L236 (1973)
Potential energy curves and spectroscopic constants for some diatomic systems. [T, F_2, F_2^+, F_2^-, NF, etc.]

EX M. Elyaakoubi and P. Ranson : J. Appl. Phys. 78, 4733-4739 (1995)
D Time resolved study of a reactive low pressure plasma : Determination of basic data on electron-fluorine collisions. [E, F_2 + Ar + He]

O M. G. Evans, E. Warhurst and E. Whittle : J. Chem. Soc. 1524-1534 (1950)
The dissociation energy of fluorine. [E, F_2]

O L. Farnell, J. A. Pople and L. Radom : J. Phys. Chem. 87, 79-82 (1983)
Structural predictions for open-shell systems : A comparative assessment of ab initio procedures.
[comparison, F_2^+, N_2^+, O_2, O_2^+, NO, CH, CH_2, CH_3, etc.]

O D. L. Flamm and V. M. Donnelly : Plasma Chem. Plasma Process. 1, 317-363 (1981)
The design of plasma etchants. [review, F_2 - Br_2, CF_4, BCl_3, etc.]

D A. W. Fliflet, V. McKoy and T. N. Rescigno : Phys. Rev. A21, 788-792 (1980)
Dissociation of F_2 by electron impact excitation of the lowest $^3\Pi_u$ electronic state. [T, F_2; DCS, 5 - 30 eV]

EX I. W. Fomunung, Z. Chen and A. Z. Msezane : Phys. Rev. A53, 806-817 (1996)·
Electron excitation of optically-allowed transitions in CO_2, SF_6, CO, F_2, and SO_2. [T, F_2, CO_2, SF_6, CO, SO_2]

O S. Fraga and B. J. Ransil : J. Chem. Phys. 34, 727-742 (1961a)
Studies in molecular structure. Ⅲ. Population analysis for selected first-row diatomic molecules. [T, F_2, N_2, CO, HF, BF, LiF, etc.]

O S. Fraga and B. J. Ransil : J. Chem. Phys. 35, 669-678 (1961b)
Studies in molecular structure. Ⅴ. Computed spectroscopic constants for selected diatomic molecules of the first row. [T, F_2, H_2, N_2, HF, LiF]

O S. Fraga and B. J. Ransil : J. Chem. Phys. 36, 1127-1142 (1962)
Studies in molecular structure. Ⅶ. Limited configuration interaction for selected first-row diatomics. [T, F_2, N_2, CO, HF, BF, etc.]

O D. C. Frost, C. A. McDowell and D. A. Vroom : J. Chem. Phys. 46, 4255-4259 (1967)
Photoelectron spectra of the halogens and the hydrogen halides.
[E, $h\nu$, F_2 - I_2, HF - HI]

V Y. Fujita, S. Yagi, S. S. Kano, H. Takuma, T. Ajiro, T. Takayanagi, K. Wakiya and H. Suzuki : Phys. Rev. A34, 1568-1570 (1986)
Vibrational excitation cross section for F_2 by electron impact.
[E, F_2]

O H. G. Gale and G. S. Monk : Astrophys. J. 59, 125-132 (1924)
The spectrum of fluorine. [E, $h\nu$, F_2; 3400 - 7800 A]

O H. G. Gale and G. S. Monk : Phys. Rev. 29, 211-211 (1927)
Band spectrum, continuous emission, and continuous absorption of fluorine gas. [E, $h\nu$, F_2; 5100 - 7200 A, 2600 - 2800 A, 4100 A]

O H. G. Gale and G. S. Monk : Astrophys. J. 69, 77-102 (1929)
Band spectrum of fluorine. [E, $h\nu$, F_2]

S J. W. Gallagher, E. C. Beaty, J. Dutton and L. C. Pitchford : JILA Information Center Repore No. 22, 1-258 (1982)·
A compilation of electron swarm data in electro-negative gases.
[compilation, F_2 - I_2, NF_3, SF_6, etc.]

O J. L. Gole and J. L. Margrave : J. Mol. Spectrosc. 43, 65-86 (1972)
The vacuum ultraviolet spectrum of molecular fluorine.
[E, $h\nu$, F_2; 709 - 1500 A]

O A. E. Greene and C. A. Brau : IEEE J. Quant. Elect, 14, 951-957 (1978)
Theoretical studies of UV-preionized transverse discharge KrF and ArF lasers. [T, F_2, Kr, Ar]

O P. -M. Guyon, R. Spohr, W. A. Chupka and J. Berkowitz : J. Chem. Phys. 65, 1650-1658 (1976)
Threshold photoelectron spectra of HF, DF, and F_2.
[E, $h\nu$, F_2, HF, DF]

V R. J. Hall : J. Chem. Phys. 68, 1803-1807 (1978)
A Dissociative attachment and vibrational excitation of F_2 by slow electrons.
[T, F_2; Herzenberg's theory]

O F. E. Harris and H. H. Michels : Int. J. Quant. Chem. : Quant. Chem. Symp. 1, 329-338 (1967)
Open-shell valence configuration-interaction studies of diatomic and polyatomic molecules. [T, F_2, HF, BeH_2]

O T. Hatakeyama, F. Kannari and M. Obara : Appl. Phys. Lett. 59, 387-389 (1991)·
Theoretical study of a vacuum ultraviolet F_2 excimer lamp (157 nm) excited by microwave discharge. [E, F_2]

O P. J. Hay and D. C. Cartwright : Chem. Phys. Lett. 41, 80-83 (1976),
Erratum 42, 398-398 (1976)
Rydberg ionic and valence interactions in the excited state of F_2.
[T, F_2]

S M. Hayashi and T. Nimura : J. Appl. Phys. 54, 4879-4882 (1983a)·
Calculation of electron swarm parameters in fluorine.
[T, F_2; cross section set for F_2, 0 - 10^3 eV]

A M. Hayashi : Jpn. J. Appl. Phys. 22, L565-L566 (1983b)
S Calculation of electron attachment rate coefficients in fluorine.
[T, F_2]

O M. Hayashi and Y. Nakamura : EMS-99, Tokyo 175-176 (1999)·
May we measure the exact values of electron collision cross sections for molecules by beam and swarm experiments ?
[general comment; F_2 is the mixtures of F_2(r) and F_2(v) molecules]

EX A. U. Hazi : Phys. Rev. A23, 2232-2240 (1981a)
Impact-parameter method for electronic excitation of molecules by electron impact. [T, F_2, H_2, N_2; $1^1\Sigma_u^+$ and $3^1\Pi_u$ states for F_2]

A A. U. Hazi, A. E. Orel and T. N. Rescigno : Phys. Rev. Lett. 46, 918-922 (1981b)
Ab initio study of dissociative attachment of low-energy electrons to F_2.
[T, F_2; vibrational level dependence, 0 - 1.5 eV]

A. U. Hazi : in Electron-Molecule Collisions and Photoionization Processes, Verlag Chemie International 87- (1983)

O G. Herzberg : Molecular Spectra and Molecular Structure. II. Spectra of Diatomic Molecules, D. Van Nostrand (1950)

O K. Hijikata : Rev. Mod. Phys. 32, 445-446 (1960)
Energy levels of F_2 and F_2^+. [T, F_2]

O K. Hijikata : J. Chem. Phys. 34, 221-231 (1961a)
On the fluorine molecule. Part I. The pilot calculation.
[T, F_2; energy levels; antisymmetrized products of MO]

O K. Hijikata : J. Chem. Phys. 34, 231-239 (1961b)
On the fluorine molecule. II. Energy levels of F_2 and F_2^+.
[T, F_2, F_2^+]

EX A. P. Hitchcock and C. E. Brion : J. Phys. B14, 4399-4413 (1981)
K-shell excitation of HF and F_2 studied by electron energy-loss spectroscopy. [E, F_2, HF; 2.5 keV]

EX A. P. Hitchcock, C. E. Brion, G. R. J. Williams and P. W. Langhoff : Chem. Phys. 66, 435-442 (1982)
Experimental and theoretical studies of the valence-shell dipole excitation spectrum of molecular fluorine. [E and T, F_2]

O J. M. Horne, J. Morgan and D. R. Miller : J. Chem. Phys. 67, 1279-1280 (1977)
Rotational relaxation of molecular fluorine.
[E, $h\nu$, F_2; free-jet expansions, 307 K]

O K. P. Huber and G. Herzberg : Molecular Spectra and Molecular Structure. IV. Constants of Diatomic Molecules, Van Nostrand Reinhold 104-107 (1979)

E W. H. Huo and Y.-K. Kim : IEEE Trans. Plasma Sci. 27, 1225-1240 (1999)
V Electron collision cross-section data for plasma modeling.
I [review, F_2, Cl_2, CH_4 - C_3H_8, etc.]

O R. P. Iczkowski and J. L. Margrave : J. Chem. Phys. 30, 403-405 (1959)
Absorption spectrum of fluorine in the vacuum ultraviolet.
[E, $h\nu$, F_2; 807 - 1036 A, V_i = 15.7 eV]

O M. Inokuti : Rev. Mod. Phys. 43, 297-347 (1971)
Inelastic collisions of fast charged particles with atoms and molecules — The Bethe theory revisited. [general theory]

O M. Inokuti, Y. Itikawa and J. E. Turner : Rev. Mod. Phys. 50, 23-35 (1978)
Addenda : Inelastic collisions of fast charged particles with atoms and molecules — The Bethe theory revisited [Rev. Mod. Phys. 43, 297 (1971)].
[general theory]

O R. Janoschek und H. Preuss : Z. Naturforsch. 24a, 674-675 (1969)
Molekuleigenschaften des F_2 nach dem SCF-MO-LC(LCGO)-Verfahren.
[T, F_2]

O C. D. Johnson and D. Britton : J. Phys. Chem. 68, 3032-3039 (1964)
Shock waves in chemical kinetics : The rate of dissociation of fluorine.
[E, F_2 + Ar]

V S. A. Kalin and A. K. Kazansky : J. Phys. B23, 4377-4400 (1990)
A The semiclassical version of the non-local resonance theory of electron-molecule collisions. [T, F_2, HCl; 0 - 1 eV for F_2]

O M. Karplus and H. J. Kolker : J. Chem. Phys. 38, 1263-1275 (1963)
Magnetic susceptibility of diatomic molecules.
[T, F_2, H_2, Li_2, N_2, CO, HF, etc.]

O E. Kasseckert : Z. Naturforsch. 28a, 704-708 (1973)
Ab Initio-Rechnungen zum F_2 - Molekul. [T, F_2]

O E. Kasseckert und B. Wirsam : Z. Naturforsch. 29a, 1425-1430 (1974)
Angeregte Zustande des Fluormolekuls.
[T, F_2; SCF-CI, excited states]

O C. W. Kern and M. N. Lipscomb : J. Chem. Phys. 37, 260-266 (1962)
Magnetic shielding constants in some diatomic molecules.
[T, F_2, H_2, Li_2, N_2, CO, HF]

A D. Kligler, Z. Rozenberg and M. Rokni : J. Chem. Phys. 77, 3458-3463 (1982)
Electron attachment by chlorine donors in e-beam pumped laser gas mixtures.
[E, F_2, HCl, CCl_4, CH_3Cl, CH_2Cl_2, etc.]

O L. E. Kline and M. J. Kushner : Crit. Rev. in Solid State Mater. Sci. 16, 1-35 (1989)
Computer simulation of materials processing plasma discharges. [review, F_2, Cl_2, CF_4, CCl_2F_2, SF_6, C_2F_6, CCl_4, HCl, SiH_4, Si_2H_6, CH_4, C_2H_6]

O H. J. Kolker and M. Karplus : J. Chem. Phys. 41, 1259-2166 (1964)
Theory of nuclear magnetic shielding in diatomic molecules.
[T, F_2, HF, H_2, N_2, LiH, etc.]

A M. V. Kurepa, D. S. Babic and D. S. Belic : Chem. Phys. 59, 125-136 (1981)
Attachment rate coefficients of halogen molecules (F_2, Cl_2, Br_2, I_2) for mean electron energies 10^{-2} to 10^2 eV. [T, F_2 - I_2]

E N. Lane : in Electron-Molecule Scattering, Wiley-Interscience 147-183 (1979)
R The state of the theory.
V [review, T, F_2, H_2, N_2, CO_2, HCl, LiF]

O J. G. Lauderdale, C. W. McCurdy and A. U. Hazi : J. Chem. Phys. 79, 2200-2205 (1983)・
Conversion of bound states to resonances with changing internuclear distance in molecular anions.
[T, F_2, N_2; calculation of the complex potential energy curves of electron scattering resonance]

EX B. H. Lengsfield Ⅲ and T. N. Rescigno : Phys. Rev. A44, 2913-2920 (1991)・
Electron-molecule close coupling with correlated target wave functions : Application to impact dissociation of F_2.
[T, F_2; DCS, 5 - 30 eV for $1^3\Pi_u$, $1^1\Pi_u$]

O P. F. Levelt, K. S. E. Eikema, S. Stolte, W. Hogervorst and W. Ubachs : Chem. Phys. Lett. 210, 307-314 (1993)
XUV-laser excitation of molecular fluorine. [E, $h\nu$, F_2]

O V. G. Levin, V. G. Neudatchin, A. V. Pavlitchenkov and Yu. F. Smirnov : J. Chem. Phys. 63, 1541-1546 (1975)
On the display of basic properties of the molecular electronic wave-functions in the (e, 2e) quasielastic knockout experiments.
[T, F_2, Li_2, N_2, HF, BH, CH, LiH]

O W. H. Long, Jr. and R. S. Bradford, Jr. : IEEE J. Quant. Elect. 15, 327-331 (1979)
Electrical characteristics of an e-beam controlled KrF^* discharges.
[E, F_2 + Ar + Kr]

A P. Mahadevan and R. Hofland : Spring Meeting, Washington DC, DN16 (1976); Bull. Am. Phys. Soc. 21, 575-575 (1976)
Absolute cross-sections for electron attachment to molecular fluorine.
[E, F_2; 0.5 - 16 eV, q_a 180 A^2 at ～ 1 eV and 10 A^2 near 4.5 eV]

O A. Mandl : J. Chem. Phys. 59, 3423-3424 (1973)
Detachment of electrons from F^- by F, O_2 and O. [E, $F^- + F \rightarrow F_2 + e$]

O R. Z. Martinez, D. Bermejo, J. Santos and P. Cancio : J. Mol. Spectrosc. 168, 343-349 (1994)
High-resolution stimulated Raman spectrum of F_2. [E, $h\nu$, F_2; $v = 0 \rightarrow 1$ 893.9416 cm^{-1} = 0.11083553 eV, $v = 1 \rightarrow 2$ 870.3450 cm^{-1}]

A D. L. McCorkle, L. G. Christophorou, A. A. Christodoulides and L. Pichiarella : J. Chem. Phys. 85, 1966-1970 (1986)
Electron attachment to F_2. [E, F_2; swarm-unfolded data]

O T. A. Milne and P. W. Gilles : J. Am. Chem. Soc. 81, 6115-6120 (1959)
The dissociation energy of fluorine and the magnetic deflection of its molecular beams. [E, F_2; 1.79 ± 0.02 eV]

E L. A. Morgan and C. J. Noble : J. Phys. B17, L369-L373 (1984)
Elastic scattering of electrons by fluorine molecules. [T, F_2]

O W. L. Morgan and A. Szoke : Phys. Rev. A23, 1256-1265 (1981)
Kinetic processes in Ar-Kr-F_2 laser mixtures.
[E and T, F_2 + Ar + Kr; ex. cross sections for F_2]

E W.L.Morgan : JILA Report No.34, 1-46 + figures (1991)
V A critical evaluation of low energy electron impact cross sections for
EX plasma processing modeling : I. Cl_2, F_2, and HCl. II. CF_4, SiH_4, and CH_4.
I [compilation, F_2, Cl_2, CF_4, SiH_4, CH_4]

E W.L.Morgan : Plasma Chem.Plasma Process.12, 449-476 (1992)○
V A critical evaluation of low energy electron impact cross sections for
EX plasma processing modeling : I. Cl_2, F_2, and HCl.
I [compilation, F_2, Cl_2, HCl]

E W.L.Morgan : in Advances in Atomic, Molecular and Optical Physics, Vol.43,
V Academic 79-110 (1999)
EX Electron collision data for plasma chemistry modeling.
I [review, F_2, Cl_2, C_3F_8, etc.]

E M.A.Morrison : in Advances in Atomic and Molecular Physics, Vol.24, Academic 51-156 (1988)
Near-threshold electron-molecule scattering. [review]

EX A.Z.Msezane and Z.Felfli : J.Mol.Struct.(Theochem) 454, 187-200 (1998)
Recent theoretical advances in small-angle electron scattering.
[T, F_2, H, He, Xe, Na, N_2, SF_6]

O R.S.Mulliken : Phys.Rev.46, 549-571 (1934)
The halogen molecules and their spectra. J-J-like coupling. Molecular ionization potentials. [T, F_2 - I_2, HF - HI, BrCl, IBr, ICl]

O R.S.Mulliken : J.Chem.Phys.8, 382-395 (1940)
Intensities in molecular electronic spectra. X. Calculations on mixed-halogen, hydrogen halide, alkyl halide, and hydroxyl spectra.
[T, F_2 - Br_2, HF - HI, OH, CH_3Cl - CH_3I, etc.]

O H.Nakatsuji : Chem.Phys.Lett.67, 329-333 (1979)
Cluster expansion of the wavefunction. Electron correlations in ground and excited states by SAC(symmetry-adapted-cluster) and SAC CI theories.
[T, general theory]

O H.Nakatsuji : Theor.Chim.Acta 71, 201-229 (1987)
Exponentially generated wave functions and excited states of benzene.
[T, F_2, C_6H_6, LiF, CO, H_2O]

O M.W.Nathans : J.Chem.Phys.18, 1122-1122 (1950)
The absorption spectrum and the dissociation energy of fluorine.
[discussion, $h\nu$, F_2]

V W.L.Nighan : Appl.Phys.Lett.32, 297-300 (1978a)
D Influence of electron-F_2 collisions in rare-gas-halide laser discharges.
[E, F_2 + Ar + Kr]

O W.L.Nighan : IEEE J.Quant.Elect.14, 714-726 (1978b)
Plasma processes in electron-beam controlled rare-gas halide lasers.
[T, F_2 + Ar + Kr]

EX H. Nishimura, D. C. Cartwright and S. Trajmar : J. Chem. Phys. 71, 5039-5041 (1979)
Electron energy-loss spectra in molecular fluorine.
[E, F_2; 30 - 90 eV, 5 - 140°]

A K. J. Nygaard, S. R. Hunter, J. Fletcher and S. R. Foltyn : Appl. Phys. Lett. 32, 351-353 (1978a)
Electron attachment in dilute fluorine-helium mixtures. [E, F_2 + He]

S K. J. Nygaard, J. Fletcher, S. R. Hunter and S. R. Foltyn : Appl. Phys. Lett. 32, 612-613 (1978b)
Electron drift velocities in helium-fluorine gas mixtures. [E, F_2 + He]

A F. J. Nygaard, H. L. Brooks and S. R. Hunter : IEEE J. Quant. Elect. 15, 1216-1223 (1979)
Negative ion production rates in rare gas-halide lasers.
[E, F_2, Cl_2, I_2, NF_3]

O I. Ozier, L. M. Crapo, J. W. Cederberg and N. F. Ramsey : Phys. Rev. Lett. 13, 482-484 (1964)
Nuclear interactions and rotational moment of F_2. [E, F_2]

O N. Kh. Petrov, N. F. Chebotanev and S. Ya. Pshezhetskii : Sov. J. Quant. Elect. 7, 1285-1287 (1977)
Laser method for determination of the quantum yield of atoms in photodissociation of molecules. [E, $h\nu$, F_2, ClF, etc.]

O T. L. Porter : J. Chem. Phys. 48, 2071-2083 (1968)
Emission spectrum of molecular fluorine. [E, $h\nu$, F_2]

O A. W. Potts and W. C. Price : Trans. Faraday Soc. 67, 1242-1252 (1971)·
Photoelectron spectra of the halogens and mixed halides ICl and IBr.
[E, $h\nu$, F_2 - I_2, ICl, IBr]

O R. Rackwitz, D. Feldman, E. Heinicke und H. J. Kaiser : Z. Naturforsch. 29a. 1797-1802 (1974)
Photodissoziation bei zweiatomigen negativen Halogenmolekulionen.
[E, $h\nu$, F_2^-, Cl_2^-, Br_2^-, I_2^-; 0.5 - 3 eV]

O A. A. Radzig and B. M. Smirnov : Reference Data on Atoms, Molecules and Ions, Springer (1985)

O B. J. Ransil : Rev. Mod. Phys. 32, 239-244 (1960a)
Studies in molecular structure. I. Scope and summary of the diatomic molecule program. [T, F_2, N_2, CO, HF, BF, etc.]

O B. J. Ransil : Rev. Mod. Phys. 32, 245-254 (1960b)
Studies in molecular structure. II. LCAO-MO-SCF wave functions for selected first-row diatomic molecules.
[T, F_2, N_2, HF, BH, NH, CO, BF, etc.]

I M. V. V. S. Rao and S. K. Srivastava : 18th ICPEAC, Aarhus 294-294 (1993)·
A Formation of positive and negative ions by electron impact on F_2.
[E, F_2; q_i; th. - 1000 eV; q_a : 0 - 40 eV]

I M. V. V. S. Rao and S. K. Srivastava : J. Phys. B29, 1841-1848 (1996) ○
Cross sections for the production of positive ions by electron impact on F_2. [E, F_2; th. - 1000 eV; F_2^+ and (F^+ + F_2^{2+})]

O A. L. G. Rees : J. Chem. Phys. 26, 1567-1571 (1957) ; Erratum 27, 1424-1424 (1957)
Electronic spectrum and dissociation energy of fluorine.
[T, F_2; 37.1 Kcal/mol, eV]

E T. N. Rescigno, C. F. Bender, C. W. McCurdy and V. McKoy : J. Phys. B9, 2141-2146 (1976)
Cross sections for the elastic scattering of low energy electrons by molecular fluorine : An approximate theoretical treatment using discrete basis functions. [T, F_2; 0 - 13.6 eV]

O T. N. Rescigno, C. F. Bender and B. V. McKoy : Chem. Phys. Lett. 45, 307-310 (1977)
The equation of motion method for F_2 : Transition energies, oscillator strength and Born cross sections. [T, F_2]

EX T. N. Rescigno : Comments At. Mol. Phys. 33, 315-324 (1997) ·
Dissociative excitation in electron-molecule collisions.
[comments, F_2, Cl_2, HBr, H_2O, NF_3, CH_4, C_2H_4, SiH_4, CH_3Cl]

O J. K. Rice, A. K. Hays and J. R. Woodworth : Appl. Phys. Lett. 31, 31-33 (1977)
VUV emissions from mixtures of F_2 and the noble gases - A molecular F_2 laser at 1575 A. [E, F_2, Ne, He]

E M. E. Riley, C. J. MacCallum and F. Biggs : Atomic Data Nucl. Data Tables 15, 443-475 (1975), Erratum 28, 379-379 (1983)
Theoretical electron-atom elastic scattering cross sections. Selected elements, 1 keV to 256 keV. [T, F, etc.]

O R. R. Rue and K. Ruedenberg : J. Phys. Chem. 68, 1676-1706 (1964)
Chemical binding in homonuclear diatomic molecules.
[T, F_2, N_2, etc. ; LCAO-MO-SCF wave functions]

O T. Sakai, K. Tanaka, A. Murakami, H. Iwaki, H. Terashima and T. Shoda : J. Phys. B21, 229-237 (1988)
Theoretical study of the recently observed $^3\Pi_g$ state of the F_2 molecule.
[T, F_2; see K. Hoshiba (1985)]

O H. F. Schaefer Ⅲ : J. Chem. Phys. 52, 6241-6247 (1970)
New approach to electronic structure calculations for diatomic molecules : Application to F_2 and Cl_2. [T, F_2, Cl_2]

E B. I. Schneider and P. J. Hay : J. Phys. B9, L165-L167 (1976a)
Elastic scattering of electrons from F_2.
[T, F_2; R-matrix, 0.05 - 0.92 k(a_0^{-1})]

E B. I. Schneider and P. J. Hay : Phys. Rev. A13, 2049-2056 (1976b)
Elastic scattering of electrons from F_2 : An R-matrix calculations.
[T, F_2]

B. I. Schneider : 10th ICPEAC, Paris 257-269 (1977)
The R-matrix method. Applications to electron-molecule collisions.
[T, F_2]

A B. I. Schneider and C. A. Brau : Appl. Phys. Lett. 33, 569-571 (1978)
Dissociative attachment of electrons to F_2.
[E, F_2 + N_2, F_2 + Ar; 0.9 - 4 eV]

O J. M. Sichel and M. A. Whitehead : Theor. Chim. Acta 11, 239-253 (1968)
Semi-empirical all valence electrons SCF-MO-CNDO theory. Ⅲ. Orbital energies and ionization potentials.
[T, F_2, SO_2, H_2, CH_4, NH_3, H_2O, HF, N_2, CO, CO_2, N_2O, O_3, C_2H_2, C_2H_4, C_2H_6, C_3H_8, etc.]

A G. D. Sides, T. O. Tiernan and R. J. Hanrahan : J. Chem. Phys. 65, 1966-1975 (1976)
Measurement of thermal electron dissociative attachment rate constants for halogen gases using a flowing afterglow technique.
[E, F_2, Cl_2, Br_2, SF_6]

O B. M. Smirnov and A. S. Yatsenko : Phys. Usp. 39, 211-230 (1996)
Properties of dimers. [review, F_2 - I_2, He_2 - Xe_2, H_2, N_2, O_2, etc.]

O D. Spence : Phys. Rev. A10, 1045-1052 (1974)
Systematics of Feshbach resonances in the molecular halogens.
[E, F_2 - I_2]

EX D. Spence, H. Tanaka, M. A. Dillon and K. Lanik : J. Phys. B19, L569-L573 (1986)
Direct observation of 157 nm laser photons from the $f^3\Pi_g$ state of F_2 by high-resolution electron impact. [E, F_2; 10 - 25 eV]

O J. L. Steinfeld : J. Phys. Chem. Ref. Data 13, 445-553 (1984)
Rate data for inelastic collision processes in the diatomic halogen molecules. [compilation, F_2 - I_2, BrCl, etc.; not e, not $h\nu$]

O R. K. Steunenberg and R. C. Vogel : J. Am. Chem. Soc. 78, 901-902 (1956)
The absorption spectrum of fluorine.
[E, $h\nu$, F_2 - I_2; 2100 - 8000 A, 298 - 373 K]

I F. A. Stevie and M. J. Vasile : J. Chem. Phys. 74, 5106-5110 (1981)
Electron impact ionization cross sections of F_2 and Cl_2.
[E, F_2, Cl_2; th. - 102 eV]

O W. Stricker und L. Krauss : Z. Naturforsch. 23a, 486-491 (1968)
Die Bestimmung der Dissoziationenergie des F_2 - Molekuls und ein Beitrag zu seinem Bandenspektrum. [E, F_2; 1.44 ± 0.07 eV]

O W. Stricker und I. G. Hochenbleicher : Z. Naturforsch. A28, 27-30 (1973)
Das lasererregte Raman-Spektrum von gasformigem Fluor.
[E, $h\nu$, F_2; vib. ex., 0 → 1, 1 → 2 and 0 → 2]

S H. Sugawara, H. Tagashira and Y. Sakai : J. Phys. D30, 368-373 (1997)
Evaluation of the real space electron drift velocity in gases using moment equations performed in velocity space. [T, F_2, SF_6]

O W. Sun, R. M. Pitzer and C. W. McCurdy : Phys. Rev. A40, 3669-3672 (1989)
Photodetachment cross section for the $3\sigma_u$ channel of F_2^- in the static-exchange approximation. [T, $h\nu$, F_2^-]

A W. C. Tam and S. F. Wong : J. Chem. Phys. 68, 5626-5630 (1978) ○
Dissociative attachment of halogen molecules by 0 - 8 eV electrons.
[E, F_2, Cl_2, Br_2, I_2]

O W. Thiel and A. Schweig : Chem. Phys. Lett. 12, 46-52 (1971)
Photoionization cross sections in the valence electron approximation. I. Linear molecules. [T, $h\nu$, F_2, Cl_2, HF, HCl]

I R. Thorburn : Proc. Phys. Soc. London 73, 122-126 (1959)
Ionization and dissociation by electron impact in fluorine, hydrogen fluoride, chlorine and hydrogen chloride. [E, F_2, Cl_2, HF, HCl]

A D. W. Trainor and J. H. Jacob : Appl. Phys. Lett. 35, 920-922 (1979)
Electron dissociative attachment rate constants for F_2 and NF_3 at 300 and 500 K. [E, F_2, NF_3; 300 and 500 K]

O R. P. Tuckett, A. R. Dale, D. M. Jaffey, P. S. Jarrett and T. Kelly : Mol. Phys. 49, 475-486 (1983)
The $A^2\Pi_u \rightarrow X^2\Pi_g$ electronic emission spectrum of the fluorine molecular ion F_2^+ studied in a supersonic beam. [E, $h\nu$, F_2]

O W. J. van der Meer, M. Volmer and C. A. de Lange : J. Elect. Spectrosc. Relat. Phenom. 49, 263-272 (1989)・
Absolute photoionisation cross-sections of atomic and molecular fluorine at 584 A. [E, $h\nu$, F_2, F, HF]

O H. van Lonkhuyzen and C. A. de Lange : Chem. Phys. 89, 313-322 (1984)・
High-resolution UV photoelectron spectroscopy of diatomic halogens.
[E, $h\nu$, F_2, Cl_2, Br_2; $h\nu$ = 15.5 - 21.5 eV for F_2]

O F. I. Vilesov : Sov. Phys. Usp. 6, 888-929 (1964)
Photoionization of gases and vapors by vacuum ultraviolet radiation.
[compilation, $h\nu$, F_2 - I_2, F - I, etc.; V_i for 417 molecules]

O D. A. Vroom : PhD Thesis, University of British Columbia 1-202 (1965)
Photoelectron spectroscopy of gases.
[E, $h\nu$, F_2, Cl_2, Br_2, I_2, N_2, O_2, NO, CO, HF, HCl, etc.]

V J. M. Wadehra and J. N. Bardsley : 11th ICPEAC, Kyoto 348-349 (1979)
EX Vibrational excitation and dissociative excitation in electron collisions with H_2, D_2 and F_2. [T, F_2, H_2, D_2]

O A. C. Wahl : J. Chem. Phys. 41, 2600-2611 (1964)
Analytic self-consistent field wavefunctions and computed properties for homonuclear diatomic molecules. [T, F_2 only]

EX R.-G. Wang, Z.-W. Wang, M. A. Dillon and D. Spence : J. Chem. Phys. 80, 3574-3579 (1984)・
Electron energy loss spectroscopy of molecular fluorine. [E, F_2]

O W. C. Wang and L. C. Lee : J. Phys. D21, 675-682 (1988)・
Photodetachment cross sections of negative halogen ions in discharge media. [E, hν, F_2, Cl_2, HF, HCl, HBr, CH_3Br, etc.]

O J. D. Watts and R. J. Bartlett : J. Chem. Phys. 95, 6652-6657 (1991)
A coupled-cluster study of inversion symmetry breaking in the F_2^+ molecular ion. [T, F_2^+]

V C. F. Wong and J. C. Light : Phys. Rev. A30, 2264-2273 (1984)
A Application of R-matrix theory to resonant reactive electron-molecule scattering : vibrational excitation and dissociative attachment of N_2 and F_2. [T, F_2, N_2]

A S. F. Wong : Symp. Electron-Molecule Collisions, Tokyo 111-120 (1979)
Recent trends in beam experiments on dissociative attachment.
[T, F_2, Cl_2, SF_6]

O J. R. Woodworth and J. K. Rice : J. Chem. Phys. 69, 2500-2504 (1978)
An efficient, high-power F_2 laser near 157 nm. [E, F_2]

O K. Yamada, K. Miyazaki, T. Hasama and T. Sato : Appl. Phys. Lett. 54, 597-599 (1989)・
High-power discharge-pumped F_2 molecular laser. [E, F_2]

O V. V. Zaitsev, E. Yu. Zvereouskaya, V. D. Klimov and V. A. Savel'ev : J. Appl. Spectrosc. 35, 1177-1180 (1981)
Spectral charactersitics and electrical parameters of the positive column of a glow discharge in He + F_2 and Kr + F_2 mixtures.
[E, F_2 + He, F_2 + Kr]

E A. Zecca, G. P. Karwasz and R. S. Brusa : Rivista Nuovo Cimento 19, No. 1, 1-146
V (1996)・
EX One century of experiments on electron-atom and molecule scattering :
I A critical review of integral cross-sections. I. Atoms and diatomic
A molecules. [compilation, F_2, He - Xe, Li - Cs, H_2, N_2, O_2, etc.]

O G. Zhi-Yu, W. Shao-Yin, D. Proch, F. Rebentrost, H. Weber and K. L. Kompa : Appl. Phys. B31, 157-161 (1983)
Kinetic studies of Ar_2F^* in fast transverse-discharge-excited He-Ar-F_2 mixtures. [E, F_2 + He + Ar]

Addenda of References for F_2

EX T. H. J. Bisschops : Thesis, Eindhoven Univ. (1987)

0 H. H. Claassen, H. Selig and J. Shamir : Appl. Spectrosc. 23, 8-12 (1969)

0 H. G. M. Edwards, D. A. Long and R. Love : in Advances in Raman Spectroscopy, Vol. 1, J. P. Mathieu (Ed), 514-515 (1972)

0 P. J. Elving, C. A. Horton and H. H. Willard : in Fluorine Chemistry, Vol. II, J. H. Simons (Ed), Academic 56- (1954)

0 M. S. Gordon and D. G. Truhlar : Theor. Chim. Acta 71, 1-5 (1987)
The Hartree-Fock dissociation of F_2. [T, F_2; R = 1.3 - 5 A]

C. Mundel : PhD Thesis, University of Heidelberg (1985)

Author Index for F_2 References

Chlorine Molecule Cl_2

References for Cl_2 (1900 - 1999)

(Chlorine)

[Halogen]

E : Elastic collision,	R : Rotational excitation,
V : Vibrational excitation,	EX : Electronic excitation,
D : Dissociation,	I : Ionization,
A : Attachment,	QT : Grand total cross section,
S : Swarm,	α : Ionization coefficient,
O : The others,	[ ]: Additional informations,
	E : Exp., T : Theory.

The oldest paper in this list is given by E.R.Laird (1901).

A N.G.Adams, D.Smith and E.Alge : 3rd Int.Swarm Seminar, Innsbruck 42-45 (1983).
Electron attachment coefficients determined using a flowing afterglow/ Langmuir probe (FALP) apparatus.
[E, Cl_2, SF_6, CCl_4, CCl_3F, CCl_2F_2, $CHCl_3$; see D.Smith (1984)]

O R.G.Aickin and N.S.Bayliss : Trans.Faraday Soc.33, 1333-1338 (1937) C52
The continuous absorption spectrum of chlorine in the region 4000 - 5000 A. [E, $h\nu$, Cl_2; 291 - 982 K]

O M.S.N.Al-Kahali, R.J.Donovan, K.P.Lawley, T.Ridley and A.J.Yarwood : J.Phys. Chem. 99, 3978-3983 (1995)
Three-photon excitation of the lower 0_u^+ ion-pair states of Cl_2 via a continuum intermediate state. [E, $h\nu$, Cl_2]

O M.S.N.Al-Kahali, R.J.Donovan, K.P.Lawley, Z.Min and T.Ridley : J.Chem.Phys. 104, 1825-1832 (1996a)
Mass-resolved multiphoton ionization spectroscopy of jet-cooled Cl_2. I. Bound-free-bound spectroscopy. [E, $h\nu$, Cl_2]

O M.S.N.Al-Kahali, R.J.Donovan, K.P.Lawley and T.Ridley : J.Chem.Phys.104, 1833-1838 (1996b)
Mass-resolved multiphoton ionization spectroscopy of jet-cooled Cl_2. II. The (2+1) REMPI spectrum between 76000 and 90000 cm^{-1}.
[E, $h\nu$, Cl_2]

O E.v.Angerer : Z.Phys.11, 167-169 (1922)
Spectroskopische Messung der Elektronenaffinitat von Chlor.
[E, $h\nu$, Cl_2, Br_2, I_2; 2300 - 3200 A]

O B.S.Ault, W.F.Howard, Jr. and L.Andrews : J.Mol.Spectrosc.55, 217-228 (1975)
Laser-induced fluorescence and Raman spectra of chlorine and bromine molecules isolated in inert matrices. [E, $h\nu$, Cl_2, Br_2; 15 K]

A J. A. Ayala, W. E. Wentworth and E. C. M. Chen : J. Phys. Chem. 85, 768-777 (1981)·
Electron attachment to halogens.
[E, Cl_2, F_2, Br_2, I_2; thermal electron attachment]

O E. S. Aydil and D. J. Economou : J. Electrochem. Soc. 139, 1396-1406 (1992a)·C10
Theoretical and experimental investigations of chlorine RF glow discharges.
Ⅰ. Theoretical. [E and T, Cl_2]

O E. S. Aydil and D. J. Economou : J. Electrochem. Soc. 139, 1406-1412 (1992b)·
Theoretical and experimental investigations of chlorine RF glow discharges.
Ⅱ. Experimental. [E, Cl_2]

A R. Azria, R. Abouaf, D. Teillet-Billy and D. Babic : 12th ICPEAC, Gatlinburg 413-414 (1981)
Differential cross section for negative ions formation in halogen molecules. [E, Cl_2]

A R. Azria, R. Abouaf and D. Teillet-Billy : J. Phys. B15, L569-L574 (1982) C96
Symmetry of Cl_2^{-*} resonant states formed in dissociative electron attachment reaction on Cl_2. [E, Cl_2; 0 - 10 eV]

O R. Azria, L. Parenteau and L. Sanche : J. Chem. Phys. 87, 2292-2296 (1987) C118
A Dynamics of dissociative attachment reactions in electron stimulated desorption : Cl^- from condensed Cl_2. [E, Cl_2 on a Pt]

O A. P. M. Baede : Physica 59, 541-544 (1972)
The adiabatic electron affinities of Cl_2, Br_2, I_2, IBr, NO_2 and O_2.
[T, Cl_2 - I_2, O_2, NO_2, etc.]

S V. A. Bailey and R. H. Healey : Phil. Mag. 19, 725-746 (1935) C101
The behaviour of electrons in chlorine.
[E, Cl_2, Cl_2 + He, Cl_2 + CO_2; E/N = 30 - 240 Td]

V J. N. Bardsley : in Electron-Molecule and Photon-Molecule Collisions, Plenum
A 267-280 (1979)
Molecular resonance phenomena.
[review, Cl_2, F_2, I_2, H_2, N_2, O_2, NO, HCl]

O N. L. Bassett and D. J. Economou : J. Appl. Phys. 75, 1931-1939 (1994) C11
Effect of Cl_2 additions to an argon glow discharge.
[T, Cl_2 + Ar; B. Eq., see E. S. Aydel (1992ab) and P. Jiang (1993)]

O A. D. Becke : Int. J. Qunat. Chem. : Quant. Chem. Symp. 28, 625-632 (1994)
Thermochemical tests of a kinetic-energy dependent exchange-correlation approximation. [T, Cl_2, HF, SiH_4, etc.]

O A. T. Bell : Techniques and Applications of Plasma Chemistry, John Wiley and Sons (1974)

O A. Benz and H. Morgner : Mol. Phys. 57, 319-336 (1986)
Transition state spectroscopy with electrons. The reaction of He(2^3S, 2^1S) with Cl_2. [T, Cl_2; not e, not $h\nu$]

O N. Billy, B. Girard, G. Gouedard and J. Vigue : J. Chem. Phys. 89, 1196-1198 (1988)
Hyperfine predissociation of the B state of Cl_2. [E, hν, Cl_2]

O N. Billy, G. Gouedard, B. Girard and J. Vigue : J. Physique II, 1, 323-342 (1991)
Lifetimes and predissociations in the Cl_2 B-state. [E, Cl_2]

D V. V. Boiko, A. T. Rakhimov and N. V. Suetin : Sov. Phys. Tech. Phys. 35, 1268-1275 (1990) ·C8
Mathematical modeling of a planar rf reactor with radical etching.
[T, Cl_2]

O V. E. Bondybey and C. Fletcher : J. Chem. Phys. 64, 3615-3620 (1976) C81
Photophysics of low lying electronic states of Cl_2 in rare gas solids. [E, hν, Cl_2]

α S. E. Bozin and C. C. Goodyear : Brit. J. Appl. Phys. 18, 49-57 (1967) C102
A Measurement of ionization and attachment coefficients in chlorine.
[E, Cl_2; E/N = 210 - 750 Td, 293 K]

A N. E. Bradbury : J. Chem. Phys. 2, 827-834 (1934) C125
Formation of negative ions in gases by electron attachment. Part I. NH_3, CO, NO, HCl and Cl_2. [E, Cl_2, NH_3, CO, NO, HCl]

O M. Braunstein and V. McKoy : J. Chem. Phys. 92, 4887-4892 (1990)
Studies of valence shell photoionization of Cl_2.
[T, hν, Cl_2; th.~ 20 eV]

O N. J. Bridge and A. D. Buckingham : Proc. Roy. Soc. London A295, 334-349 (1966)
The polarization of laser light scattered by gases.
[T and E, hν, Cl_2, HCl, H_2, D_2, N_2, CO, NO, O_2, CO_2, N_2O, SO_2, NH_3, etc.]

O A. G. Briggs and R. G. W. Norrish : Proc. Roy. Soc. London A276, 51-68 (1963)
Transient absorption spectra of chlorine and bromine.
[E, hν, Cl_2, Br_2]

O M. Brith, M. D. Rowe, O. Schnepp and P. J. Stephens : Chem. Phys. 9, 57-73 (1975)
The magnetic circular dichroism spectrum of the halogen molecules I_2, Br_2, Cl_2. Resolution of overlapping continua.
[E, hν, Cl_2, Br_2, I_2; 250 - 800 nm]

O J. B. Burkholder and E. J. Bair : J. Phys. Chem. 87, 1859-1863 (1983) C62
Potential energy parameters and shapes of the vibrational components of the 345-nm system of chlorine. [E, hν, Cl_2; 195, 301 K]

O G. E. Busch, R. T. Mahoney, R. I. Morse and K. R. Wilson : J. Chem. Phys. 51, 449-450 (1969)
Translational spectroscopy : Cl_2 photodissociation. [E, hν, Cl_2]

O J. Le Calve, M. C. Castex, D. Haaks, B. Jordan and G. Zimmerer : Nuovo Cimento 63B, 265-275 (1981)
Time-resolved study of the UV fluorescence of chlorine under synchrotron radiation excitation of Cl_2/rare-gas mixtures.
[E, hν, Cl_2, Cl_2 + (Ar, Kr); 1350 - 2000 A]

O W. H. B. Cameron and A. Elliott : Proc. Roy. Soc. London A169, 463-469 (1939)
The emission band spectrum of chlorine. Ⅲ. Continua.
[E, hν, Cl_2; Ⅱ see A. Elliott (1938)]

E M. Capitelli, R. Celiberto and M. Cacciatore : in Advances in Atomic, Molecular
V and Optical Physics, Vol. 33, Academic 321-372 (1994)
EX Needs for cross sections in plasma chemistry.
I [review, Cl_2, H_2, N_2, O_2, CO, HCl, F_2, HF, CO_2, etc.]

O R. A. Carabetta and H. B. Palmer : J. Chem. Phys. 46, 1325-1332 (1967a)
Radiative recombination of chlorine atoms in shock waves.
[E, hν, Cl_2 + Ar; 2200 K]

O R. A. Carabetta and H. B. Palmer : J. Chem. Phys. 46, 1333-1338 (1967b)
Rate of dissociation of chlorine in shock waves.
[E, Cl_2 + Ar, Cl_2 + Ar + O_2; 1735 - 2582 K]

O T. A. Carlson, M. O. Krause, F. A. Grimm and T. A. Whitley : J. Chem. Phys. 78, 638-642 (1983) C71
Angle-resolved photoelectron spectroscopy of Cl_2 as a function of photon energy from 18 to 70 eV. [E, hν, Cl_2]

O M. C. Castex, J. le Calve, D. Haaks, B. Jordan and G. Zimmerer : Chem. Phys. Lett. 70, 106-111 (1980) C26
Formation of $KrCl^*$ and $ArCl^*$ molecules and radiative lifetimes of their B states investigated with selective synchrotron radiation excitation.
[E, hν, Cl_2 + Kr, Cl_2 + Ar]

I R. E. Center and A. Mandl : J. Chem. Phys. 57, 4104-4105 (1972)·C107
Ionization cross sections of F_2 and Cl_2 by electron impact.
[E, Cl_2, F_2; th. - 100 eV]

O V. Cermak : J. Elect. Spectrosc. Relat. Phenom. 6, 135-144 (1975)
Electron spectroscopy of autoionizing states of oxygen, chlorine, and bromine atoms. [E, hν, Cl_2, Br_2, O_2; 21.217 eV]

O H. Chang and D.-M. Hwang : J. Chem. Phys. 67, 4777-4778 (1977)
The resonance Raman spectrum of gaseous chlorine. [E, hν, Cl_2]

O J. P. Chang, A. P. Mahorowala and H. H. Sawin : J. Vac. Sci. Technol. A16, 217-224 (1998) C20
Plasma-surface kinetics and feature profile evolution in chlorine etching of polysilicon. [E, Cl_2]

A P. J. Chantry : Applied Atomic Collision Physics, Vol. 3, Gas Lasers, Academic Press 35-70 (1982) C127
Negative ion formation in gas lasers.
[review, Cl_2, F_2, I_2, HCl, CO_2, CCl_4, NF_3, SF_6, $HgBr_2$]

O E. C. M. Chen and W. E. Wentworth : J. Phys. Chem. 89, 4099-4105 (1985)
Negative ion states of the halogens. [T, F_2 - I_2, F - I]

O C. C. Cheng, K. V. Guinn, V. M. Donnelly and I. P. Herman : J. Vac. Sci. Technol. A12, 2630-2640 (1994) C14
In-situ pulsed laser-induced thermal desorption studies of the silicon chloride surface layer during silicon etching in high density plasmas of Cl_2 and Cl_2/O_2 mixtures. [E, Cl_2, $Cl_2 + O_2$]

O A. I. Chichini : Chem. Phys. Lett. 209, 459-463 (1993)
Measurement of $Cl(^2P_{1/2})$ quantum yield for the photodissociation of NOCl, ICl, PCl_3, Cl_2O and $COCl_2$. [E, $h\nu$, Cl_2, HCl, CCl_4, NOCl, etc.]

O M. S. Child and R. B. Bernstein : J. Chem. Phys. 59, 5916-5925 (1973)
Diatomic interhalogens : Systematics and implications of spectroscopic interatomic potentials and curve crossings. [T, F_2 - I_2, IBr, etc.]

A A. A. Christodoulides, R. Schumacher and R. N. Schindler : J. Phys. Chem. 79, 1904-1911 (1975) C130
Studies of the electron cyclotron resonance technique. X. Interactions of thermal-energy electrons with molecules of chlorine, hydrogen chloride, and methyl chloride. [E, Cl_2, HCl, CH_3Cl; 293 - 513 K]

O A. A. Christodoulides, D. L. McCorkle and L. G. Christophorou : in Electron Molecule Interactions and Their Applications, Vol. 2, Academic Press 423-641 (1984) C74
Electron affinities of atoms, molecules, and radicals.
[review, F_2 - I_2, etc. ; EA(Cl_2) = 1.02 - 3.2 eV]

O L. G. Christophorou : Atomic and Molecular Radiation Physics, Wiley (1971)

A L. G. Christophorou : Contrib. Plasma Phys. 27, 237-281 (1987) · C173
Electron attachment and detachment processes in electronegative gases.
[review, E, Cl_2, F_2, SF_6, perfluoroalkanes]

E L. G. Christophorou and J. K. Olthoff : J. Phys. Chem. Ref. Data 28, 131-169 (1999) ○
V Electron interactions with Cl_2. [compilation, Cl_2, Cl, Cl^+]

O W. A. Chupka, J. Berkowitz and D. Gutman : J. Chem. Phys. 55, 2724-2733 (1971)
Electron affinities of halogen diatomic molecules as determined by endoergic charge transfer. [E, F_2 - I_2]

O M. A. A. Clyne and J. A. Coxon : Proc. Roy. Soc. London A298, 424-452 (1967)
The formation and detection of some low-lying excited electronic states of BrCl and other halogens. [E, $h\nu$, Cl_2, BrCl, ICl]

O M. A. A. Clyne and D. S. Stedman : Trans. Faraday Soc. 64, 1816-1835 (1968)
Recombination of ground-state halogen atoms. Part 1. — Radiative recombination of chlorine atoms. [E, $h\nu$, Cl_2, Br_2]

O M. A. A. Clyne and J. A. Coxon : J. Mol. Spectrosc. 33, 381-406 (1970)
The visible band absorption spectrum of chlorine.
[E, $h\nu$, Cl_2; $A^3\Pi(0_u^+) \leftarrow X^1\Sigma_g^+$, 670 K]

O M. A. A. Clyne and I. S. McDermid : J. Chem. Soc. Faraday Trans. II 74, 1935-1946 (1978)
Laser-induced fluorescence studies : the B - X transition of Cl_2. Part 1 - Rotationally-resolved excitation spectra and predissociation in the excited $B^3\Pi(0_u^+)$ state. [E, $h\nu$, Cl_2]

O M. A. A. Clyne and I. S. McDermid : J. Chem. Soc. Faraday Trans. II 75, 280-291 (1979a)
Laser-induced fluorescence studies : B - X transition of Cl_2. Part 2 - Transition from bound to unbound excited states. [E, $h\nu$, Cl_2]

O M. A. A. Clyne and I. S. McDermid : J. Chem. Soc. Faraday Trans. II 75, 1313-1326 (1979b)
Laser-induced fluorescence studies : the B - X transition of Cl_2. Part 3 - Collisional energy transfer rates in the $B^3\Pi(0_u^+)$ state of Cl_2. [E, $h\nu$, Cl_2]

O M. A. A. Clyne and I. S. McDermid : J. Chem. Soc. Faraday Trans. II 75, 1677-1691 (1979c)
Laser-induced fluorescence studies : the B - X transition of Cl_2. Part 4 - Predissociation in the B state. [E, $h\nu$, Cl_2]

O M. A. A. Clyne and E. Martinez : J. Chem. Soc. Faraday Trans. II 76, 1275-1292 (1980a)
Laser-induced fluorescence studies : the B - X transition of Cl_2. Part 5 - Radiative lifetime of the B state. [E, $h\nu$, Cl_2]

O M. A. A. Clyne and E. Martinez : J. Chem. Soc. Faraday Trans. II 76, 1561-11568 (1980b)
Laser-induced fluorescence studies : the B - X transition of Cl_2. Part 6 - Rotationally-dependent predissociation. [E, $h\nu$, Cl_2]

O M. A. A. Clyne, M. C. Heaven and J. Tellinghuisen : J. Chem. Phys. 76, 5341-5349 (1982)
Theoretical treatment of the spontaneous predissociation of Br_2, $B^3\Pi(0_u^+)$. [T, $h\nu$, Cl_2, Br_2, I_2; mostly for Br_2]

O J. W. Coburn : Plasma Chem. Plasma Process. 2, 1-41 (1982)
Plasma-assisted etching. [review, Cl_2, F_2, CF_4, C_2F_6, etc.]

I J. E. Collin : Can. J. Chem. 40, 2172-2175 (1962)
The Franck-Condon principle and the ionization of molecules. [compilation, F_2 - I_2, HF - HI, H_2, N_2, O_2, CO, NO, CO_2]

QT G. D. Cooper, J. E. Sanabia, J. H. Moore, J. K. Olthoff and L. G. Christophorou : J. Chem. Phys. 110, 682-683 (1999)○ C93
Total electron scattering cross section for Cl_2. [E, Cl_2; 0.3 - 23 eV]

O H. Cordes und H. Sponer : Z. Phys. 63, 334-344 (1930)
Die Molekulabsorption des Chlors, Broms, Jodchlorids und Jodbromids im aussersten Ultraviolet. [E, $h\nu$, Cl_2, Br_2, ICl, IBr; 1560 - 3000 A]

O J. A. Coxon : J. Quant. Spectrosc. Radiat. Transf. 11, 443-462 (1971a)
The calculation of potential energy curves of diatomic molecule : Application to halogen molecules. [T, Cl_2, Br_2, I_2]

O J. A. Coxon and R. Schanker : J. Mol. Spectrosc. 69, 109-122 (1978)
Rotational analysis of the $B^3\Pi(0^+) \rightarrow X^1\Sigma^+$ band systems of $^{35}Cl^{35}Cl$ and $^{35}Cl^{37}Cl$ in the chlorine afterglow emission spectrum.
[E, $h\nu$, Cl_2; 6300 - 9900 A]

O J. A. Coxon : J. Mol. Spectrosc. 82, 264-282 (1980)
Revised molecular constants, RKR potential, and long-range analysis for the $B^3\Pi(0_u^+)$ state of Cl_2, and rotationally dependent Franck-Condon factors for $Cl_2(B \leftrightarrow X^1\Sigma_g^+)$. [compilation, Cl_2]

O A. B. Cornford, D. C. Frost, C. A. McDowell, J. L. Ragle and I. A. Stenhouse : J. Chem. Phys. 54, 2651-2657 (1971) · C69
Photoelectron spectra of the halogens. [E, $h\nu$, F_2 - I_2]

D P. C. Cosby : 42nd GEC, Palo Alto J-24 (1989);
Bull. Am. Phys. Soc. 35, 1822-1822 (1990) C113
Electron-impact dissociation of Cl_2 molecules.
[E, Cl_2; q_d max. 2.1 A^2 near 15 eV]

D P. C. Cosby : Meeting Division Atomic Molecular Optical Physics, (1990)
Dissociation of chlorine molecules. [E, Cl_2]

D P. C. Cosby : 17th ICPEAC, Brisbane 261-261 (1991)
Electron-impact dissociation of chlorine in a fast beam.
[E, Cl_2; 7 - 100 eV]

D P. C. Cosby and H. Helm : SRI Report, PYU 1147/MP 92-280 (1992a)

D P. C. Cosby and H. Helm : Wright Lab. Report No. WL-TR-93-2004 (1992b) C114

O T. L. Cottrell : The Strength of Chemical Bonds, Butterworths (19)
[$D(Cl_2)$ = 2.48 eV]

O J. A. Coxon : J. Quant. Spectrosc. Radiat. Transf. 11, 443-462 (1971a)
The calculation of potential energy curves of diatomic molecules : Application to halogen molecules. [T, Cl_2, Br_2, I_2]

O J. A. Coxon : J. Quant. Spectrosc. Radiat. Transf. 11, 1355-1364 (1971b)
Franck-Condon factors and r-centroids for halogen molecules. - I. The $B^3\Pi(0_u^+) - X^1\Sigma_g^+$ system of $^{35}Cl_2$. [T, Cl_2]

O J. A. Coxon : in Molecular Spectroscopy, Vol. I, The Chemical Soc., London 177- (1973)
The low-lying electronic states of diatomic halogen molecules.
[review, Cl_2 - I_2,

O J. A. Coxon : J. Mol. Spectrosc. 82, 264-282 (1980) C60
Revised molecular constants, RKR potential and long-range analysis for the $B^3\Pi(0_u^+)$ state of Cl_2, and rotationally dependent Franck-Condon factors for Cl_2 ($B \longleftrightarrow X^1\Sigma_g^+$). [compilation, Cl_2]

O P. Czuprynski, O. Joubert and L. Vallier : J. Vac. Sci. Technol. B16, 147-158 (1998)·
X-ray photoelectron spectroscopy analysies of metal stacks etched in Cl_2/BCl_3 high density plasmas. [E, Cl_2 + BCl_3]

O R. d'Agostino, F. Cramarossa, F. Fracassi, F. Illuzzi and M. N. Armenise : J. Vac. Sci. Technol. B6, 1584-1591 (1988)·C4
Anomalous regimes for GaAs etching in Cl_2 - Ar plasmas. [E, Cl_2 + Ar]

O R. d'Agostino, F. Cramarossa, S. De Benedictis and F. Fracassi : Plasma Chem. Plasma Process. 4, 163-178 (1984)·
Optical emission spectroscopy and actinometry in CCl_4-Cl_2 radiofrequency discharges. [E, Cl_2 + CCl_4]

S H. Date, P. L. G. Ventzek, M. Shimozuma and H. Tagashira : J. Appl. Phys. 79, 2902-2908 (1996)·
Electron swarm parameters in ramp electric fields. [T, Cl_2, model gas]

O V. V. Datsyuk, I. A. Izmailov and V. A. Kochelap : Phys. Usp. 41, 379-402 (1998)·
Vibrational relaxation of excimers. [review, Cl_2, F_2, HCl, He - Xe]

O J. J. DeCorpo and J. L. Franklin : J. Chem. Phys. 54, 1885-1888 (1971)
A Electron affinities of the halogen molecules by dissociative electron attachment. [E, Cl_2, CCl_4, BF_3, etc.]

O P. G. Deo : Phil. Mag. 39, 978-984 (1948)
On the emission spectrum of chlorine under conditions productive of Joshi-effect. [E, $h\nu$, Cl_2]

O S. C. Deshmukh and D. J. Economou : J. Appl. Phys. 72, 4597-4607 (1992)·C12
Factors affecting the Cl atom density in a chlorine discharge.
[T, Cl_2, Cl; c.s. set for Cl_2 and Cl, B. Eq.]

O R. W. Diesen, J. C. Wahr and S. E. Adler : J. Chem. Phys. 50, 3635-3636 (1969)
Photochemical recoil spectroscopy. [E, $h\nu$, Cl_2, NO_2]

O R. W. Diesen, J. C. Wahr and S. E. Adler : J. Chem. Phys. 55, 2812-2819 (1971)
Photochemical recoil spectroscopy : Chlorine spectrum and scattering analysis. [E, $h\nu$, Cl_2; photodissociation]

A J. G. Dillard : Chem. Rev. 73, 589-643 (1973)·
Negative ion mass spectrometry.
[review, Cl_2, F_2, Br_2, I_2, CCl_4, CH_3Cl, etc.]

O S. Dobosz, M. Lewenstein, M. Lezius, D. Normand and M. Schmidt : J. Phys. B30, L757-L765 (1997)
Multiple ionization of chlorine in strong laser fields : II. Spatial ion distribution. [E, $h\nu$, Cl_2]

O J. G. Dojahn, E. C. M. Chen and W. E. Wentworth : J. Phys. Chem. 100, 9649-9657 (1996)・C90
Characterization of homonuclear diatomic ions by semiempirical Morse potential energy curves. 1. The halogen anions. [T, F_2 - I_2, At_2]

O M. Dolg : Mol. Phys. 88, 1645-1655 (1996)
Accuracy of energy-adjusted quasirelativistic pseudopotentials : A calibration study of XH and X_2 (X = F, Cl, Br, I, At).
[T, F_2 - I_2, At_2, HF - HI, HAt]

O V. M. Donnelly, D. L. Flamm and D. E. Ibbotson : J. Vac. Sci. Technol. A1, 626-628 (1983)
Plasma etching of Ⅲ-Ⅴ compound semiconductors.
[review, Cl_2, Br_2, CCl_2F_2, etc.]

O H. Doshita, K. Ohtani and A. Namiki : J. Vac. Sci. Technol. A16, 265-269 (1998) C21
Dynamical aspect of Cl_2 reaction on Si surfaces. [E, Cl_2]

O A. E. Douglas, C. K. Mϕller and B. P. Stoicheff : Can. J. Phys. 41, 1174-1192 (1963) C56
The absorption spectrum of $^{35}Cl_2$ from 4780 to 6000 A. [E, hν, Cl_2]

O A. E. Douglas and A. R. Hoy : Can. J. Phys. 53, 1965-1975 (1975)・
The resonance fluorescence spectrum of Cl_2 in the vacuum ultraviolet.
[E, hν, Cl_2]

O A. E. Douglas : Can. J. Phys. 59, 835-840 (1981)・C61
The absorption spectrum of Cl_2 in the vacuum ultraviolet. [E, hν, Cl_2]

A G. F. Drukarev and S. A. Pozdneev : 11th ICPEAC, Kyoto 346-347 (1979)・
Calculation of dissociative attachment cross section to F_2, Cl_2 and I_2 molecules. [T, Cl_2, F_2, I_2; 0.7 - 1 eV for Cl_2]

O H. G. M. Edwards, E. A. M. Good and D. A. Long : J. Chem. Soc. Faraday Trans. Ⅱ 72, 927-933 (1976)
Pure rotational Raman spectra of the chlorine species, $^{35}Cl_2$ and $^{35}Cl^{37}Cl$.
[E, hν, Cl_2]

EX A. M. Efremov, V. I. Svetsov and V. P. Michalkin : High Energy Chem. 29, 433-434
S (1995) C41
Refinement of excitation cross sections for electronic states of molecules in mathematical modeling of chlorine plasma. [T, Cl_2]

O J. H. D. Eland : in Electron Spectroscopy : Theory, Techniques, and Applications, Vol. 3, C. R. Brundle and A. D. Baker (Ed), Academic (1979) C70

A A. V. Eletskii and B. M. Smirnov : Sov. Phys. Usp. 28, 956-971 (1985)・
Dissociative attachment of an electron to a molecule.
[review, F_2 - I_2, etc.]

O A. Elliott : Proc. Roy. Soc. London A123, 629-644 (1929)
The absorption band spectrum of chlorine. [E, hν, Cl_2]

O A. Elliott : Proc. Roy. Soc. London A127, 638-657 (1930)
The absorption band spectrum of chlorine – II.
[E, hν, $Cl^{35}Cl^{35}$, $Cl^{35}Cl^{37}$]

O A. Elliott and W. H. B. Cameron : Proc. Roy. Soc. London A158, 681-691 (1937) C137
The emission band spectrum of chlorine – I. [E, hν, Cl_2]

O A. Elliott and W. H. B. Cameron : Proc. Roy. Soc. London A164, 531-546 (1938) C138
The emission band spectrum of chlorine (Cl_2^+). II.
[E, hν, Cl_2; III see W. H. B. Cameron (1939)]

R A. Ernesti, M. Gote and H. J. Korsch : Phys. Rev. A52, 1266-1271 (1995)・C99
Rotational excitation in two-center Coulomb-scattering systems : Application to electron-molecule collisions.
[T, Cl_2, HCl, CO, N_2; 10^2 - 10^3 eV]

O W. C. Fergusson, L. Slotin and D. W. G. Style : Trans. Faraday Soc. 32, 956-962 (1936) C51
Absorption spectrum of aqueous chlorine and hydrogen peroxide vapour.
[E, hν, Cl_2, HClO]

O D. S. Fischl and D. W. Hess : J. Vac. Sci. Technol. B6, 1577-1580 (1988) C3
Molybdenum etching with chlorine atoms and molecular chlorine plasmas.
[E, Cl_2; 343 - 453 K]

QT J. B. Fisk : Phys. Rev. 51, 25-28 (1937)・C91
On the cross sections of Cl_2 and N_2 for slow electrons.
[E, Cl_2, N_2; 2 - 40 eV]

O D. L. Flamm and V. M. Donnelly : Plasma Chem. Plasma Process. 1, 317-363 (1981)
The design of plasma etchants.
[review, Cl_2, F_2, Br_2, CF_4, BCl_3, etc.]

O D. L. Flamm : in Gaseous Dielectrics V, Pergamon Press 317-325 (1987)・
Gaseous media for plasma chemistry and etching.
[review, Cl_2, CF_4, C_2F_6, etc.]

O G. I. Font and I. D. Boyd : J. Vac. Sci. Technol. A15, 313-319 (1997) C19
Numerical study of the effects of reactor geometry on a chlorine plasma helicon etch reactor. [T, Cl_2; c. s. set]

O J. Fournier, F. Salama and R. J. LeRoy : J. Phys. Chem. 89, 3530-3534 (1985)
Ultraviolet photolysis and internal dynamics of Cl_2 in an argon matrix at 4.2 K. [E, hν, Cl_2]

D. C. Frost and C. A. McDowell : in Advances in Mass Spectrometry, Pergamon Press 413-430 (1959)
Recent electron impact studies on simple molecules (O_2, Cl_2, I_2).
[E, Cl_2, I_2, O_2]

I D. C. Frost and C. A. McDowell : Can. J. Chem. 38, 407-420 (1960)・C76
A The ionization and dissociation of some halogen molecules by electron impact. [E, Cl_2, Br_2, I_2, ICl, IBr; Cl^+ 12 - 20 eV, Cl^- 1.5 - 3.5 eV and 12 - 19 eV]

O D. C. Frost, C. A. McDowell and D. A. Vroom : J. Chem. Phys. 46, 4255-4259 (1967) C67
Photoelectron spectra of the halogens and the hydrogen halides.
[E, $h\nu$, F_2 - I_2, HF - HI]

I L. Frost, A. M. Grisogokno, I. E. McCarthy, E. Weigold, C. E. Brion, A. O. Bawagan, P. K. Mukherjee, W. Von Niessen, M. Rosi and A. Sgamellotti : Chem. Phys. 113, 1-18 (1987) C77
Orbital momentum distributions and binding energies for the complete valence shell of molecular chlorine by electron momentum spectroscopy.
[E, Cl_2]

S J. W. Gallagher, E. C. Beaty, J. Dutton and L. C. Pitchford : JILA Information Center Report No. 22, 1-258 (1982)・
A compilation of electron swarm data in electro-negative gases.
[compilation, F_2 - I_2, NF_3, SF_6, etc.]

S J. W. Gallagher, E. C. Beaty, J. Dutton and L. C. Pitchford : J. Phys. Chem. Ref. Data 12, 109-152 (1983)・
An annotated compilation and appraisal of electron swarm data in electro-negative gases. [compilation, Cl_2, CF_4, SF_6, NH_3, etc.; 19 molecules]

O J. W. Gallagher, C. E. Brion, J. A. R. Samson and P. W. Langhoff : J. Phys. Chem. Ref. Data 17, 9-153 (1988) C64
Absolute cross sections for molecular photoabsorption, partial photo-ionization and ionic photofragmentation processes. [compilation, $h\nu$, Cl_2, H_2, N_2, O_2, NO, CO, CO_2, N_2O, H_2O, NH_3, CH_4, SF_6, etc.]

O J. A. Ganske, H. N. Berko and B. J. Finlayson-Pitts : J. Geophys. Res. 97, 7651-7656 (1992)・C65
Absorption cross sections for gaseous $ClNO_2$ and Cl_2 at 298 K : Potential organic oxidant source in the marine tropoaphere.
[E, $h\nu$, Cl_2, etc.; 270 - 400 nm for Cl_2]

O F. Ghandour, M. Jacon, E. N. Svendsen and J. Oddershede : J. Chem. Phys. 79, 2150-2156 (1983)・
Theoretical interpretation of the resonance Raman spectrum of gaseous chlorine. [T, Cl_2; Raman band profiles excited by a 3638 A photon]

O G. E. Gibson and N. S. Bayliss : Phys. Rev. 44, 188-192 (1933a) C49
Variation with temperature of the continuous absorption spectrum of diatomic molecules : Part I. Experimental, the absorption spectrum of chlorine. [E, $h\nu$, Cl_2; 291 - 1038 K, 2618 - 4275 A]

O G. E. Gibson, O. K. Rice and N. S. Bayliss : Phys. Rev. 44, 193-200 (1933b)
Variation with temperature of the continuous absorption spectrum of diatomic molecules : Part II. Theoretical. [T, $h\nu$, Cl_2]

O T. L. Gilbert and A. C. Wahl : J. Chem. Phys. 55, 5247-5261 (1971) C85
Single-configuration wavefunctions and potential curves for low-lying states of He_2^+, Ne_2^+, Ar_2^+, F_2^-, Cl_2^- and the ground states of Cl_2.
[T, Cl_2, Cl_2^-, Ar_2^+, etc.]

O A. P. Golovitskii and G. N. Mikhailov : Opt. Spectrosc. 81, 534-537 (1996)
Coefficient of absorption of UV radiation by molecular chlorine at elevated temperatures. [T, $h\nu$, Cl_2; 500 - 3000 K, 3650, 3850 A]

O O. Goscinski : Mol. Phys. 24, 655-659 (1972)
Outer vibrational truning points near dissociation in the $B(^3\Pi_{OU}^+)$ state of Br_2 and Cl_2. [T, Cl_2, Br_2]

R M. Gote and H. Ehrhardt : J. Phys. B28, 3957-3986 (1995)○ C94
Rotational excitation of diatomic molecule at intermediate energies : Absolute differential state-to-state transition cross sections for electron scattering from N_2, Cl_2, CO and HCl. [E, Cl_2, N_2, CO, HCl]

O R. A. Gottscho, R. H. Burton, D. L. Flamm, V. M. Donnelly and G. P. Davies : J. Appl. Phys. 55, 2707-2714 (1984a)
Ion dynamics of rf plasmas and plasma sheaths : A time-resolved spectroscopic study. [E, Cl_2 + N_2]

O R. A. Gottscho and V. M. Donnelly : J. Appl. Phys. 56, 245-250 (1984b)
Optical emission actinometry and spectral line shapes in rf glow discharges. [E, Cl_2 + Ar, CF_4 + O_2 + Ar]

O G. Gouedard, N. Billy, B. Girard and J. Vigue : Can. J. Phys. 66, 721-723 (1988)・
Isotope shifts in the Cl_2 B - X system.
[E, $^{35-35}Cl_2$, $^{35-37}Cl_2$, $^{37-37}Cl_2$]

O T. E. Graedel and P. J. Crutzen : Chemie der Atmosphare, Spektrum Akademischer (1994) C32

O F. Grein, S. D. Peyerimhoff and R. J. Buenker : Can. J. Phys. 62, 1928-1932 (1984)・
Ab initio studies on the oscillator strength of the $2^3\Pi_u$ - $X^1\Sigma_g^+$ spin-forbidden transition in Cl_2. [T, Cl_2]

E R. J. Gulley, T. A. Field, W. A. Steer, N. J. Mason, S. L. Lunt, J.-P. Ziesel and D. Field :
QT J. Phys. B31, 2971-2980 (1998)○ C92
Very low energy electron collisions with molecular chlorine.
[E, Cl_2; 0.020 - 9.5 eV]

O P. Gurtler, H. Kunz and J. le Calve : J. Chem. Phys. 91, 6020-6028 (1989)
Vacuum ultraviolet spectroscopy of the Cl_2 molecule trapped in pure neon, pure argon, or mixed neon-argon matrices. [E, $h\nu$, Cl_2]

O H. v. Halban und K. Siedentopf : Z. Phys. Chemie 103, 71-90 (1923)
Die Lichtabsorption des Chlors. [E, $h\nu$, Cl_2]

0 J. C. Han, M. Suto and J. C. Lee : J. Appl. Phys. 68, 2649-2656 (1990) C133
Transient signals induced by laser irradiation of negative ions in hollow electrode discharge of Cl_2 and HCl in N_2.
[E, Cl_2 + N_2, HCl + N_2]

0 P. B. V. Haranath and P. Tiruvenganna Rao : Indian J. Phys. 31, 175-176 (1957)
New emission spectrum of chlorine in the Schumann region.
[E, hν, Cl_2; 1400 - 1820 A]

0 P. B. V. Haranath and P. Tiruvenganna Rao : J. Mol. Spectrosc. 2, 428-463 (1958a)
Band spectra of iodine, chlorine, and bromine in the spectral region 2400 - 1400 A. [E, hν, Cl_2, Br_2, I_2]

0 P. B. V. Haranath and P. Tiruvenganna Rao : Indian J. Phys. 32, 401-417 (1958b)
The emission spectrum of chlorine (Cl_2^+). [E, hν, Cl_2; PA5924 (1960)]

0 M. Hayashi and Y. Nakamura : EMS-99, Tokyo 175-176 (1999)
May we measure the exact values of electron collision cross sections for molecules by beam and swarm experiments ?
[general comment; Cl_2 is the mixtures of Cl_2(r) and Cl_2(v)]

0 A. K. Hays : Opt. Comm. 28, 209-212 (1979) C25
Laser oscillation on the 2580 A band system of molecular chlorine.
[E, hν, Cl_2]

0 G. A. Hebner : J. Vac. Sci. Technol. A14, 2158-2162 (1996) C134
Negative ion density in inductively coupled chlorine plasmas. [E, Cl_2]

0 P. J. Hendra and C. J. Vear : Spectrochimica Acta 28A, 1949-1961 (1972)
The pure rotational laser Raman spectrum of chlorine. [E, hν, Cl_2]

0 G. Herzberg : Molecular Spectra and Molecular Structure, I. Spectra of Diatomic Molecules, Van Nostrand (1950) C42

0 P. C. Hiberty, S. Humbel and P. Archirel : J. Phys. Chem. 98, 11697-11704 (1994)
Nature of the differential electron correlation in three-electron bond dissociations. Efficiency of a simple two-configuration valence bond method with breathing orbitals. [T, Cl_2^-, F_2^-, $(H_3N - NH_3)^+$]

0 G. Hochenbleicher and H. W. Schrotter : Appl. Spectrosc. 25, 360-362 (1971)
Observation of hot bands in the Raman spectra of Cl_2 gas and CCl_4 vapor.
[E, hν, Cl_2, CCl_4]

0 W. Holzer, W. F. Murphy and H. J. Bernstein : J. Chem. Phys. 52, 399-407 (1970a)
Resonance Raman effect and resonance fluorescence in halogen gases.
[E, hν, Cl_2, Br_2, I_2, BrCl, etc.]

0 W. Holzer, W. F. Murphy and H. J. Bernstein : J. Chem. Phys. 52, 469-470 (1970b)
Resonance fluorescence of iodine, bromine, and chlorine gases obtained with argon-ion laser excitation. [E, hν, Cl_2, Br_2, I_2]

0 H. G. Howell : Proc. Phys. Soc. London A66, 759-764 (1953) C139
The visible emission spectrum of Cl_2^+. [T, hν, Cl_2]

O K. P. Huber and G. Herzberg : Molecular Spectra and Molecular Structure. IV. Constants of Diatomic Molecules. Van Nostrand Reinhold Company 146-149 (1979) C45

O F. P. Huberman : J. Mol. Spectrosc. 20, 29-64 (1966)
The emission spectrum of Cl_2^+. [E, hν, Cl_2]

O S. Hubinger and J. B. Nee : J. Photochem. Photobiol. A86, 1-17 (1995) C66
Absorption spectra of Cl_2, Br_2 and BrCl between 190 and 600 nm.
[E, hν, Cl_2, Br_2, etc.]

O B. M. Hughes, C. Lifshitz and T. O. Tiernan : J. Chem. Phys. 59, 3162-3181 (1973) C122
Electron affinities from endothermic negative-ion charge-transfer reactions. Ⅲ. NO, NO_2, SO_2, CS_2, Cl_2, Br_2, I_2, and C_2H_2.
[E, Cl_2, Br_2, I_2, etc.]

E V 1 W. M. Huo and Y. -K. Kim : IEEE Trans. Plasma Sci. 27, 1225-1240 (1999)
Electron collision cross-section data for plasma modeling.
[review, Cl_2, F_2, CH_4 - C_3H_8, etc.]

O D. -M. Hwang and H. Chang : J. Mol. Spectrosc. 69, 11-18 (1978)
Resonance fluorescence of gaseous chlorine excited with a single longitudinal mode argon ion laser. [E, hν, Cl_2]

O D. E. Ibbotson, D. L. Flamm and V. M. Donnelly : J. Appl. Phys. 54, 5974-5981 (1983)
Crystallographic etching of GaAs with bromine and chlorine plasmas.
[E, Cl_2, Br_2]

O R. P. Iczkowski, J. L. Margrave and J. W. Green : J. Chem. Phys. 33, 1261-1262 (1960) C55
Absorption spectrum of chlorine in the vacuum ultraviolet.
[E, hν, Cl_2; 1350 - 1100 A]

O T. Ishiwata, I. Fujiwara, T. Shinzawa and I. Tanaka : J. Chem. Phys. 79, 4779-4787 (1983)
Identification of new ion-pair states of molecular chlorine.
[E, hν, Cl_2]

O T. Ishiwata, T. Shinzawa, T. Kusayanagi and I. Tanaka : J. Chem. Phys. 82, 1788-1791 (1985)
First observation of the f(0_g^+) ion-pair state of Cl_2 by optical-optical double resonance. [E, hν, Cl_2; see T. Shinzawa (1985)]

O T. Ishikawa : J. Chem. Phys. (1991a) and J. Mol. Spectrosc. (1991b, c) see p. 31

O T. Ishiwata, J. -H. Si and K. Obi : J. Chem. Phys. 96, 5678-5686 (1992)
Optical-optical double resonance spectroscopy of Cl_2 : Analysis of the $1_g(^3P_1)$ - $A^3\Pi(1_u)$ system. [E, hν, Cl_2]

O T. Ishiwata, T. Shinzawa, J. Si, K. Obi and I. Tanaka : J. Mol. Spectrosc. 166, 321-337 (1994)
Optical-optical double-resonance spectroscopy of Cl_2 : Analyses of the 0_u^+, 1_u and $2_u(^3P_2)$ ion-pair states. [E, hν, Cl_2;

0 T. Ishiwata, T. Kusayanagi and I. Tanaka : J. Mol. Spectrosc. 173, 552-560 (1995)
Optical-optical double resonance spectroscopy of the Cl_2 $0_u^+(^3P_0)$ ion-pair state. [E, hν, Cl_2]

0 V. S. Ivanov and V. B. Sovkov : Opt. Spectrosc. 70, 28-31 (1991)
Calculation of the dissociative photoabsorption band shape of a diatomic molecule by the method of moments : the 345-nm band of the Cl_2 molecule.
[T, hν, Cl_2; see J. B. Burkholder (1983)]

0 V. S. Ivanov and V. B. Sovkov : Opt. Spectrosc. 74, 52-61 (1993)
Method of spectral moments : application to diatomic molecules : a review.
[T, hν, Cl_2, Br_2]

0 T. A. Jacobs and R. R. Giedt : J. Chem. Phys. 39, 749-756 (1963a)
Dissociation of Cl_2 in shock waves. [E, hν, Cl_2; 1700 - 2500 K]

0 T. A. Jacobs and R. R. Giedt : J. Quant. Spectrosc. Radiat. Transf. 3, 289-291 (1963b)
The applicability of Beer's law for a broad spectral band pass.
[T, hν, example for Cl_2]

0 T. A. Jacobs and R. R. Giedt : J. Quant. Spectrosc. Radiat. Transf. 5, 457-463 (1965)・
Absorption coefficients of Cl_2 at high temperatures.
[E, hν, Cl_2; 293 and 1000 - 2000 K]

0 P. Jiang and D. J. Economou : J. Appl. Phys. 73, 8151-8160 (1993)・
Temporal evolution of the electron energy distribution function in oxygen and chlorine gases under dc and ac fields. [T, Cl_2, O_2; B. Eq.]

0 J. A. Joens and E. J. Bair : J. Chem. Phys. 79, 5780-5784 (1983)
Spectral moments of vibrationally excited components of continuous vibronic spectra. [T, hν, Cl_2, O_3, OCS; spectral absorption]

0 G. H. Johannesson, H. Wang and A. Kvaran : J. Mol. Spectrosc. 179, 334-341 (1996)
REMPI spectra of Cl_2 : Vibrational and rotational analysis of the $2^1\Pi_g$ Rydberg states of $^{35}Cl_2$, $^{35}Cl^{37}Cl$ and $^{37}Cl_2$.
[E, hν, Cl_2; resonance enhanced multiphoton ionization]

0 F. W. Jones and W. Spooner : Trans. Faraday Soc. 31, 811-813 (1935) C50
Absorption of light by gaseous chlorine in the wavelength region 5040 A. U. to 5320 A. U. [E, hν, Cl_2]

0 J. Jortner and U. Sokolov : Nature 190, 1003-1004 (1961)
Spectrophotometric determination of the electron affinities of some diatomic molecules. [E, hν, Cl_2, Br_2, I_2, ICl, O_2, NO]

EX J. Jureta, S. Cvejanovic, M. Kurepa and D. Cvejanovic : Z. Phys. A304, 143-153 (1982)・C43
Threshold electron impact excitation of Cl_2. [E, Cl_2]

E L. J. Kieffer : Atomic Data 2, 293-391 (1971)
Low-energy electron-collision cross-section data. Part Ⅲ : Total scattering ; differential elastic scattering. [compilation, Cl_2, etc.]

0 M. Kimura and M. Fukuda : Mem. Coll. Sci. Kyoto Imp. Univ. 4, 155-158 (1920a)
Studies of the spectrum of chlorine. I. Emission and absorption spectra.
[E, $h\nu$, Cl_2]

0 M. Kimura and M. Fukuda : Mem. Coll. Sci. Kyoto Imp. Univ. 4, 159-162 (1920b)
Studies of the spectrum of chlorine. II. The influence of magnetic fields upon spectral lines of chlorine. [E, $h\nu$, Cl_2]

0 L. D. B. Kiss and H. H. Sawin : J. Electrochem. Soc. 139, 1414-1420 (1992)
Comparison of CF_3Cl and C_2F_6 + Cl_2 plasma chemistry by power modulation.
[E, Cl_2 + C_2F_6, CF_3Cl]

0 L. E. Kline and M. J. Kushner : Crit. Rev. in Solid State Mater. Sci. 16, 1-35 (1989) C6
Computer simulation of materials processing plasma discharges. [review, Cl_2, F_2, CF_4, CCl_2F_2, SF_6, C_2F_6, CCl_4, HCl, SiH_4, Si_2H_6, CH_4, C_2H_6]

0 B. G. Koenders, D. M. Wieringa, K. E. Drabe and C. A. de Lange : Chem. Phys. 118, 113-121 (1987)
A photoelectron spectroscopic study of low-lying Rydberg states in molecular chlorine using multiphoton ionisation. [E, $h\nu$, Cl_2]

0 B. G. Koenders, S. M. Koeckhoven, G. J. Kuik, K. E. Drabe and C. A. de Lange : J. Chem. Phys. 91, 6042-6051 (1989a)
Photoelectron spectroscopic studies of multiphoton processes in molecular chlorine involving the $2^1\Pi_g$ Rydberg state. [E, $h\nu$, Cl_2]

0 B. G. Koenders, S. M. Wieringa, G. J. Kuik, K. E. Drabe and C. A. de Lange : Chem. Phys. 129, 41-50 (1989b)
(3+1) REMPI PES of molecular chlorine in the 73300 to 75300 cm^{-1} region : $1^1\Sigma_u^+$ and $^3\Sigma_u$ states. [E, $h\nu$, Cl_2]

0 G. P. Kota, J. W. Coburn and D. B. Graves : J. Vac. Sci. Technol. A16, 270-277 (1998) C22
The recombination of chlorine atoms at surfaces. [E, Cl_2]

0 H. Kuhn : Z. Phys. 39, 77-91 (1926)
Absorptionsspektren und Dissoziationswarmen von Halogenmolekulen.
[E, $h\nu$, Cl_2, Br_2, I_2]

A M. V. Kurepa and D. S. Belic : Chem. Phys. Lett. 49, 608-610 (1977a) C80
Dissociative attachment of electrons to chlorine molecule.
[E, Cl_2; 0 - 14 eV]

A M. V. Kurepa and D. S. Belic : 10th ICPEAC, Paris 2, 834-835 (1977b)
Cross sections for electron attachment to chlorine molecules.
[E, Cl_2; 1 - 10 eV]

I M. V. Kurepa and D. S. Belic : J. Phys. B11, 3719-3729 (1978) C95
A Electron-chlorine molecule total ionisation and electron attachment cross sections. [E, Cl_2; q_i 11 - 100 eV; q_a 0 - 100 eV]

A M. V. Kurepa, D. S. Babic and D. S. Belic : Chem. Phys. 59, 125-136 (1981)・C128
Attachment rate coefficients of halogen molecules (F_2, Cl_2, Br_2, I_2) for mean electron energies 10^{-2} to 10^2 eV. [T, F_2 - I_2]

O M. J. Kushner : J. Appl. Phys. 82, 5312-5320 (1997) C17
Consequences of asymmetric pumping in low pressure plasma processing reactors : A three-dimensional modeling study. [E, Cl_2]

R H. Kutz and H. -D. Meyer : Phys. Rev. A51, 3819-3830 (1995)○ C98
Rotational excitation of N_2 and Cl_2 molecules by electron impact in the energy range 0.01 - 1000 eV : Investigation of excitation mechanism. [T, Cl_2, N_2]

O P. Laborie, J. -M. Rocard and J. A. Rees : Electronic Cross-Sections and Macroscopic Coefficients. 2 - Metallic Vapours and Molecular Gases, Dunod (1971)

O E. R. Laird : Astrophys. J. 14, 85-115 (1901), 215-216 (1901)
The absorption spectrum of chlorine.
[E, $h\nu$, Cl_2; Liveing : Chem. News 47, 121 (1883)]

O J. Le Calve, M. C. Castex, D. Haaks, B. Jordan and G. Zimmerer : Nuovo Cimento 63B, 265-275 (1981)
Time-resolved study of the UV fluorescence of chlorine under synchrotron radiation excitation of Cl_2/rere-gas mixtures.
[E, $h\nu$, Cl_2, Cl_2 + (Kr, Ar)]

O J. Le Calve and M. Chergui : Chem. Phys. Lett. 132, 256-260 (1986)
An alternative interpretation of the spectroscopy and internal dynamics of excited Cl_2 molecules trapped in an argon matrix. [E, $h\nu$, Cl_2]

O C. Lee and M. A. Lieberman : J. Vac. Sci. Technol. A13, 368-380 (1995)・C16
Global model of Ar, O_2, Cl_2, and Ar/O_2 high-density plasma discharges.
[T, Cl_2, etc.]

O J. Lee and A. D. Walsh : Trans. Faraday Soc. 55, 1281-1292 (1959)・C54
The vacuum ultra-violet absorption spectra of the halogen molecules. Part 1. — Chlorine. [E, $h\nu$, Cl_2; 1070 - 2100 A]

O L. C. Lee, G. P. Smith, J. T. Moseley, P. C. Cosby and J. A. Guest : J. Chem. Phys. 70,
A 3237-3246 (1979) C89
Photodissociation and photodetachment of Cl_2^-, ClO^-, Cl_3^- and $BrCl_2^-$.
[E, $h\nu$, Cl_2; Cl_2 + M + e → Cl_2^- + M]

O L. C. Lee, M. Suto and K. Y. Tang : J. Chem. Phys. 84, 5277-5283 (1986)
Quantitative VUV spectroscopy of Cl_2. [E, $h\nu$, Cl_2]

O Y. T. Lee, M. A. Lieberman, A. J. Lichtenberg, F. Bose, H. Baltes and R. Patrick :
J. Vac. Sci. Technol. A15, 113-126 (1997)・C18
Global model for high pressure electronegative radio-frequency discharges. [T, Cl_2]

0 R. J. LeRoy and R. B. Bernstein : J. Chem. Phys. 52, 3869-3879 (1970)
Dissociation energy and log-range potential of diatomic molecules from vibrational spacings of higher levels. [T, Cl_2]

0 R. J. LeRoy and R. B. Bernstein : J. Mol. Spectrosc. 37, 109-130 (1971)
Dissociation energies and long-range potentials of diatomic molecules from vibrational spacings : The halogens. [T, Cl_2, Br_2, I_2]

0 R. J. LeRoy : Can. J. Phys. 50, 953-959 (1972)
Dependence of the diatomic rotational constant B_v on the long-range internuclear potential. [T, Cl_2, Br_2, I_2]

0 R. J. LeRoy : in Molecular Spectroscopy, Vol. 1, R. F. Barrow, D. A. Long and D. J. Millen (Ed), The Chemical Soc. 113-1 (1973)

[review, Cl_2, I_2,]

0 R. J. LeRoy : Can. J. Phys. 52, 246-256 (1974)
Long-range potential coefficients from RKR turning points : C_6 and C_8 for $B(^3\Pi_{ou}^+)$ - state Cl_2, Br_2, and I_2. [T, Cl_2, Br_2, I_2]

0 L. Li, M. Wu and P. M. Johnson : J. Chem. Phys. 86, 1131-1135 (1987a)
Photodissociation, third harmonic interferences, polarization effects, and the MPI spectroscopy of chlorine. [E, $h\nu$, Cl_2]

0 L. Li, R. J. Lipert, H. Park, W. A. Chupka and S. D. Colson : J. Chem. Phys. 87, 6767-6769 (1987b)
Dynamics and spectroscopic manifestations of two-photon bound-bound absorption through a repulsive intermediate state. [E, $h\nu$, Cl_2]

0 L. Li, R. J. Lipert, H. Park, W. A. Chupka and S. D. Colson : J. Chem. Phys. 88, 4608-4613 (1988a)
Spectroscopy and photophysics of $^1\Pi_g$ and $^3\Pi_g$ Rydberg, ion-pair states of Cl_2, revealed by multiphoton ionization. [E, $h\nu$, Cl_2]

0 L. Li, R. J. Lipert, J. Lobue, W. A. Chupka and S. D. Colson : Chem. Phys. Lett. 151, 335-339 (1988b)
Adiabatic dissociation of photoexcited chlorine molecules. [E, $h\nu$, Cl_2]

0 S. G. Lias, J. E. Bartmess, J. F. Liebman, J. L. Holmes, R. D. Levin and W. G. Mallard : J. Phys. Chem. Ref. Data 17, Suppl. -1, 1-872 (1988) C75
Gas-phase ion and neutral thermochemistry. [review]

0 D. P. Lymberopoulos and D. J. Economou : IEEE Trans. Plasma Sci. 23, 573-580 (1995) · C15
Two-dimensional simulation of polysilicon etching with chlorine in a high density plasma reactor. [T, Cl_2]

0 M. V. Malyshev, V. M. Donnelly, A. Kornblit and N. A. Ciampa : J. Appl. Phys. 84, 137-146 (1998a) · C23
Percent dissociation of Cl_2 in inductively coupled, chlorine-containing plasmas. [E, Cl_2]

0 M. V. Malyshev, V. M. Donnelly and S. Samukawa : J. Appl. Phys. 84, 1222-1230. (1998b) C24
Ultrahigh frequency versus inductively coupled chlorine plasmas : Comparisons of Cl and Cl_2 concentrations and electron temperatures measured by trace rare gases optically emission spectroscopy.
[E, Cl_2, Cl]

0 D. M. Manos and D. L. Flamm (Ed) : Plasma Etching, An Introduction, Academic Press (1989) C5

0 D. Maric, J. P. Burrows, R. Meller and G. K. Moortgat : J. Photochem. Photobiol. A : Chem. 70, 205-214 (1993) C33
A study of the UV-visible absorption spectrum of molecular chlorine.
[E, $h\nu$, Cl_2; 200 - 550 nm, 298 K]

0 Y. Matsumi, M. Kawasaki, T. Sato, T. Kinugawa and T. Arikawa : Chem. Phys. Lett. 155, 486-490 (1989)
Photodissociation of chlorine molecule in the UV region.
[E, $h\nu$, Cl_2; 308 and 351 nm]

0 T. Matsuura, H. Uetake, T. Ohmi, J. Murota, K. Fukuda, N. Mikoshiba, T. Kawashima and Y. Yamashita : Appl. Phys. Lett. 56, 1339-1341 (1990) C7
Directional etching of Si with perfect selectivity to SiO_2 using an ultraclean electron cyclotron resonance plasma. [E, Cl_2]

0 W. Matthies : Ann. Physik 18, 463-494 (1905)
Uber die Glimmentladung in den Halogenen Chlor, Brom, Jod.
[E, Cl_2, Br_2, I_2]

0 A. G. McConkey, G. Dawber, L. Avaldi, M. A. MacDonald, G. C. King and R. I. Hall : J. Phys. B27, 271-282 (1994) C73
Threshold photoelectrons coincidence spectroscopy of doubly charged ions of hydrogen chloride and chlorine. [E, $h\nu$, Cl_2, HCl]

A D. L. McCorkle, A. A. Christodoulides and L. G. Christophorou : Chem. Phys. Lett. 109, 276-279 (1984)・C117
Electron attachment to Cl_2.
[E, Cl_2; attach. rate const. at 213 - 323 K; 0.04 - 0.78 eV]

0 E. W. McDaniel, M. R. Flannery, E. W. Thomas and S. T. Manson : Atomic Data Nucl. Data Tables 33, 1-148 (1985)
Selected bibliography on atomic collisions : Data collections, bibliographies, review articles, books, and papers of particular tutorial value. [compilation]

0 R. G. McLoughlin, J. D. Morrison and D. L. Smith : Int. J. Mass Spectrom. Ion Process. 58, 201-215 (1984)・C83
Photodissociaiton of Cl_2^+, Br_2^+ and I_2^+. [E, $h\nu$, Cl_2 - I_2]

O E. Meeks and J. W. Shon : IEEE Trans. Plasma Sci. 23, 539-549 (1995)・
Modeling of plasma-etch processes using well stirred reactor approximations and including complex gas-phase and surface reactions.
[T, Cl_2; cross section set for Cl_2 and Cl]

O M. Meyyappan : J. Appl. Phys. 71, 2574-2579 (1992)
Analysis of a magnetron electronegative rf discharge. [T, Cl_2]

O C. J. Mogab and H. J. Levinstein : J. Vac. Sci. Technol. 17, 721-730 (1980)
Anisotropic plasma etching of polysilicon. [E, Cl_2 + C_2F_6, etc.]

O T. Moller, B. Jordan, P. Gurtler, G. Zimmerer, D. Haaks, J. Le Calve and M.-C. Castex : Chem. Phys. 76, 295-306 (1983) C82
Spectroscopic investigation of the electronic structure of the chlorine molecule in the VUV. [E, $h\nu$, Cl_2; 6 - 10.1 eV]

O T. Moller, B. Jordan, G. Zimmerer, D. Haaks, J. Le Calve and M.-C. Castex : Z. Phys. D4, 73-87 (1986)
Time and spectrally resolved fluorescence of Cl_2^* and $ArCl^*$ in Cl_2 doped Ar under state selective pulsed photoexcitation with synchrotron radiation. [E, $h\nu$, Cl_2, Cl_2 + Ar]

E W. L. Morgan : JILA Report No. 34, 1-46 + figures (1991)
V A critical evaluation of low energy electron impact cross sections for
EX plasma processing modeling : I. Cl_2, F_2 and HCl. II. CF_4, SiH_4, and CH_4.
I [compilation, Cl_2, F_2, HCl, etc.]

E W. L. Morgan : Plasma Chem. Plasma Process. 12, 449-476 (1992)○ C31
V A critical evaluation of low energy electron impact cross sections for
EX plasma processing modeling : I. Cl_2, F_2 and HCl.
I [compilation; Cl_2, F_2, HCl]

E W. L. Morgan : in Advances in Atomic, Molecular and Optical Physics, Vol. 43,
V Academic 79-110 (1999)
EX Electron collision data for plasma chemistry modeling.
I [review, Cl_2, F_2, C_3F_8, etc.]

I J. D. Morrison and A. J. C. Nicholson : J. Chem. Phys. 20, 1021-1023 (1952) C78
Studies of ionization efficiency. Part II. The ionization potentials of some organic molecules. [E, Cl_2, Br_2, I_2; 83 molecules]

A D. Muigg, G. Denifl, N. J. Mason, E. Illenberger, I. C. Walker, A. Stamatovic and T. D. Mark : 21st ICPEAC, Sendai 330 (1999)○
Dissociative electron attachment to molecular chlorine at very low energies. [E, Cl_2; 0 - 0.7 eV]

O R. S. Mulliken : J. Chem. Phys. 8, 382-395 (1940)
Intensities in molecular electronic spectra. X. Calculations on mixed-halogen, hydrogen halide, alkyl halide and hydroxyl spectra.
[T, F_2 - Br_2, HF, HCl, HI, etc.]

O J. R. Murray and H. T. Powell : Appl. Phys. Lett. 29, 252-253 (1976)・
KrCl laser oscillation at 222 nm. [E, Cl_2 + Kr + Ar, NF_3 + Kr + Ar]

O R. Nagpal and A. Garscadden : Contrib. Plasma Phys. 35, 301-330 (1995) · C39
Electron and heavy particle energy redistributions in glow discharges in gas mixtures. [review, Cl_2 + Ar, N_2 + O_2, N_2 + H_2]

O G. Nakamura : Mem. Coll. Sci. Kyoto Univ. 9, 335-369 (1926)
Studies of the band spectrum of halogen. II. The analysis of the band spectrum of iodine, bromine and chlorine. [E, hν, Cl_2, I_2, Br_2]

O W. L. Nighan : in Applied Atomic Collision Physics, Vol. 3, Gas Lasers, Academic 319-347 (1982) C28
Properties of electron-beam controlled XeCl (B→X) and HgBr (B→X) laser discharges. [review, XeCl, etc.]

A K. J. Nygaard, H. L. Brooks and S. R. Hunter : IEEE J. Quant. Elect. 15, 1216-1223 (1979)
Negative ion production rates in rare gas-halide lasers.
[E, Cl_2, F_2, I_2, NF_3]

O H. Okabe : Photochemistry of Small Molecules, Wiley-Interscience (1978) C58

O T. Oomori, M. Tuda, H. Ootera and K. Ono : J. Vac. Sci. Tech. A9, 722-726 (1990)
Electrical and optical measurements of electron cyclotron resonance discharges in Cl_2 and Ar. [E, Cl_2 + Ar]

O S.-K. Pack and D. J. Economou : J. Appl. Phys. 68, 3904-3915 (1988)
Analysis of low pressure rf glow discharges using a continuum model.
[T, Cl_2, Ar-like]

O H. B. Palmer and R. A. Carabetta : J. Chem. Phys. 49, 2466-2468 (1968)
Radiative recombination of chlorine atoms in shock waves : A re-examination. [E, hν, Cl_2]

O J. Park, Y. Lee and G. W. Flynn : Chem. Phys. Lett. 186, 441-449 (1991)
Tunable diode laser probe of chlorine atoms produced from the photodissociation of a number of molecular precursors.
[E, hν, Cl_2, S_2Cl_2, CCl_4, HCl, etc.]

O W. B. Person : J. Chem. Phys. 38, 109-116 (1963)
Electron affinities of some halogen molecules and the charge-transfer frequency. [T, Cl_2, Br_2, I_2, ICl]

O S. D. Peyerimhoff and R. J. Buenker : Chem. Phys. 57, 279-296 (1981) C46
Electronically excited and ionized states of the chlorine molecule.
[T, Cl_2]

EX N. Pinhao and A. Chouki : 22th ICPIG, Hoboken 2, 5-6 (1995) C40
S Electron collision cross sections and transport parameters in Cl_2.
[compilation and T, Cl_2; c. s. set for Cl_2]

O A. W. Potts and W. C. Price : J. Chem. Soc. Faraday Trans. II 67, 1242-1252 (1971) C68
Photoelectron spectra of the halogens and mixed halides ICl and IBr.
[E, hν, Cl_2, F_2, Br_2, I_2, ICl, IBr]

E S. Pozdneev and V. Shcheglov : Chem. Phys. 123, 27-41 (1988)・
D Application of the quantum theory of scattering to the calculation of
A the simplest chemical reactions.
[T, Cl_2, Br_2, I_2, HCl, HBr, H_2, HD, D_2, N_2]

O L. J. Radziemaki, Jr. and V. Kaufman : J. Opt. Soc. Am. 59, 424-443 (1969)
Wavelengths, energy levels, and analysis of neutral atomic chlorine (Cl I).
[E, hν, Cl]

O T. P. Rakitzis, S. A. Kandel, A. J. Alexander, Z. H. Kim and R. N. Zare : J. Chem. Phys. 110, 3351-3359 (1999)
Measurements of Cl-atom photofragment angular momentum distributions in the photodissociation of Cl_2 and ICl. [E, hν, Cl_2, ICl]

O V. V. Rao and P. T. Rao : Can. J. Phys. 36, 1557-1568 (1958)・C140
The visible emission spectrum of Cl_2^+. [E, hν, Cl_2]

O Y. V. Rao and P. Venkateswarlu : J. Mol. Spectrosc. 9, 173-190 (1962)
Vacuum ultraviolet resonance spectrum of Cl_2 molecule.
[E, hν, Cl_2]

E T. N. Rescigno : Phys. Rev. A50, 1382-1389 (1994)○ C112
EX Low-energy electron-collision processes in molecular chlorine.
[T, Cl_2; 0.2 - 30 eV, close-coupling calculations using the complex Kohn variational method]

EX T. N. Rescigno : Comments At. Mol. Phys. 33, 315-324 (1997)・
Dissociative excitation in electron-molecule collisions.
[comments, Cl_2, F_2, HBr, H_2O, NF_3, CH_4, C_2H_4, SiH_4, CH_3Cl]

O A. D. Richards, B. E. Thompson, K. D. Allen and H. H. Sawin : J. Appl. Phys. 62, 792-798 (1987a)
Atomic chlorine concentration measurements in a plasma etching reactor. Ⅰ. A comparison of infrared absorption and optical emission actinometry.
[E, hν, Cl_2, CF_3Cl]

O A. D. Richards and H. H. Sawin : J. Appl. Phys. 62, 799-807 (1987b) C2
Atomic chlorine concentration measurements in a plasma etching reactor. Ⅱ. A simple predictive model. [E, Cl_2]

O W. G. Richards and R. F. Barrow : Proc. Chem. Soc. London 297- (1967)

E M. E. Riley, C. J. MacCallum and F. Biggs : Atomic Data Nucl. Data Tables 15, 443-475 (1975); Erratum 28, 379-379 (1983)
Theoretical electron-atom elastic scattering cross sections. Selected elements, 1 keV to 256 keV. [T, Cl, etc.]

α A. V. Risbud and M. S. Naidu : Indian J. Pure Appl. Phys. 16, 32-36 (1978)・
O Sparking potentials and ionization coefficients in some electronegative gases and their mixtures. [E, Cl_2, Br_2, CO_2, CCl_2F_2, SF_6]

0 G. L. Rogoff, J. M. Kramer and R. B. Piejak : IEEE Trans. Plasma Sci. PS-14, 103-111 (1986) C1
A model for the bulk plasma in an RF chlorine discharge.
[, Cl_2; cross section set for Cl_2]

A M. Rokni, J. H. Jacob and J. A. Mangano : Appl. Phys. Lett. 34, 187-189 (1979) C88
Electron attachment rate constant for Cl_2 at room temperature and 250°C.
[E, Cl_2 + N_2, Cl_2 + Ar; 523 - 573 K, 31st GEC, MA-9 (1978)]

0 M. Rokni and J. H. Jacob : in Applied Atomic Collision Physics, Vol. 3, Gas Lasers, 273-317 (1982) C27
Rare-gas halide lasers. [review, KrCl, XeCl, etc.]

0 C. Roxlo and A. Mandl : J. Appl. Phys. 51, 2969-2972 (1980) C59
Vacuum ultraviolet absorption cross sections for halogen containing molecules. [E, $h\nu$, Cl_2, Br_2, I_2, HCl - HI, CCl_4, $HgCl_2$, etc.]

0 F. Salama and J. Fournies : Chem. Phys. Lett. 120, 35-40 (1985)
Determination of the lowest bound ionic state threshold of Cl_2 trapped in solid argon at 4.5 K using synchrotron radiation. [E, $h\nu$, Cl_2]

0 P. C. Samartzis, B. L. G. Bakker, T. P. Rakitzis, D. H. Parker and T. N. Kitsopoulos : J. Chem. Phys. 110, 5201-5207 (1999)
Spin-orbit branching ratios for the Cl atom photofragments following the excitation of Cl_2 from 310 to 470 nm. [E, $h\nu$, Cl_2]

0 J. A. R. Samson and G. C. Angel : J. Chem. Phys. 86, 1814-1818 (1987) C63
The photoionization cross sections of molecular chlorine.
[E, $h\nu$, Cl_2; 150 - 1037 A]

0 S. Samukawa : J. Vac. Sci. Tech. A17, 774-779 (1999)·
Degree of Cl_2 dissociation and etching characteristics in high-density plasmas. [E, Cl_2]

0 A. D. Sappey and J. B. Jeffries : Appl. Phys. Lett. 55, 1182-1184 (1989)
Detection of Cl in rf plasmas by laser-excited stimulated emission.
[E, Cl_2 + Ar]

α M. N. Sawmy and J. A. Harrison : J. Phys. D2, 1437-1446 (1969)
Effect of attachment and multiple ionization on $\ln(\alpha/p)$ against p/E curves. [T, Cl_2, CO_2, CO, O_2, SF_6, CCl_2F_2, etc.]

0 H. F. Schaefer III : J. Chem. Phys. 52, 6241-6247 (1970)
New approach to electronic structure calculations for diatomic molecules : Application to F_2 and Cl_2. [T, Cl_2, F_2]

0 G. R. Scheller, R. A. Gottscho, T. Intrator and D. B. Graves : J. Appl. Phys. 64, 4384-4397 (1988)·
Nonlinear excitation and dissociation kinetics in discharges through mixtures of rare and attaching gases. [E, Cl_2, BCl_3, SF_6]

O M. Schmidt, D. Normand and C. Cornaggia : Phys. Rev. A50, 5037-5045 (1994)
Laser-induced trapping of chlorine molecules with pico- and femtosecond pulses. [E, hν, Cl_2]

O M. Schmidt, S. Dobosz, P. D'Oliveira, P. Meynadier, M. Perdrix, M. Bougeard, M. Lezius and D. Normand : J. Phys. B30, L749-L755 (1997)
Multiple ionization of chlorine in strong laser fields : I. Post-dissociation ionization. [E, Cl_2; 130 fs pulses, tunnel ioniz. theory]

A E. Schultes, A. A. Christodoulides and R. N. Schindler : Chem. Phys. 8, 354-365 (1975) C131
Studies by the electron cyclotron resonance (ECR) technique. Ⅷ. Interactions of low energy electrons with the chlorine-containing molecules CCl_4, $CHCl_3$, CH_2Cl_2, $C_nH_{2n+1}Cl$ (n = 1 to 4), C_2H_3Cl, $COCl_2$, NOCl, CNCl and Cl_2. [E, Cl_2, CCl_4, etc.; 0.04 - 0.4 eV for Cl_2]

O G. C. Schwartz and P. M. Schaible : J. Vac. Sci. Technol. 16, 410-413 (1979)・
Reactive ion etching of silicon. [E, Cl_2 + Ar, CCl_4 + Ar]

O D. J. Seery and D. Britton : J. Phys. Chem. 68, 2263-2266 (1964) C57
The continuous absorption spectra of chlorine, bromine, bromine chloride, iodine chloride, and iodine bromide.
[E, hν, Cl_2, Br_2, BrCl, ICl, IBr]

O D. A. Shaw, G. C. King and F. H. Read : J. Phys. B13, L723-L728 (1980)
An investigation of inner-shell excited states near the $L_{2,3}$ edges of Cl_2 using electron impact excitation with high resolution.
[E, Cl_2; 1.5 keV]

E R. J. Sheppard : PhD Thesis, (1966)
Scattering of slow electrons from the nitrogen molecules. [T, Cl_2, N_2]

O T. Shinzawa, A. Tokunaga, T. Ishikawa and I. Tanaka : J. Chem. Phys. 83, 5407-5412 (1985)・
A spectroscopic study of the $E(0_g^+)$ state of Cl_2 by optical-optical double resonance. [E, hν, Cl_2]

A G. D. Sides, T. O. Tiernan and R. J. Hanrahan : J. Chem. Phys. 65, 1966-1975 (1976) C132
Measurement of thermal electron dissociative attachment rate constants for halogen gases using a flowing afterglow techniques.
[E, Cl_2, F_2, Br_2, SF_6]

A D. Smith, N. G. Adams and E. Alge : J. Phys. B17, 461-472 (1984)・C126
Attachment coefficients for the reactions of electrons with CCl_4, CCl_3F, CCl_2F_2, $CHCl_3$, Cl_2 and SF_6 detemined between 200 and 600 K using the FALP technique.
[E, Cl_2, CCl_4, SF_6, CCl_3F, CCl_2F_2, $CHCl_3$; flowing-afterglow]

A D. Smith and P. Spanel : in Advances in Atomic, Molecular and Optical Physics, Vol. 32, Academic 307-343 (1994)
Studies of electron attachment at thermal energies using the flowing afterglow-Langmuir probe technique.
[review, Cl_2, SF_6, CCl_2F_2, CCl_4, C_6F_6, etc.]

O T. J. Sommerer and M. J. Kushner : J. Vac. Sci. Tech. B10, 2179-2187 (1992)
Monte Carlo-fluid model of chlorine atom production in Cl_2, HCl, and CCl_4 radio-frequency discharges for plasma etching. [E, Cl_2, HCl, CCl_4]

O V. N. Soshnikov : Sov. Phys. Usp. 4, 425-440 (1961)・
Absolute intensities of electronic transitions in diatomic molecules.
[compilation, F_2 - I_2, HF - HI, H_2, N_2, O_2, etc.]

A D. Spence and G. J. Schulz : J. Chem. Phys. 58, 1800-1803 (1973)・
Temperature dependence of electron attachment at low energies for polyatomic molecules.
[E, Cl_2, SF_6, CCl_4, $CFCl_3$, CH_2Br_2, CH_3I, CF_3Br, CH_3Br]

O D. Spence : Phys. Rev. A10, 1045-1052 (1974) C97
Systematics of Feshbach resonances in the molecular halogens.
[E, F_2 - I_2]

EX D. Spence, R. H. Huebner, H. Tanaka, M. A. Dillon and R. -G. Wang : J. Chem. Phys. 80, 2989-2996 (1984) C44
Electronic structure of Cl_2 from 5 to 15 eV by electron energy loss spectroscopy. [E, Cl_2; 5.5 - 14.5 eV energy-loss range, 200 eV]

I S. K. Srivastava and R. Boivin : Bull. Am. Phys. Soc. 42, 1738-1738 (1997)・ C109
Ionization cross sections of Cl_2 by electron impact. [E, Cl_2]

O J. I. Steinfeld : J. Phys. Chem. Ref. Data 13, 445-553 (1984)・
Rate data for inelastic collision processes in the diatomic halogen molecules. [compilation, Cl_2, F_2, Br_2, I_2, FCl, etc.]

O R. K. Steunenberg and R. C. Vogel : J. Am. Chem. Soc. 78, 901-902 (1956)
The absorption spectrum of fluorine. [E, $h\nu$, F_2 - I_2; 2000 - 6000 A]

I F. A. Stevie and M. J. Vasile : J. Chem. Phys. 74, 5106-5110 (1981) C108
Electron impact ionization cross sections of F_2 and Cl_2.
[E, Cl_2, F_2; th. - 102 eV]

EX R. J. Stubbs, T. A. York and J. Comer : J. Phys. B18, 3229-3243 (1985)○ C84
Electron energy loss studies of Cl_2 using a position-sensitive multidetector electron spectrometer. [E, Cl_2]

O S. A. Sullivan, B. S. Freiser and J. L. Beauchamp : Chem. Phys. Lett. 48, 294-298 (1977)
Gas phase photodissociation spectrum of Cl_2^-.
[E, $h\nu$, Cl_2; 220 - 700 nm]

O P. Sulzer und K. Wieland : Helv. Phys. Acta 25, 653-676 (1952)
Intensitatsverteilung eines kontinuierlichen Absorptionsspektrums in Abhangigkeit von Temperature und Wellenzahl.
[E, Cl_2 - I_2; 291 - 1038 K for Cl_2]

α M. N. Swamy and J. A. Harrison : Brit. J. Appl. Phys. 2, 1437-1446 (1969)
Effect of attachment and multiple ionization on $\ln(\alpha/p)$ against p/E curves. [compilation, Cl_2, O_2, CO, CO_2, SF_6, CCl_2F_2, $SiCl_4$, CF_3SF_5]

O R. C. Sze : IEEE J. Quant. Elect. QE-15, 1338-1347 (1979)
Rare-gas halide avalanche discharge lasers.
[review, Cl_2, F_2, HCl, HBr, NF_3, etc.]

A R. C. Sze, A. E. Green and C. A. Brau : J. Appl. Phys. 53, 1312-1316 (1982)・
Ground-state dissociative attachment rates in HCl and Cl_2.
[E, Cl_2, HCl; 0.7 - 5 eV]

A W.-C. Tam and S. F. Wong : J. Chem. Phys. 68, 5626-5630 (1978) C87
Dissociative attachment of halogen molecules by 0 - 8 eV electrons.
[E, Cl_2, F_2, Br_2, I_2]

O P. W. Tasker, G. G. Balint-Kurti and R. N. Dixon : Mol. Phys. 32, 1651-1660 (1976) C86
A calculation for the potential curves for the halogen molecule negative ions. [T, Cl_2, Br_2, I_2, ClBr, ClI, BrI]

O J. Tellinghuisen and D. K. Chakraborty : Chem. Phys. Lett. 134, 565-570 (1987)
Identification and analysis of the D' → A' transition in the emission spectrum of Cl_2. [E, $h\nu$, Cl_2; using $^{35}Cl_2$ and $^{37}Cl_2$]

O P. C. Tellinghuisen, G. Guo, D. K. Chakraborty and J. Tellinghuisen : J. Mol. Spectrosc. 128, 268-277 (1988)
The D' → A' transition in Cl_2. [E, $h\nu$, Cl_2]

O W. Thiel and A. Schweig : Chem. Phys. Lett. 12, 49-52 (1971)
Photoionization cross sections in the valence electron approximation. I. Linear molecules. [T, $h\nu$, Cl_2, F_2, HF, HCl]

I R. Thorburn : Proc. Phys. Soc. London 73, 122-126 (1959)・C79
Ionization and dissociation by electron impact in fluorine, hydrogen fluoride, chlorine and hydrogen chloride. [E, Cl_2, F_2, HF, HCl]

O H.-J. Tiller, R. Gobel and U. Fuhr : Beitr. Plasmaphys. 24, 487-497 (1984)・
Ion extraction of Cl containing plasmas — Problems and possibilities of the investigations of plasma processes. [E, Cl_2, CCl_4, $SiCl_4$]

O J. A. C. Todd, W. G. Richards and M. A. Byrne : Trans. Faraday Soc. 63, 2081-2084 (1967)
Complete potential energy curves for excited states of chlorine and bromine. [T, Cl_2, Br_2]

O T. Tsuchizawa, K. Yamanouchi and S. Tsuchiya : J. Chem. Phys. 93, 111-120 (1990)
Rydberg and ion-pair state mixing in the $1^1\Sigma_u^+$ and $2^3\Pi_u$ vibronic states of Cl_2 as studied by vacuum ultraviolet laser spectroscopy.
[E, $h\nu$, Cl_2]

O K. Tsukiyama, Y. Kurematsu, M. Tsukakoshi, A. Misi and T. Kasuya : Chem. Phys. Lett. 152, 523-527 (1988)
VUV and UV fluorescence lifetimes of Cl_2. [E, $h\nu$, Cl_2]

O G. S. Tyndall, T. J. Wallington, M. D. Hurley and W. F. Schneider : J. Phys. Chem. 97, 1576-1582 (1993)・
Rate coefficient for the reaction of CH_2OH radicals with Cl_2 and infrared spectra of chloromethanol and dichloromethanol.
[E, hν, Cl_2, CH_3OH; $Cl_2 + h\nu \rightarrow 2Cl$]

O W. J. van der Meer, R. J. Butselaar and C. A. de Lange : Aust. J. Phys. 39, 779-788 (1986)・
Photoionisation cross sections of chlorine atoms and molecules at 584 A.
[E, hν, Cl_2, Cl]

O H. van Lonkhuyzen and C. A. de Lange : Chem. Phys. 89, 313-322 (1984) C72
High-resolution UV photoelectron spectroscopy of diatomic halogens.
[E, hν, Cl_2, F_2, Br_2; He I]

O K. Venkateswarlu : Proc. Indian Acad. Sci. A26, 22-30 (1947)
Emission bands of halogens. V. Continuous bands of chlorine.
[E, hν, Cl_2]

O K. Venkateswarlu and B. N. Khanna : Proc. Indian Acad Sci. A49, 117-127 (1959)
Emission spectrum of chlorine excited in the presence of argon. I.
Band system in the region 2600 - 2390 A. [E, hν, Cl_2 + Ar]

O P. L. G. Ventzek, M. Grapperhaus and M. J. Kushner : J. Vac. Sci. Technol. B12, 3118-3137 (1994) C13
Investigation of electron source and ion flux uniformity in high plasma density inductively coupled etching tools using two-dimentional modeling. [T, Cl_2, $SiCl_4$, Ar; c. s. set for Cl_2]

O M. G. Voitik and A. G. Molchanov : Sov. Tech. Phys. Lett. 5, 458-459 (1979)・
Energy distribution and rate constants for inelastic collisions of electrons in a discharge in an Ar - Hg - Cl_2 mixture.
[, Cl_2 + Ar + Hg]

O H. von Halban und K. Siedentopf : Z. Elektrochem. 28, 496-499 (1922) C48
Die Lichitabsorption des Chlors. [E, hν, Cl_2]

O H. von Halban und K. Siedentopf : Z. Phys. Chem. 103, 71-90 (1923) C47
Die Lichitabsorption des Chlors. [E, hν, Cl_2]

O D. A. Vroom : Thesis, University of British Columbia 1-202 (1965)
Photoelectron spectroscopy of gases.
[E, hν, Cl_2, F_2, Br_2, I_2, N_2, O_2, NO, CO, HF, HCl, etc.]

O W. R. Wadt and P. J. Hay : J. Chem. Phys. 82, 284-298 (1985)
Ab initio effective core potentials for molecular calculations.
Potentials for main group elements Na to Bi. [T, Cl_2, Br_2, etc.]

A H. B. Wahlin : Phys. Rev. 19, 173-186 (1922)・
Behavior of free electron toward gas molecules.
[E, Cl_2, CO, NH_3, C_2H_4, C_2H_2, C_2H_6, C_2H_5Cl]

O F. Wallart : Can. J. Spectrosc. 17, 128-131 (1972)
Study of vibrational hot bands by Raman spectroscopy. — Application to chlorine and bromine chloride. [E, hν, Cl_2; 150 - 350 K]

O P. Wang, I. V. Okuda, S. S. Dimov and R. H. Lipson : Chem. Phys. Lett. 229, 370-376 (1994)
Mass-resolved VUV laser spectra in the vicinity of the Rydberg minimum of the $1^1\Sigma_u^+$ state of Cl_2. [E, hν, Cl_2; 136 nm]

O P. Wang, S. S. Dimov, G. Rosenblood and R. H. Lipson : J. Phys. Chem. 99, 3984-3989 (1995)
Vibrational reassignment of the $2^1\Sigma_u^+ \leftarrow X^1\Sigma_g^+$ transition of Cl_2. [E, hν, Cl_2; 78000 - 80100 cm^{-1}]

O Y. Wang, R. J. Van Brunt and J. K. Olthoff : J. Appl. Phys. 83, 703-708 (1998)
Mass spectrometric measurement of molecular dissociation in inductively coupled plasmas. [E, Cl_2, N_2, O_2, SF_6]

O K. Watanabe : J. Chem. Phys. 26, 542-547 (1957) C53
Ionization potentials of some molecules. [E, Cl_2, Br_2, I_2, 89 molecules]

O K. Watanabe, T. Nakayama and J. Mottl : J. Quant. Spectrosc. Radiat. Transf. 2, 369-382 (1962)
Ionization potentials of some molecules.
[E, Cl_2, many atoms and molecules]

EX W. C. Wells and E. C. Zipf : J. Chem. Phys. 66, 5828-5829 (1977)·C115
Translational spectroscopy of metastable fragments produced by dissociative excitation of chlorine. [E, Cl_2; 17.5 - 200 eV]

O R. J. Wheatley and S. Price : Mol. Phys. 71, 1381-1404 (1991)
A systematic intermolecular potential method applied to chlorine.
[T, Cl_2]

O K. Wieland, J. B. Tellinghuisen and A. Nobs : J. Mol. Spectrosc. 41, 69-83 (1972)
The band systems E → B (4000 - 4360 A) and F → X (2530 - 2740 A) of $^{127}I_2$ and $^{129}I_2$, and the correspinding system E ←→ B of Br_2 and Cl_2.
[E, hν, Cl_2, Br_2, I_2]

O R. L. Wilkins : J. Quant. Spectrosc. Radiat. Transf. 4, 775-782 (1964)
Continuous absorption coefficients of chlorine. [T, hν, Cl_2]

O R. G. Winkel, J. L. Hunt and M. J. Clouter : J. Chem. Phys. 50, 1298-1302 (1969)
Pressure-induced fundamental infrared absorption band of gaseous chlorine.
[E, hν, Cl_2; 298 and 369 K]

O B. Woernle : Ann. Phys. 5, 475-506 (1930)
Die Absorption langwelliger Rontgenstrahlen von 2 - 10 AE in leichten Elementen. [E, hν, Cl_2,

A S. F. Wong : Symp. Electron-Molecule Collisions, Tokyo 111-120 (1979)
Recent trends in beam expeirments on dissociative attachment.
[, Cl_2, F_2, SF_6]

O J. Wormer, T. Moller, J. Stapelfeldt, G. Zimmerer, D. Haaks, S. Kampf, J. Le Calve and M. C. Castex : Z. Phys. D7, 383-395 (1988)・
Analysis of bound-free fluorescence and improved characterization of the electronic and spectroscopic properties of the $1^1\Sigma_u^+$ state of Cl_2. [E, hν, Cl_2]

O J. S. Wright, G. A. DiLabio, D. R. Matusek, P. B. Corkum, M. Yu. Ivanov, Ch. Ellert, R. J. Buenker, A. B. Alekseyev and G. Hirsch : Phys. Rev. A59, 4512-4521 (1999)
Dissociation of molecular chlorine in a Coulomb explosion : Potential curves, bound states, and deviation from Coulombic behavior for Cl_2^{n+} (n = 2, 3, 4, 6, 8, 10). [T, Cl_2]

O K. Yamanouchi, T. Tsuchizawa, J. Miyawaki and S. Tsuchiya : Chem. Phys. Lett. 156, 301-304 (1989)
Experimental evidence for Rydberg and ion-pair state mixing of Cl_2 in the $1^1\Sigma_u^+$ state. [E, hν, Cl_2]

O C. Yan and A. C. Kummel : J. Chem. Phys. 98, 6869-6882 (1993)
Effect of hyperfine depolarization upon creation and detection of alignment in free-jet expansions via selective photodissociation. [E, hν, Cl_2, Br_2]

O K. K. Yee and T. J. Stone : Mol. Phys. 26, 1169-1176 (1973)
Analysis of RKR long-range potentials of the $B^3\Pi_{ou}^+$ states of Br_2 and Cl_2. [T, Cl_2, Br_2]

O A. Yokozawa, H. Ohtake and S. Samukawa : Jpn. J. Appl. Phys. 35, 2433-2439 (1996)
Simulation of a pulse time-modulated bulk plasma in Cl_2. [E, Cl_2]

O V. Z. Zafiropulos, G. S. Fu, E. Hontzopoulos, C. Fotakis and M. C. Castex : Chem. Phys. Lett. 179, 258-262 (1991)
Multiphoton ionization of chlorine : the $^3\Sigma_u$ state. [E, hν, Cl_2]

O V. V. Zaitsev, E. Yu. Zverevskaya, Ya. I. Zukher and P. D. Netyagov : High Temp. 16, 981-986 (1978)
Electron energy distribution functions and rates of inelastic processes in the positive column of a glow discharge in Kr + Cl_2. [E, Cl_2 + Kr]

O A. A. Zakharyan and V. M. Novikov : Sov. J. Opt. Tech. 39, 119-120 (1972)
Optical absorption in molelcular chlorine of the vacuum ultraviolet. [, hν, Cl_2]

E V EX I A A. Zecca, G. P. Karwasz and R. S. Brusa : Rivista Nuovo Cimento 19, No. 1, 1-146 (1996)・
One century of experiments on electron-atom and molecule scattering : A critical review of integral cross-sections. I. — Atoms and diatomic molecules. [compilation, Cl_2, F_2, He - Xe, Li - Cs, etc.]

Author Index for Cl_2 References

Author Index for Cl_2 References. Addenda

Bromine Molecule Br_2

References for Br_2 (1900 - 1999)

(Bromine)

[Halogen]

E : Elastic collision,	R : Rotational excitation,
V : Vibrational excitation,	EX : Electronic excitation,
D : Dissociation,	I : Ionization,
A : Attachment,	QT : Grand total cross section,
S : Swarm,	α : Ionization coefficient,
O : The others,	[ ]: Additional informations, E : Exp., T : Theory.

The oldest paper in this list is given by E. v. Angerer (1922).

O A. P. Acton, R. G. Aickin and N. S. Bayliss : J. Chem. Phys. 4, 474-479 (1936)
The continuous absorption spectrum of bromine : A new interpretation.
[E, $h\nu$, Br_2; 293 - 906 K, 3274 - 5717 A]

O R. G. Aickin and N. S. Bayliss : Trans. Faraday Soc. 34, 1371-1374 (1938)
The absorption spectrum of bromine vapour in the region 3400 A to 2200 A. [E, $h\nu$, Br_2]

O E. v. Angerer : Z. Phys. 11, 167-169 (1922)
Spectroskopische Messung der Elektronenaffinitat von Chlor.
[E, $h\nu$, Br_2, Cl_2, I_2; 2300 - 3200 A]

E F. L. Arnot : Proc. Roy. Soc. London A144, 360-377 (1934a)
The diffraction of electrons in the halogens.
[E, Br_2, I_2, Ar, Kr, Xe, $CHBr_3$, CCl_4, H_2S; DCS]

E F. L. Arnot and J. C. McLauchlan : Proc. Roy. Soc. London A146, 662-672 (1934b)
The scattering of electrons in bromine vapour. [T, Br_2, Br]

O B. S. Ault, W. F. Howard, Jr. and L. Andrews : J. Mol. Spectrosc. 55, 217-228 (1975)
Laser-induced fluorescence and Raman spectra of chlorine and bromine molecules isolated in inert matrices. [E, $h\nu$, Br_2, Cl_2; 15 K]

O O. I. Austin, R. J. Donovan, A. Hopkirk, K. P. Lawley, O. Shaw and A. J. Yencha : Chem. Phys. 118, 91-100 (1987)
Vacuum ultraviolet absorption and fluorescence excitation spectra of Br_2.
[E, $h\nu$, Br_2; 125 - 170 nm]

A J. A. Ayala, W. E. Wentworth and E. C. M. Chen : J. Phys. Chem. 85, 768-777 (1981)
Electron attachment to halogens.
[E, Br_2, Cl_2, F_2, I_2; thermal electron attachment]

O A. P. M. Baede : Physica 59, 541-544 (1972)
The adiabatic electron affinities of Cl_2, Br_2, I_2, IBr, NO_2 and O_2.
[T, Cl_2 - I_2, NO_2, etc.]

O P. Baierl and W. Kiefer : J. Chem. Phys. 62, 306-308 (1975a)
Hot band and isotopic structure in the resonance Raman spectrum of bromine vapor. [E, $h\nu$, Br_2]

O P. Baierl, J. G. Hochenbleicher and W. Kiefer : Appl. Spectrosc. 29, 356-357 (1975b)
Pure rotational Raman spectra of $^{79}Br_2$ and $^{81}Br_2$. [E, $h\nu$, Br_2]

O P. Baierl and W. Kiefer : J. Raman Spectrosc. 3, 353-369 (1975c)
Resonance Raman scattering from isotopically pure and neutral bromine vapor. [E, $h\nu$, Br_2]

A J. E. Bailey, R. E. B. Makinson and J. M. Somerville : Phil. Mag. 24, 177-190 (1937)
The behaviour of electrons in bromine. [E, Br_2]

O K. Balasubramanian : Chem. Phys. 119, 41-50 (1988)
CAS SCF/CI calculations on electronic states of Br_2 and Br_2^+.
[T, Br_2, Br_2^+]

O R. F. Barrow, D. F. Broyd, L. B. Pederson and K. K. Yee : Chem. Phys. Lett. 18, 357-358 (1973)
The dissociation energies of gaseous Br_2 and I_2. [E, $h\nu$, Br_2, I_2]

O R. F. Barrow, T. C. Clark, J. A. Coxon and K. K. Yee : J. Mol. Spectrosc. 51, 428-449 (1974)
The $B^3\Pi_{Ou}^+ - X^1\Sigma_g^+$ system of Br_2 : Rotational analysis, Franck-Condon factors, and long range potential in the $B^3\Pi_{Ou}^+$ state. [E, $h\nu$, Br_2]

O N. S. Bayliss : Proc. Roy. Soc. London A158, 551-561 (1937)
The theory of the continuous absorption spectrum of bromine.
[T, $h\nu$, Br_2]

O N. S. Bayliss and J. V. Sullivan : J. Chem. Phys. 22, 1615-1616 (1954)
Vacuum ultraviolet absorption spectra of iodine and bromine.
[E, $h\nu$, Br_2, I_2]

O P. Berwanger, K. S. Viswanathan and J. Tellinghuisen : J. Mol. Spectrosc. 91, 275-285 (1982)
The E → B transition (3000 - 3140 A) in Br_2. [E, $h\nu$, $^{79}Br_2$, $^{81}Br_2$]

I J. P. Blewett : Phys. Rev. 49, 900-903 (1936)
A Mass spectrograph analysis of bromine. [E, Br_2; 0 - 50 eV]

O V. E. Bondybey, S. S. Bearder and C. Fletcher : J. Chem. Phys. 64, 5243-5246 (1976)
Br_2 $B^3\Pi$ (O_u^+) excitation spectra and radiative lifetimes in rare gas solids. [E, $h\nu$, Br_2]

O J. C. D. Brand, U. D. Deshpande, A. R. Hoy and S. M. Jaywant : J. Mol. Spectrosc. 100, 143-150 (1983)
Polarization spectroscopy of the $EO_g^+ - BO_u^+$ band system of Br_2.
[E, $h\nu$, Br_2]

O J. C. D. Brand, A. R. Hoy, S. M. Jaywant and A. W. Taylor : J. Mol. Spectrosc. 123, 84-92 (1987a)
The $\beta\, 1_g$ state of diatomic bromine : A new state of the ion-pair series.
[E, $h\nu$, Br_2]

O J. C. D. Brand and A. R. Hoy : Appl. Spectrosc. Rev. 23, 285-328 (1987b)・
Multiphoton spectra and states of halogens. [review, $Cl_2 - I_2$, etc.]

O R. G. Briggs and R. G. W. Norrish : Proc. Roy. Soc. London A276, 51-68 (1963)
Transient absorption spectra of chlorine and bromine.
[E, $h\nu$, Br_2, Cl_2; 2400 - 2990 A for Br_2]

O M. Brith, M. D. Rowe, O. Schnepp and P. J. Stephens : Chem. Phys. 9, 57-73 (1975)
The magnetic circular dichroism spectrum of the halogen molecules I_2, Br_2, Cl_2. Resolution of overlapping continua.
[E, $h\nu$, Br_2, I_2, Cl_2; 250 - 800 nm]

O W. G. Brown : Phys. Rev. 38, 1179-1186 (1931)
Vibrational quantum analysis of the visible absorption bands of bromine.
[E, $h\nu$, Br_2; 5100 - 7600 A]

O W. G. Brown : Phys. Rev. 39, 777-787 (1932)
Fine structure of the visible absorption bands of bromine.
[E, $h\nu$, $Br_2^{79,81}$]

O E. D. Bugrim, S. N. Makrenko and I. L. Tsikora : Opt. Spectrosc. 39, 15-17 (1975)
Efficiency of deactivation of the $B^3\Pi O_u^+$ state of molecular bromine in collisions. [E, $h\nu$, Br_2, Br_2 + (He - Kr, N_2, O_2, CO_2); 5461 A Hg line]

A G. E. Caledonia : Chem. Rev. 75, 333-351 (1975)・
A survey of the gas-phase negative ion kinetics of inorganic molecule attachment reaction.
[review, Br_2, I_2, F - I, O_2, NO, HCl, OH, H_2O, N_2O, NO_2, CO_2, SO_2, O_3]

O G. Capelle, K. Sakurai and H. P. Broida : J. Chem. Phys. 54, 1728-1730 (1971)
Lifetimes and self-quenching cross sections of vibrational levels in the B state of bromine excited by a tunable dye laser. [E, Br_2]

O J. H. Carver and J. L. Gardner : J. Quant. Spectrosc. Radiat. Transf. 12, 207-218 (1972)・
Photoelectron spectroscopy and partial photoionization cross sections for iodine and bromine. [E, $h\nu$, Br_2, I_2]

O V. Cermak : J. Elect. Spectrosc. Relat. Phenom. 6, 135-144 (1975)
Electron spectroscopy of autoionizing states of oxygen, chlorine etching of polysilicon. [E, $h\nu$, Br_2, Cl_2, O_2]

Y. Chun → see C. Yan

0 W. A. Chupka, J. Berkowitz and D. Gutman : J. Chem. Phys. 55, 2724-2733 (1971)
Electron affinities of halogen diatomic molecules as determined by endoergic charge transfer. [E, F_2 - I_2]

0 M. A. A. Clyne and J. A. Coxon : J. Mol. Spectrosc. 23, 258-271 (1967)
The emission spectra of Br_2 and IBr formed in atomic recombination processes. [E, $h\nu$, Br_2, IBr]

0 M. A. A. Clyne, J. A. Coxon and A. R. Woon-Fat : Trans Faraday Soc. 67, 3155-3165 (1971)
Electronic excitation of bromine to the $B^3\Pi(0_u^+)$ state in the recombination of ground state Br $^2P_{3/2}$ atoms. [E, $h\nu$, Br_2]

0 M. A. A. Clyne and M. C. Heaven : J. Chem. Soc. Faraday Trans. II 74, 1992-2013 (1978)
Kinetics of excited states of Br_2 using laser excitation.
Part 1. - System description and rotationally-dependent lifetimes in $Br_2(B)$. [E, $h\nu$, Br_2]

0 M. A. A. Clyne, M. C. Heaven and E. Martinez : J. Chem. Soc. Faraday Trans. II 76, 405-419 (1980)
Kinetics of excited states of Br_2 using laser excitation.
Part 2. - Radiative lifetime and collisional deactivation of the $B\ ^3\Pi(0_u^+)$ state. [E, $h\nu$, Br_2]

0 M. A. A. Clyne, M. C. Heaven and J. Tellinghuisen : J. Chem. Phys. 76, 5341-5349 (1982)
Theoretical treatment of the spontaneous predissociation of Br_2, $B\ ^3\Pi(0_u^+)$. [T, Br_2, Cl_2, I_2]

0 H. Cordes und H. Sponer : Z. Phys. 63, 334-344 (1930)
Die Molekulabsorption des Chlors, Broms, Jodchlorids und Jodbromids im aussersten Ultraviolet. [E, $h\nu$, Br_2, Cl_2, ICl, IBr; 1560 - 3000 A]

0 A. B. Cornford, D. C. Frost, C. A. McDowell, J. L. Ragle and I. A. Stenhouse : J. Chem. Phys. 54, 2651-2657 (1971)
Photoelectron spectra of the halogens. [E, $h\nu$, F_2 - I_2]

0 J. A. Coxon : J. Mol. Spectrosc. 37, 39-62 (1971a)
The $B^3\Pi(0_u^+) \leftarrow X^1\Sigma_g^+$ system of $^{79}Br^{79}Br$.
[E, $h\nu$, Br_2; absorption, 6350 - 7700 A]

0 J. A. Coxon : J. Quant. Spectrosc. Radiat. Transf. 11, 443-462 (1971b)
The calculation of potential energy curves of diatomic molecules : Application to halogen molecules. [T, Br_2, Cl_2, I_2]

0 L. Dabrowski : Acta Phys. Polonica 3, 301-305 (1934)
Absorption of bromine at high temperature. [E, $h\nu$, Br_2; 1213 K]

0 O. Darbyshire : Proc. Roy. Soc. London A159, 93-109 (1937)
The absorption spectrum of bromine in the near infra-red.
[E, $h\nu$, Br_2; 7600 - 8180 A]

O V. H. Dibeler, J. A. Walker and K. E. McCulloh : J. Chem. Phys. 53, 4715-4716 (1970)
Threshold for molecular photoionization of bromine. [E, $h\nu$, Br_2]

A J. G. Dillard : Chem. Rev. 73, 589-643 (1973)・
Negative ion mass spectroscopy.
[review, Br_2, Cl_2, F_2, I_2, CCl_4, CH_3Cl, etc.]

O J. Dojahn, E. C. M. Chen and W. E. Wentworth : J. Phys. Chem. 100, 9649-9657 (1996)・
Characterization of homonuclear diatomic ions by semiempirical Morse potential energy curves. I. The halogen anions. [T, F_2 - I_2, At_2]

O V. M. Donnelly, D. L. Flamm and D. E. Ibbotson : J. Vac. Sci. Technol. A1. 626-628 (1983)
Plasma etching of Ⅲ-Ⅴ compound semiconductors.
[review, Br_2, Cl_2, CCl_2F_2, etc.]

O A. V. Eletskii, B. M. Smirnov and G. V. Shlyapnikov : Opt. Spectrosc. 36, 630-634 (1974)
Photodissociation and photorecombination emissin of diatomic molecules.
[T, $h\nu$, F_2 - I_2, etc.]

O A. V. Eletskii and B. M. Smirnov : Sov. Phys. Usp. 28, 956-971 (1985)
Dissociative attachment of an electron to a molecule.
[review, F_2 - I_2, etc.]

O R. S. Eng and J. T. Latourrette : J. Mol. Spectrosc. 52, 269-276 (1974)
Hyperfine spectra of bromine vapor near 633 nm. [E, $h\nu$, Br_2]

O J. J. Ewing, J. H. Jacob, J. A. Mangano and H. A. Brown : Appl. Phys. Lett. 28, 656-659 (1976)
Discharge pumping of the Br_2^* laser. [E, $h\nu$, Br_2]

O D. L. Flamm and V. M. Donnelly : Plasma Chem. Plasma Process. 1, 317-363 (1981)
The design of plasma etchants.
[review, Br_2, Cl_2, F_2, CF_4, BCl_3, etc.]

I D. C. Frost and C. A. McDowell : Can. J. Chem. 38, 407-420 (1960)
A The ionization and dissociation of some halogen molecules by electron impact. [E, Br_2, Cl_2, I_2, ICl, IBr]

O D. C. Frost, C. A. McDowell and D. A. Vroom : J. Chem. Phys. 46, 4255-4259 (1967)
Photoelectron spectra of the halogens and the hydrogen halides.
[E, $h\nu$, F_2 - I_2, HF - HI]

O L. Frost, A. -M. Grisogono, E. Weigold, A. O. Bawagan, C. E. Brion and W. von Niessen : 15th ICPEAC, Brighton 314-314 (1987)
Electron momentum spectroscopy of molecular bromine and iodine.
[E, Br_2, I_2; 1000 eV]

S J. W. Gallagher, E. C. Beaty, J. Dutton and L. C. Pitchford : JILA Information Center Report No. 22, 1-258 (1982)
A compilation of electron swarm data in electron-negative gases.
[compilation, F_2 - I_2, SF_6, etc.]

0 S. Gerstenkorn, P. Luc, A. Raynal and J. Sinzelle : J. Physiq. 48, 1685-1696 (1987)
Description of the absorption spectrum of bromine recorded by means of Fourier transform spectroscopy : The ($B^3\Pi_{ou}^+ \leftarrow X^1\Sigma_g^+$) system.
[E, hν, Br_2; 293 - 1023 K]

0 D. B. Gibbs and E. A. Ogryzlo : Can. J. Chem. 43, 1905-1911 (1965)
Halogen atom reactions. Ⅲ. Luminescence from the recombination of bromine atoms. [E, hν, Br_2; Br + Br]

0 O. Goscinski : Mol. Phys. 24, 655-359 (1972)
Outer vibrational turning points near dissociation in the B($^3\Pi_{OU}^+$) state of Br_2 and Cl_2. [T, Br_2, Cl_2]

0 P. B. V. Haranath and P. Tiruvenganna Rao : Lett Curr. Sci. 24, 79-80 (1955a)
The visible emission spectrum of Br_2^+. [E, hν, Br_2]

0 P. B. V. Haranath and P. Tiruvenganna Rao : Indian J. Phys. 29, 205-226 (1955b)
The emission spectrum of bromine. [E, hν, Br_2; 4400 - 6400 A]

0 T. Harris, J. H. D. Eland and R. P. Tuckett : J. Mol. Spectrosc. 98, 269-281 (1983)
The A - X system of Br_2^+ radical cations. [E, hν, Br_2]

0 M. Hayashi and Y. Nakamura : EMS-99, Tokyo 175-176 (1999)
May we measure the exact values of electron collision cross sections for molecules by beam and swarm experiments ?
[general comment, Br_2 is the mixture of Br_2(r) and Br_2(v) molecules]

0 C. P. Hemenway, T. G. Lindeman and J. R. Wiesenfeld : J. Chem. Phys. 70, 3560-3561 (1979)
Measurement of the $A^3\pi_{1u} \leftarrow X^1\Sigma_g^+$ continuum absorptivity in Br_2.
[E, hν, Br_2]

0 W. Holzer, W. F. Murphy and H. J. Bernstein : J. Chem. Phys. 52, 399-407 (1970a)
Resonance Raman effect and resonance fluorescence in halogen gases.
[E, hν, Br_2, Cl_2, I_2, BrCl, etc.]

0 W. Holzer, W. F. Murphy and H. J. Bernstein : J. Chem. Phys. 52, 469-470 (1970b)
Resonance fluorescence of iodine, bromine, and chlorine gases obtained with argon-ion laser excitation. [E, hν, Br_2, Cl_2, I_2]

0 J. A. Horsley : J. Mol. Spectrosc. 22, 469-471 (1967a)
Rotational analysis of the $A^3\Pi_{1u} - X^1\Sigma_g^+$ system of bromine.
[E, compilation, hν, Br_2]

0 J. A. Horsley and R. F. Barrow : Trans. Faraday Soc. 63, 32-38 (1967b)
Absorption spectrum of bromine from 6200 to 5100 A.
[E, hν, $^{79}Br_2$, $^{81}Br_2$]

0 K. P. Huber and G. Herzberg : Molecular Spectra and Molecular Structure, Ⅳ. Constants of Diatomic Molecules, Van Nostrand Reinhold Company 104-107 (1979)

0 S. Hubinger and J. B. Nee : J. Photochem. Photobiol. A86, 1-7 (1995)
Absorption spectra of Cl_2, Br_2 and BrCl between 190 and 600 nm.
[E, $h\nu$, Br_2, Cl_2, etc.]

0 E. Hwang, P. J. Dagdigian and J. Tellinghuisen : J. Mol. Spectrosc. 181, 297-306 (1997)
Spectroscopy of metastable species in a free-jet expansion : The $\beta \leftarrow A$ transition in Br_2. [E, $h\nu$, Br_2]

0 R. P. Ibbotson, D. L. Flamm and V. M. Donnelly : J. Appl. Phys. 54, 5974-5981 (1983)
Crystallographic etching of GaAs with bromine and chlorine plasmas.
[E, Br_2, Cl_2]

0 T. Ishiwata, T. Shinzawa, A. Tokunaga and I. Tanaka : Chem. Phys. Lett. 101, 350-352 (1983)
A new ion-pair state of Br_2. [E, $h\nu$, Br_2]

0 T. Ishiwata, H. Ohtoshi and I. Tanaka : J. Chem. Phys. 81, 2300-2304 (1984a)
Identification of a new ion-pair state of Br_2 by a sequential two-photon excitation technique. [E, $h\nu$, Br_2]

0 T. Ishiwata, A. Tokunaga, T. Shinzawa and I. Tanaka : Bull. Chem. Soc. Jpn. 57, 1317-1320 (1984b)
An analysis of the $E(0_g^+)$ ion-pair state of bromine through stepwise excitation technique. [E, $h\nu$, Br_2]

0 T. Ishiwata, A. Tokunaga, T. Shinzawa and I. Tanaka : Bull. Chem. Soc. Jpn. 57, 1469-1472 (1984c)
An optical-optical double resonance excitation of bromine to a new $D(0_u^+)$ ion-pair state. [E, $h\nu$, Br_2]

0 T. Ishiwata, A. Tokunaga, T. Shinzawa and I. Tanaka : J. Mol. Spectrosc. 108, 314-327 (1984d)
A spectroscopic study of the $D(0_u^+)$ ion-pair state of Br_2 by the optical-optical double-resonance technique. [E, $h\nu$, Br_2]

0 T. Ishiwata, T. Hara, K. Obi and I. Tanaka : J. Phys. Chem. 95, 2763-2769 (1991a)
Optical-optical double resonance spectroscopy of Br_2 through the $A^3\Pi(1_u)$ state : Analysis of the 0_u^+, 1_u, and $2_u(^3P_2)$ ion-pair states.
[E, $h\nu$, Br_2]

0 T. Ishiwata, O. Nakamura and K. Obi : J. Mol. Spectrosc. 150, 262-270 (1991b)
Optical-optical double resonance spectroscopy of the Br_2 $0_g^+(^1D)$ ion-pair state. [E, $h\nu$, Br_2]

0 T. Ishiwata, O. Nakamura and K. Obi : J. Mol. Spectrosc. 151, 513-521 (1992)
Optical-optical double resonance spectroscopy of the Br_2 $1_g(^1D)$ ion-pair state. [E, $h\nu$, Br_2]

0 V. Ivanov and V. B. Sovkov : Opt. Spectrosc. 74, 52-61 (1993)
Method of spectral moments : Application to diatomic molecules; a review.
[T, $h\nu$, Br_2, Cl_2]

O Y.-J. Jee, M. S. Park, Y. S. Kim, Y.-J. Jung and K.-H. Jung : Chem. Phys. Lett. 287, 701-708 (1998)
Photodissociation of bromine molecule near 265 nm. [E, hν, Br_2]

O J. Jortner and U. Sokolov : Nature 190, 1003-1004 (1961)
Spectrophotometric determination of the electron affinities of some diatomic molecules. [E, hν, Br_2, Cl_2, I_2, ICl, O_2, NO]

O B. G. Koenders, G. J. Kuik, K. E. Drabe and C. A. De Lange : Chem. Phys. Lett. 147, 310-314 (1988)
(2+1) REMPI PES of gerade Rydberg states of molecular bromine in the 68000 to 73400 cm^{-1} region. [E, hν, Br_2]

O G. Kortum und W. Luck : Z. Naturforsch. 6a, 305-312 (1951)
Absorptionsuntersuchungen an der sichtbaren Bande des Bromdampfes.
[E, hν, Br_2; old papers see G. Kortum : Z. Naturf. 1, 439 and 637 (1946)]

O H. Kuhn : Z. Phys. 39, 77-91 (1926)
Absorptionsspektren und Dissoziationswarmen von Halogenmolekulen.
[E, hν, Br_2, Cl_2, I_2]

I M. V. Kurepa, D. S. Babic and D. S. Belic : J. Phys. B14, 375-384 (1981a) ○
A Electron-bromine-molecule total ionisation and electron attachment cross sections. [E, Br_2; q_i 10 - 100 eV, q_a 0 - 10 eV]

A M. V. Kurepa, D. S. Babic and D. S. Belic : Chem. Phys. 59, 126-136 (1981b)
Attachment rate coefficients of halogen molecules (F_2, Cl_2, Br_2, I_2) for mean energies 10^{-2} to 10^2 eV. [T, F_2 - I_2]

O K. P. Lawley, R. J. Donovan, T. Ridley, A. J. Yencha and T. Ichimura : Chem. Phys. Lett. 168, 168-172 (1990)
First Rydberg cluster in Br_2 observed via two-photon resonant multiphoton ionisation. [E, hν, Br_2]

O S. R. Leone and C. B. Moore : Phys. Rev. Lett. 33, 269-272 (1974)
Isotopically selective photochemistry of bromine. [E, hν, Br_2]

O R. J. LeRoy and G. Burns : J. Mol. Spectrosc. 25, 77-85 (1968)
A method for testing and improving molecular constants of diatomic molecules with special reference to Br_2 ($^1\Sigma_g^+$). [T, Br_2]

O R. J. LeRoy and R. B. Bernstein : J. Mol. Spectrosc. 37, 109-130 (1971)
Dissociation energies and long-range potentials of diatomic molecules from vibrational spacings : The halogens. [T, Br_2, Cl_2, I_2]

O R. H. Lipson, A. R. Hoy and M. J. Flood : Chem. Phys. Lett. 149, 155-160 (1988)
Direct vibrational numbering of the DO_u^+ ion pair state of Br_2.
[E, hν, Br_2]

O R. H. Lipson and A. R. Hoy : J. Mol. Spectrosc. 134, 183-198 (1989)
VUV laser spectroscopy of ion-pair states of Br_2. [E, hν, Br_2]

O R. M. Lum and K. B. McAfee, Jr. : J. Chem. Phys. 63, 5029-5033 (1975a)
Direct measurement of spontaneous predissocitation using coaxial laser-molecular beams. [E, hν, Br_2]

O R. M. Lum and R. S. Hozack : J. Mol. Spectrosc. 58, 325-327 (1975b)
Identification of selectively excited transitions in Br_2 isotopes at 5145 A. [E, hν, Br_2]

O F. Martinez, F. J. Basterrechea, J. Albaladejo, F. Castano and P. Puyuelo : J. Phys. B24, 2765-2774 (1991)
Dynamics of the low vibrational levels of Br_2 $B^3\Pi(0_u^+)$ state by laser induced fluorescence. [E, hν, Br_2]

O K. B. McAfee, Jr. and R. S. Hozack : J. Chem. Phys. 64, 2491-2495 (1976)
Lifetimes and energy transfer near the dissociation limit in bromine. [E, hν, Br_2]

O M. V. McLoughlin, J. D. Morrision and D. L. Smith : Int. J. Mass Spectrom. Ion Process. 58, 201-215 (1984)・
Photodissociation of Cl_2^+, Br_2^+ and I_2^+. [E, hν, Cl_2 - I_2]

I J. D. Morrison and A. J. Nichlson : J. Chem. Phys. 20, 1021-1023 (1952)
Studies of ionization efficiency. Part II. The ionization potentials of some organic molecules. [E, Br_2, Cl_2, I_2, 83 molecules]

O J. D. Morrison, H. Hurzeler, M. G. Inghram and H. E. Stanton : J. Chem. Phys. 33, 821-824 (1960)
Threshold law for the probability of excitation of molecules by photon impact. A study of the photoionization efficiencies of Br_2, I_2, HI, and CH_3I. [E, hν, Br_2, I_2, HI, CH_3I]

O R. S. Mulliken : Phys. Rev. 46, 549-571 (1934)
The halogen molecules and their spectra. J-J-like coupling. Molecular ionization potentials. [T, F_2 - I_2, HF - HI, N_2, CO, etc.]

O R. S. Mulliken : J. Chem. Phys. 8, 382-395 (1940)
Intensities in molecular electronic spectra. X. Calculations on mixed-halogen, hydrogen halide, alkyl halide, and hydroxyl spectra.
[T, F_2 - Br_2, HF - HI, OH, CH_3Cl - CH_3I, etc.]

O J. R. Murray, J. C. Swingle and C. E. Turner, Jr. : Appl. Phys. Lett. 28, 530-531 (1976)
Laser oscillation on the 292-nm band system of Br_2. [E, hν, Br_2]

O G. Nakamura : Mem. Coll. Sci. Kyoto Univ. 9, 335-369 (1926)
Studies of the band spectrum of halogen. II. The analysis of the band spectrum of iodine, bromine and chlorine. [E, hν, Br_2, I_2, Cl_2]

O R. J. Oldman, R. K. Sander and K. R. Wilson : J. Chem. Phys. 63, 4252-4260 (1975)
Photofragment spectrum of bromine. [E, hν, Br_2; visible and near UV]

O T. N. Olney, M. N. Cann, G. Cooper and C. E. Brion : Chem. Phys. 223, 59-98 (1997)・
Absolute scale determination for photoabsorption spectra and the calculation of molecular properties using dipole sum-rules.
[E and T, $h\nu$, Br_2, Cl_2, I_2, He - Xe, H_2O, N_2O, SiH_4, PH_3, PF_3, etc.]

O W. B. Person : J. Chem. Phys. 38, 109-116 (1963)
Electron affinities of some halogen molecules and the charge-transfer frequency. [T, Br_2, Cl_2, I_2, ICl]

O A. W. Potts and W. C. Price : Trans. Faraday Soc. 67, 1242-1252 (1971)
Photoelectron spectra of the halogens and mixed halides ICl and IBr.
[E, $h\nu$, F_2 - I_2, ICl, IBr]

E S. Pozdneev and V. Shcheglov : Chem. Phys. 123, 27-41 (1988)・
A Application of the quantum theory of scattering to the calculation of the simplest chemical reactions.
[T, Br_2, Cl_2, I_2, HCl, HBr, H_2, HD, D_2, N_2]

O R. Rackwitz, D. Feldman, E. Heinicke und H. J. Kaiser : Z. Naturforsch. 29a, 1797-1802 (1974)
Photodissoziation bei zweiatomigen negativen Halogenmolekulionen.
[E, $h\nu$, Br_2^-, F_2^-, Cl_2^-, I_2^-; 0.5 - 3 eV]

Y. V. Rao → Y. Venkateswara Rao

α S. A. A. Razzak and C. C. Goodyear : J. Phys. D2, 1577-1581 (1969)・
A Measurement of ionization and attachment coefficients in bromine.
[E, Br_2; E/N = 225 - 630 Td]

O A. L. G. Rees : Proc. Phys. Soc. London 59, 1008-1010 (1947)
Note on the interpretation of the visible absorption spectrum of bromine.
[T, $h\nu$, Br_2]

E M. E. Riley, C. J. MacCallum and F. Biggs : Atomic Data Nucl. Data Tables 15, 443-475 (1975); Erratum 28, 379-379 (1983)
Theoretical electron-atom elastic scattering cross sections. Selected elements, 1 keV to 256 keV. [T, Br, Cl, etc.]

α A. V. Risbud and M. S. Naidu : Indian J. Pure Appl. Phys. 16, 32-36 (1978)・
O Sparking potentials and ionization coefficients in some electronegative gases and their mixtures. [E, Br_2, Cl_2, CO_2, CCl_2F_2, SF_6]

O C. Roxlo and A. Mandl : J. Appl. Phys. 51, 2969-2972 (1980)
Vacuum ultraviolet absorption cross sections for halogen containing molecules. [E, $h\nu$, Br_2, Cl_2, I_2, HCl - HI, CCl_4, $HgCl_2$, etc.]

O D. J. Seery and D. Britton : J. Phys. Chem. 68, 2263-2266 (1964)
The continuous absorption spectra of chlorine, bromine, bromine chloride, iodime chloride, and iodine bromide.
[E, hν, Br_2, Cl_2, BrCl, ICl, IBr; 2200 - 6000 A, 298 K]

E C. H. Shaw and T. M. Snyder : Phys. Rev. 58, 600-602 (1940)・
Electron scattering in bromine gas. [T, Br_2; DCS, 15, 41 eV]

EX D. A. Shaw, D. Cvejanovic, G. C. King and F. H. Read : J. Phys. B17, 1173-1187 (1984)
Inner-shell and outer-shell excitation of HCl, HBr and Br_2 by electron impact with high resolution. [E, Br_2, HCl, HBr; 1.5 keV]

O T. Shinzawa, A. Tokunaga, T. Ishiwata, I. Tanaka, K. Kasatani, M. Kawasaki and H. Sato : J. Chem. Phys. 80, 5909-5915 (1984)
A spectroscopic study of the $F(0_u^+)$ ion-pair state of Br_2 by the double resonance method. [E, hν, Br_2]

A G. D. Sides, T. O. Tiernan and R. J. Hanrahan : J. Chem. Phys. 65, 1966-1975 (1976)
Measurement of thermal electron dissociative attachment rate constants for halogen gases using a flowing afterglow techniques.
[E, Br_2, F_2, Cl_2, SF_6]

O B. M. Smirnov and A. S. Yatsenko : Phys. Usp. 39, 211-230 (1996)
Properties of dimers. [review, F_2 - I_2, He_2 - Xe_2, etc.]

E I. M. Smith, D. G. Thompson and K. Blum : J. Phys. B31, 4029-4058 (1998)
Chiral effects in electron scattering by molecules using a continuum multiple scattering method. [T, Br_2, HBr, BCl, etc.]

O T. M. Snyder and C. H. Shaw : Phys. Rev. 57, 881-886 (1940)
The fine structure of the X-ray absorption limits of bromine and chlorine. [T, hν, Br_2, Cl_2]

O V. N. Soshnikov : Sov. Phys. Usp. 4, 425-440 (1961)・
Absolute intensities of electronic transitions in diatomic molecules.
[review, hν, F_2 - I_2, HF - HI, H_2, N_2, O_2, Li_2, Na_2]

O D. Spence : Phys. Rev. A10, 1045-1052 (1974)
Systematics of Feshbach resonances in the molecular hologens.
[E, F_2 - I_2]

O R. K. Steunenberg and R. C. Vogel : J. Am. Chem. Soc. 78, 901-902 (1956)
The absorption spectrum of fluorine.
[E, hν, F_2 - I_2; 2000 - 6000 A, 298 - 373 K]

O P. Sulzer und K. Wieland : Helv. Phys. Acta 25, 653-676 (1952)
Intensitatsverteilung eines kontinuierlichen Absorptionsspektrums in Abhangigkeit von Temperature und Wellenzahl.
[E, hν, Br_2, Cl_2, I_2; 293 - 906 K for Br_2, 3200 - 6000 A]

O K. G. P. Sulzmann, F. Bien and S. S. Penner : J. Quant. Spectrosc. Radiat. Transf. 7, 969-977 (1967)
Intensity and collision half-width measurements using a laser source. II. Continuum and line absorption of Br_2 at 6328 A. [E, hν, Br_2]

O A. Sur and J. Tellinghuisen : J. Mol. Spectrosc. 88, 323-346 (1981)
The D' → A' transition in Br_2. [E, hν, Br_2; 2800 - 2950 A]

E D. A. Swick and J. Karle : J. Chem. Phys. 35, 2257-2258 (1961)・
EX Pattern inversion for coherent inelastic electron scattering by Br_2.
[T, Br_2]

A W.-C. Tam and S. F. Wong : J. Chem. Phys. 68, 5626-5630 (1978)○
Dissociative attachment of halogen molecules by 0 - 8 eV electrons.
[E, Br_2, F_2, Cl_2, I_2]

O P. W. Tasker, G. G. Balint-Kurti and R. N. Dixon : Mol. Phys. 32, 1651-1660 (1976)
A calculation for the potential curves for the halogen molecule negative ions. [T, Br_2, Cl_2, I_2, ClBr, ClI, BrI]

O J. Tellinghuisen, P. Berwanger, J. G. Ashmore and K. S. Viswanathan : Chem. Phys. Lett. 84, 528-533 (1981)
The emission spectrum of Br_2 in argon. [E, hν, Br_2 + Ar]

O J. Tellinghuisen : J. Chem. Phys. 78, 2374-2380 (1983)
Direct fitting of spectroscopic data to near-dissociation expansions : I_2(D' - A'), Br_2(D' - A') and XeCl(B →X and D → X).
[T, hν, Br_2, I_2, XeCl]

O J. Tellinghuisen, D. Austin, M. MacDonald, K. P. Lawley and R. J. Donovan : Can. J. Phys. 67, 863-869 (1989)
Isotopic mass dependence in the bound-free D-X fluorescence spectrum of Br_2. [E, hν, Br_2, $^{81}Br_2$; 1576 A from F_2 laser]

O W. B. Tiffany, H. W. Moos and A. L. Schawlow : Science 157, 40-43 (1967)
Selective laser photocatalysis of bromine reactions. [E, hν, Br_2]

O W. B. Tiffany : J. Chem. Phys. 48, 3019-3031 (1968)
Selective photochemistry of bromine using a ruby laser.
[E, hν, Br_2; 6000 - 7200 A]

O J. A. C. Todd, W. G. Richards and M. A. Byrne : Trans. Faraday Soc. 63, 2081-2084 (1967)
Complete potential energy curves for excited states of chlorine and bromine. [T, Br_2, Cl_2]

A D. W. Trainor and M. J. W. Boness : Appl. Phys. Lett. 32, 604-606 (1978)・
Dissociative attachment of electrons to Br_2 and HBr.
[E, Br_2, HBr; attach. rate const. at 0.3 - 0.8 eV]

A F. K. Truby : Phys. Rev. A4, 613-618 (1971)・
Dissociative electron attachment in Br_2 at 296 °K.
[E, Br_2; attachment coeff. 0.82 x 10^{-12} cm^3/s]

0 Y. Uchida and Y. Ota : Jap. J. Phys. 5, 59-66 (1928)
Studies on the emission band spectrum of bromine. [E, $h\nu$, Br_2]

0 H. van Lonkhuyzen and C. A. de Lange : Chem. Phys. 89, 313-322 (1984)
High-resolution UV photoelectron spectroscopy of diatomic halogens.
[E, $h\nu$, Br_2, F_2, Cl_2; He I]

0 Y. Venkateswara Rao and P. Venkateswarlu : J. Mol. Spectrosc. 13, 288-295 (1964)
Vacuum ultraviolet resonance spectrum of Br_2 molecule.
[E, $h\nu$, Br_2; 1565 - 1860 A]

0 K. Venkateswarlu : Proc. Indian Acad. Sci. A25, 138-150 (1947)
Emission bands of halogens. Ⅳ. Diffuse bands of bromine. [E, $h\nu$, Br_2]

0 P. Venkateswarlu and R. D. Verma : Proc. Indian Acad. Sci. A46, 251-264 (1957a)
Emission spectrum of bromine excited in the presence of argon. Ⅰ.
[E, $h\nu$, Br_2 + Ar]

0 P. Venkateswarlu and R. D. Verma : Proc. Indian Acad. Sci. A46, 416-421 (1957b)
Emission spectrum of bromine excited in the presence of argon. Ⅱ.
The band system in the region 3150 - 2970 A.
[E, $h\nu$, Br_2 + Ar; Ⅲ see R. D. Verma (1958)]

0 P. Venkateswarlu : Can. J. Phys. 47, 2525-2538 (1969)
The vacuum ultraviolet spectrum of the bromin molecule.
[E, $h\nu$, Br_2; 1170 - 1700 A]

0 P. Venkateswarlu, V. N. Sarma and Y. Venkateswara Rao : J. Mol. Spectrosc. 96, 247-265 (1982)
Resonance series of Br_2 in the vacuum ultraviolet.
[E, $h\nu$, Br_2; 1500 - 2100 A, excited by discharge]

0 R. D. Verma : Proc. Indian Acad. Sci. A47, 196-200 (1958)
Emission spectrum of bromine excited in the presence of argon. Ⅲ. The band system in the region 2660 - 2590 A.
[E, $h\nu$, Br_2 + Ar; Ⅱ see P. Venkateswarlu (1957b)

0 D. A. Vroom : Thesis, University of British Columbia 1-202 (1967)
Photoelectron spectroscopy of gases.
[E, $h\nu$, Br_2, F_2, Cl_2, I_2, N_2, O_2, NO, CO, HF, HCl, etc.]

0 W. R. Wadt and P. J. Hay : J. Chem. Phys. 82, 284-298 (1985)
Ab initio effective core potentials for molecular calculations.
Potentials for main group elements Na to Bi. [T, Br_2, Cl_2, etc.]

0 K. Watanabe : J. Chem. Phys. 26, 542-547 (1957)
Ionization potentials of some molecules. [E, Br_2, Cl_2, I_2, 89 molecules]

0 K. Wieland, J. B. Tellinghuisen and A. Nobs : J. Mol. Spectrosc. 41, 69-83 (1972)
The band systems E → B (4000 - 4360 A) and F → X (2530 - 2740 A) of $^{127}I_2$ and $^{129}I_2$, and the corresponding system E ←→ B of Br_2 and Cl_2.
[E, $h\nu$, Br_2, Cl_2, I_2]

O L. Xu, Y. -f. Wang, P. -n. Wang and F. -m. Li : J. Chem. Phys. 101, 3524-3530 (1994)
Rotational analyses and angular momentum assignments of $[^2\Pi_{3/2}]4d$ Rydberg states of Br_2. [E, hν, Br_2]

O C. Yan and A. C. Kummel : J. Chem. Phys. 98, 6869-6882 (1993)
Effect of hyperfine depolarization upon creation and detection of alignment in free-jet expansions via selective photodissociation.
[E, hν, Br_2, Cl_2]

O K. K. Yee and T. J. Stone : Mol. Phys. 26, 1169-1176 (1973)
Analysis of RKR long-range potentials of the $B^3\Pi_{ou}^+$ states of Br_2 and Cl_2. [T, hν, Br_2, Cl_2]

O M. Zackrisson : J. Mol. Spectrosc. 163, 371-380 (1994)
The $A^2\Pi_u - X^2\Pi_g$ system of Br_2^+ studied by velocity modulation spectroscopy. [E, hν, Br_2]

O F. Zaraga, N. S. Nogar and C. B. Moore : J. Mol. Spectrosc. 63, 564-571 (1976)
Transition moment, radiative lifetime, and quantum yield for dissociation of the $^3\Pi_{ou}^+$ state of $^{81}Br_2$. [T, Br_2]

Addenda of References for Br_2

(published in 2000, plus some old papers)

2000

I H. Deutsch, K. Becker and T. D. Mark : Eur. Phys. J. D12, 283-287 (2000)
Calculation of absolute electron-impact ionization cross-sections of dimers and trimers. [T, Br_2, F_2, I_2, O_3, C_{60}, etc.]

Addenda (1901 - 1999)

S V. A. Bailey and R. H. Healey : Phil. Mag. 19, 725-746 (1935)
The behaviour of electrons in chlorine. [E, Cl_2, $Cl_2 + CO_2$, Cl_2 + He]

O M. Birth, M. D. Rowe, O. Schnepp and P. J. Stephens : Chem. Phys. 9, 57-73 (1975)
The magnetic circular dichroism spectrum of the halogen molecules I_2, Br_2, Cl_2. Resolution of overlapping continua. [E, hν, $Cl_2 - I_2$]

O K. K. Innes, S. J. Jackling III and T. W. Tolbert : J. Quant. Spectrosc. Radiat. Transf. 16, 443-450 (1976)
Pressure shift and/or broadening of lines in the electronic spectra of Cl_2, Br_2, I_2, O_2, HD, AlH and H_2CO.
[E, hν, Br_2, Cl_2, comparison, I_2, O_2, HD, AlH, H_2OH]

O K. R. Wilson : in Chemistry of the Excited State, N. Pitts, Jr. (Ed), Gordon and Breach 42- (1970)

Author Index for Br_2 References

A. Nobs 13
N. S. Nogar 14
R. G. W. Norrish 3

K. Obi 7
E. A. Ogryzlo 6
H. Ohtoshi 7
R. J. Oldman 9
T. N. Olney 10
Y. Ota 13

M. S. Park 8
L. B. Pederson 2
S. S. Penner 12
W. B. Person 10
L. C. Pitchford 5
A. W. Potts 10
S. Pozdneev 10
W. C. Price 10
P. Puyuelo 9

R. Rackwitz 10
J. L. Ragle 4
Y. V. Rao 10
A. Raynal 6
S. A. A. Razzak 10
F. H. Read 11
A. L. G. Rees 10
W. G. Richards 12
T. Ridley 8
M. E. Riley 10
A. V. Risbud 10
M. D. Rowe 3
C. Roxlo 10

K. Sakurai 3
R. K. Sander 9
V. N. Sarma 13
H. Sato 11
A. L. Schawlow 12
O. Schnepp 3
D. J. Seery 11
C. H. Shaw 11
D. A. Shaw 11
V. Shcheglov 10
T. Shinzawa 7, 11
G. V. Shlyapnikov 5
G. D. Sides 11
J. Sinzelle 6
B. M. Smirnov 5, 11
D. L. Smith 9
I. M. Smith 11
T. M. Snyder 11
U. Sokolov 8
J. M. Somerville 2
V. N. Soshnikov 11
V. B. Sovkov 7
D. Spence 11
H. Sponer 4
H. E. Stanton 9
I. A. Stenhouse 4
P. J. Stephens 3
R. K. Steunenberg 11
T. J. Stone 14
J. V. Sullivan 2
P. Sulzer 11
K. G. P. Sulzmann 12
A. Sur 12
D. A. Swick 12
J. C. Swingle 9

W. -C. Tam 12
I. Tanaka 7, 11
P. W. Tasker 12
A. W. Taylor 3
J. Tellinghuisen 2, 4, 7, 12
J. B. Tellinghuisen 13
D. G. Thompson 11
T. O. Tiernan 11
W. B. Tiffany 12
P. Tiruvenganna Rao 6
J. A. C. Todd 12
A. Tokunaga 7, 11
D. W. Trainor 12
F. K. Truby 12
I. L. Tsikora 3
R. P. Tuckett 6
C. E. Turner 9

Y. Uchida 13

H. van Lonkhuyzen 13
K. Venkateswarlu 13
P. Venkateswarlu 13
R. D. Verma 13
K. S. Viswanathan 2, 12
R. C. Vogel 11
W. von Niessen 5
D. A. Vroom 5, 13

W. R. Wadt 13
J. A. Walker 5
P. -n. Wang 14
Y. -f. Wang 14
K. Watanabe 13
E. Weigold 5
W. E. Wentworth 1, 5
K. Wieland 11, 13
J. R. Wiesenfeld 6
K. R. Wilson 9, 14
S. F. Wong 12
A. R. Woon-Fat 4

L. Xu 14

C. Yan 3, 14
A. S. Yatsenko 11
K. K. Yee 2, 14
A. J. Yencha 1, 8

M. Zackrisson 14
F. Zaraga 14

Iodine Molecule I_2

References for I_2 (1900 - 1999)

(Iodine)

[Halogen]

E	: Elastic collision,	R	: Rotational excitation,
V	: Vibrational excitation,	EX	: Electronic excitation,
D	: Dissociation,	I	: Ionization,
A	: Attachment,	QT	: Grand total cross section,
S	: Swarm,	α	: Ionization coefficient,
O	: The others,	[ ]	: Additional informations, E : Exp., T : Theory.

The oldest paper in this list is given by R.W.Wood (1910).

O M.E.Akopyan, F.I.Vilesov and Yu.L.Sergeev : Opt.Spectrosc.35, 472-475 (1973)
Photoionization processes in molecular iodine.
[E, $h\nu$, I_2; 90 - 140 nm]

O S.Aksela, H.Aksela and T.D.Thomas : Phys.Rev.A19, 721-733 (1979)・
$M_{4,5}N_{4,5}X$ Auger electron spectra of iodine and xenon. Many-body effects.
[E, I_2, Xe; 0.88 and 3 keV]

O A.Almenningen, O.Bastiansen, L.Fernholt and M.Traetteberg : J.Chem.Phys.32, 616-617 (1960)
Electron scattering from iodine vapor. [E, I_2; 40 keV]

O E.v.Angerer : Z.Phys.11, 167-169 (1922)
Spectroskopische Messung der Elektronenaffinitat von Chlor.
[E, Cl_2 - I_2; 2300 - 3200 A]

E F.L.Arnot : Proc.Roy.Soc.London A144, 360-377 (1934)
The diffraction of electrons in the halogens.
[E, I_2, Br_2, Ar - Xe, H_2S, CCl_4, $CHBr_3$; DCS]

O R.K.Asundi and P.Venkateswarlu : Nature 156, 452-452 (1945)
Emission bands of the fluctuation type in the spectrum of iodine.
[E, $h\nu$, I_2]

O R.K.Asundi and P.Venkateswarlu : Indian J.Phys.21, 101-118 (1947)
Spectra of the halogens, I_2, Br_2 and Cl_2. [review, E, $h\nu$, Cl_2 - I_2]

A J.A.Ayala, W.E.Wentworth and E.C.M.Chen : J.Phys.Chem.85, 768-777 (1981)
Electron attachment to halogens.
[E, I_2, F_2, Cl_2, Br_2; thermal electron attachment]

A A.Azria, R.Abouaf and D.Teillet-Billy : J.Phys.B21, L213-L217 (1988)・
Negative-ion states of molecular iodine. [E, I_2; 0 - 5 eV]

O A. P. M. Baede : Physica 59, 541-544 (1972)
The adiabatic electron affinities of Cl_2, Br_2, I_2, IBr, NO_2 and O_2.
[T, Cl_2 - I_2, etc.]

V J. N. Bardsley : in Electron-Molecule and Photon-Molecule Collisions, Plenum
A 267-280 (1979)
Molecular resonance phenomena.
[review, I_2, F_2, Cl_2, H_2, N_2, O_2, NO, HCl]

O P. N. Barnes and M. J. Kushner : J. Appl. Phys. 80, 5593-5597 (1996)
Formation of XeI(B) in low pressure inductive radio frequency electric discharges sustained in mixtures of Xe and I_2. [E, I_2 + Xe]

O R. F. Barrow, D. F. Broyd, L. B. Pederson and K. K. Yee : Chem. Phys. Lett. 18, 357-358 (1973a)
The dissociation energies of gaseous Br_2 and I_2. [E, $h\nu$, Br_2, I_2]

O R. F. Barrow and K. K. Yee : J. Chem. Soc. Faraday Trans. II 69, 684-700 (1973b)
$B^3\Pi_{ou}^+ - X^1\Sigma_g^+$ system of $^{127}I_2$: Rotational analysis and long-range potential in the $B^3\Pi_{ou}^+$ state. [E, $h\nu$, I_2]

O N. S. Bayliss and J. V. Sullivan : J. Chem. Phys. 22, 1615-1616 (1954)
Vacuum ultraviolet absorption spectra of iodine and bromine.
[E, $h\nu$, I_2, Br_2]

O D. Bertuccelli and C. B. Suarez : Spectrosc. Lett. 19, 389-396 (1986)
Comparison of relative intensity with Franck-Condon factors of the P(15) lines in seven bands of I_2 B-X transition. [E, $h\nu$, I_2]

O S. S. Bhatnager, D. L. Shrivastava, K. N. Mathur and R. K. Sharma : Phil. Mag. 5, 1226-1240 (1928)
Tesla luminescence spectra of the halogens. — Part I. Iodine.
[E, $h\nu$, I_2]

A M. A. Biondi : Phys. Rev. 109, 2005-2007 (1958a)
Dissociative attachment of electrons in iodine. I. Microwave determination of the absolute cross section at 300°K. [E, I_2]

A M. A. Biondi and R. E. Fox : Phys. Rev. 109, 2012-2014 (1958b)
Dissociative attachment of electrons in iodine. III. Discussion.
[E, I_2; II see R. E. Fox (1958)]

A D. T. Birtwistle and A. Modinos : J. Phys. B11, 2949-2955 (1978)
Dissociative attachment in iodine. [T, I_2]

O R. S. Bradford, E. R. Ault and M. L. Bhaumik : Appl. Phys. Lett. 27, 546-548 (1975)
High-power I_2 laser in the 342-nm band system.
[E, $h\nu$, I_2; e-beam-excited mixture of Ar + CF_3I]

O J. C. D. Brand and H. R. Hoy : Appl. Spectrosc. Rev. 23, 285-328 (1987)
Multiphoton spectra and states of halogens.
[review, $h\nu$, Cl_2 - I_2, IBr, ICl, IF, BrF]

O L. Brewer, R. A. Berg and G. M. Rosenblatt : J. Chem. Phys. 38, 1381-1388 (1963)
Radiative lifetime of I_2 fluorescence, $B^3\Pi_{o^+u} \rightarrow X^1\Sigma_{o^+g}$. [E, I_2]

O L. Brewer and J. Tellinghuisen : J. Chem. Phys. 56, 3929-3938 (1972)
Quantum yield for unimolecular dissociation of I_2 in visible absorption.
[E, $h\nu$, I_2]

O A. G. Briggs and R. G. W. Norrish : Proc. Roy. Soc. London A276, 51-68 (1963)
Transient absorption spectra of chlorine and bromine.
[E, $h\nu$, I_2, Cl_2, Br_2]

O M. Brith, M. D. Rowe, O. Schnepp and P. J. Stephens : Chem. Phys. 9, 57-73 (1975)
The magnetic circular dichroism spectrum of the halogen molecules I_2, Br_2, Cl_2. Resolution of overlapping continua.
[E, $h\nu$, I_2, Br_2, Cl_2; 250 - 800 nm]

A H. L. Brooks, S. R. Hunter and K. J. Nygaard : J. Chem. Phys. 71, 1870-1873 (1979)
Temperature dependence of the electron attachment coefficient in iodine.
[E, I_2; swarm, 1 - 50 Td, α_a for 0.5 - 2.4 eV, 308 - 383 K]

O J. D. Brown, G. Burns and R. J. LeRoy : Can. J. Phys. 51, 1664-1677 (1973)
Improved spectroscopic data synthesis for $I_2(B^3\Pi_{ou^+})$ and predictions of J dependence for $B(^3\Pi_{ou^+}) - X(^1\Sigma_{g^+})$ transition intensities.
[analysis, $h\nu$, I_2]

O J. D. Brown and G. Burns : Can. J. Phys. 52, 1862-1871 (1974)
The thermal emission of iodine. [E, $h\nu$, I_2; 1000 - 2000 K]

O R. L. Brown and T. C. James : J. Chem. Phys. 42, 33-35 (1964)
Isotopic determination of the vibrational numbering for the $B^3\Pi_{ou^+}$ state of iodine. [E, $h\nu$, I_2]

O W. G. Brown : Phys. Rev. 38, 1187-1189 (1931)
An infrared absorption band system of iodine.
[E, $h\nu$, I_2; 8300 - 9300 A, 353 - 423 K]

O M. Broyer and J. C. Lehmann : Phys. Lett. A40, 43-44 (1972)
Rotational Lande factors in the $B^3\Pi_{Ou^+}$ state of iodine.
[E and T, $h\nu$, I_2]

O M. Broyer, J. Vigue and J. -C. Lehmann : Chem. Phys. Lett. 22, 313-316 (1973)
Two unexpected effects concerning perturbations of the $B^3\Pi O_{u^+}$ state of molecular iodine. [E, $h\nu$, I_2]

O M. Broyer, J. -C. Lehmann and J. Vigue : J. Physiq. 36, 235-241 (1975a)
g factors and lifetimes in the B state of molecular iodine.
[E, $h\nu$, I_2]

O M. Broyer, J. Vigue and J. C. Lehmann : J. Chem. Phys. 63, 5428-5431 (1975b)
Direct evidence of the natural predissociation of the I_2 B state through systematic measurements of lifetimes. [E, $h\nu$, I_2]

O M. Broyer, J. Vigue and J.-C. Lehmann : J. Chem. Phys. 64, 4793-4794 (1976)
Hyperfine predissociation of molecular iodine. [E, $h\nu$, I_2]

A R. Buchdahl : J. Chem. Phys. 9, 146-152 (1941)
Negative ion formation in iodine vapor by electron impacts.
[E, I_2; 0 - 7 eV]

O E. D. Bugrim, S. N. Makrenko and I. L. Tsikora : Opt. Spectrosc. 37, 610-612 (1974)
Efficiency of the vibrational deactivation and quenching of an electronically excited I_2 molecule. [E, I_2; I_2^* $B^3\Pi_{ou}^+$]

O P. R. Bunker and G. R. Hanes : Chem. Phys. Lett. 28, 377-379 (1974)
Nuclear spin-spin coupling in the spectrum of I_2 at 6328 A.
[T, $h\nu$, I_2; B - X band]

O G. E. Busch, R. T. Mahoney, R. I. Morse and K. R. Wilson : J. Chem. Phys. 51, 837-838 (1969)
Photodissociation recoil spectra of IBr and I_2. [E, $h\nu$, I_2, IBr]

A G. E. Caledonia : Chem. Rev. 75, 333-351 (1975)·
A survey of the gas-phase negative ion kinetics of inorganic molecule attachment reaction.
[review, I_2, Br_2, F - I, O_2, NO, HCl, OH, H_2O, N_2O, NO_2, CO_2, SO_2, O_3]

O A. B. Callear, P. Erman and J. Kurepa : Chem. Phys. Lett. 44, 599-601 (1976)
The D state lifetime and the UV laser action of molecular iodine.
[E, $h\nu$, I_2]

O G. A. Capelle and H. P. Broida : J. Chem. Phys. 57, 5027-5029 (1972)
Magnetic field dependence of I_2 B-state lifetimes. [E, $h\nu$, I_2]

O G. A. Capelle and H. P. Broida : J. Chem. Phys. 58, 4212-4222 (1973)
Lifetimes and quenching cross sections of $I_2(B^3\Pi_{ou}^+)$. [E, I_2]

O G. Cario und O. Oldenberg : Z. Phys. 31, 914-919 (1925)
Uber elektrische Anregung des Jodbandenspektrums und des Jodbanden-spektrums. [E, $h\nu$, I_2; see O. Oldenberg (1924)]

O J. H. Carver and J. L. Gardner : J. Quant. Spectrosc. Radiat. Transf. 12, 207-218 (1972)·
Photoelectron spectroscopy and partial photoionization cross sections for iodine and bromin. [E, $h\nu$, I_2, Br_2; 600 - 1200 A]

O D. Cerny, R. Bacis, S. Churassy, D. Inard, M. Lamrini and M. Nota : Chem. Phys. 216, 207-226 (1997)
Analysis of the $D'\,^2\Sigma_g$ - $A'\,^2\Sigma_u$ transition in the molecular iodine by laser-induced-fluorescence Fourier-transform spectrometry. [E, $h\nu$, I_2]

A P. J. Chantry : in Applied Atomic Collision Physics, Vol. 3, Academic Press 35-70 (1982)
Negative ion formation in gas laser.
[review, I_2, F_2, NF_3, HCl, $HgBr_2$, etc.]

0 G. D. Chapman and P. R. Bunker : J. Chem. Phys. 57, 2951-2959 (1972)
Magnetic quenching of iodine fluorescence excited by a 6328 A He/Ne laser. [E, hν, I_2]

0 E. C. Chen and W. E. Wentworth : J. Phys. Chem. 89, 4099-4105 (1985)
Negative ion state of the halogens. [T, F_2 - I_2, F - I]

0 M. S. Child and R. B. Bernstein : J. Chem. Phys. 59, 5916-5925 (1973a)
Diatomic interhalogens : Systematics and implications of spectroscopic interatomic potentials and curve crossings. [T, F_2 - I_2, IBr, etc.]

0 M. S. Child : J. Mol. Spectrosc. 45, 293-297 (1973b)
Direct inversion of magnetic fluorescence quenching data for the $B^3\Pi$ (0_u^+) state of iodine. [T, hν, I_2]

0 W. A. Chupka, J. Berkowitz and D. Gutman : J. Chem. Phys. 55, 2724-2733 (1971)
Electron affinities of halogen diatomic molecules as determined by endoergic charge transfer. [E, F_2 - I_2]

0 A. Chutjian, J. K. Link and L. Brewer : J. Chem. Phys. 46, 2666-2675 (1967)
Measurement of lifetimes and quenching cross sections of the B state of I_2. [E, hν, I_2; v' = 10 - 100]

0 A. Chutjian and T. C. James : J. Chem. Phys. 51, 1242-1249 (1969a)
Intensity measurements in the $B^3\Pi_{ou}^+ - X^1\Sigma_{og}^+$ system of I_2.
[E, hν, I_2]

0 A. Chutjian : J. Chem. Phys. 51, 5414-5419 (1969b)
Calculation of predissociation rates of the $B^3\Pi_{ou}^+$ state of I_2.
[T, hν, I_2]

0 R. D. Clear and K. R. Wilson : J. Mol. Spectrosc. 47, 39-44 (1973)
Assignment of continuous spectra by photofragment spectroscopy : C state of I_2. [E, hν, I_2]

0 F. J. Comes, U. Nielsen and W. H. E. Schwarz : J. Chem. Phys. 58, 2230-2237 (1973)
Inner electron excitation of iodine in the gaseous and solid phase.
[E, hν, I_2; 45 - 160 eV]

0 H. Cordes : Z. Phys. 97, 603-624 (1935)
Das Absorptionsspektrum des Jodmolekuls im Vakuumultraviolett.
[E, hν, I_2; 1500 - 1950 A]

0 A. B. Cornford, D. C. Frost, C. A. McDowell, J. L. Ragle and I. A. Stenhouse : J. Chem. Phys. 54, 2651-2657 (1971)
Photoelectron spectra of the halogens. [E, hν, I_2, F_2, Cl_2, Br_2]

0 J. A. Coxon : in Molecular Spectroscopy — Volume 1, The Chemical Soc. 177-228 (1973)
Low-lying electronic states of diatomic halogen molecules.
[review, F_2 - I_2, ICl, etc.]

O D. M. Curtis and J. H. D. Eland : Int. J. Mass Spectrom. Ion Process. 63, 241-264 (1985).
Coincidence studies of double charged ions formed by 30.4 nm photoionization. [E, $h\nu$, I_2, CS_2, H_2S, SO_2, OCS, CO_2, NO, etc.]

O W. E. Curtis and S. F. Evans : Proc. Roy. Soc. London A141, 603-625 (1933)
The spectra of the halogen molecules. Part I. — Iodine.
[E, $h\nu$, I_2]

O F. W. Dalby, G. Petty-Sil, M. H. L. Pryce and C. Tai : Can. J. Phys. 55, 1033-1046 (1977)
Nonlinear resonant photoionization spectra of molecular iodine.
[E, $h\nu$, I_2]

O M. D. Danyluk and G. W. King : Chem. Phys. Lett. 44, 440-443 (1976)
Excited states of iodine from two-photon sequential absorption spectroscopy. [E, $h\nu$, I_2]

O M. D. Danyluk and G. W. King : Chem. Phys. 22, 59-70 (1977a)
Two photon sequential absorption spectroscopy of the iodine molecule.
[E, $h\nu$, I_2; pulsed N_2 laser]

O M. D. Danyluk and G. W. King : Chem. Phys. 25, 343-351 (1977b)
Energy levels of iodine near the B state dissociation limit.
[E, $h\nu$, I_2; see J. W. Tromp (1983)]

O E. O. Degenkolb, J. I. Steinfeld, E. Wasserman and W. Klemperer : J. Chem. Phys. 51, 615-622 (1969)
Vibrational dependence of the magnetic quenching in iodine.
[E, $h\nu$, I_2; 259 - 296 K]

A J. G. Dillard : Chem. Rev. 73, 589-643 (1973).
Negative ion mass spectrometry.
[review, F_2 - I_2, CCl_4, CH_3Cl, etc.]

O J. G. Dojahn, E. C. M. Chen and W. E. Wentworth : J. Phys. Chem. 100, 9649-9657 (1996).
Characterization of homonuclear diatomic ions by semiempirical Morse potential energy curves. I. The halogen anions. [T, F_2 - I_2, At_2]

O R. J. Donovan, B. V. O'Grady, K. Shobatake and A. Hiraya : Chem. Phys. Lett. 122, 612-616 (1985)
Fluorescence from ion-pair and Rydberg states of I_2. [E, $h\nu$, I_2]

I F. H. Dorman, J. D. Morriosn and A. J. C. Nicholson : J. Chem. Phys. 32, 378-384 (1960)
Threshold law for the probability of excitation by electron impact.
[E, I_2, O_2, CO, N_2]

A G. F. Drukarev and S. A. Pozdneev : 11th ICPEAC, Kyoto 346-347 (1979)
Calculation of dissociation attachment cross section to F_2, Cl_2, and I_2 molecules. [T, I_2, F_2, Cl_2; 0 - 0.2 eV for I_2]

O F. Duschinsky, E. Hirschlaff und P. Pringsheim : Physica 2, 439-448 (1935a)
Ultraviolette Fluoreszenspektra des Joddampfes, Resonanzspektra.
[E, $h\nu$, I_2]

O F. Duschinsky und P. Pringsheim : Physica 2, 633-644 (1935b)
Ultraviolette Fluoreszenspektra des Joddampfes : The McLennan Bands.
[E, hν, I_2]

O F. Duschinsky und P. Pringsheim : Physica 2, 923-932 (1935c)
Ultraviolette Fluoreszenspektra des Joddampfes : Einfluss von Fremsgasen.
[E, hν, I_2, I_2 + (N_2, He, Hg)]

A A. V. Eletskii and B. M. Smirnov : Sov. Phys. Usp. 28, 956-971 (1985)
Dissociative attachment of an electron to a molecule.
[review, F_2 - I_2, etc.]

O A. Elliott : Proc. Roy. Soc. London A174, 273-285 (1940)
The molecular spectra of iodine excited by fluorescence (in the presence of nitrogen) and by active nitrogen. [E, hν, I_2 + N_2]

O K. G. Emeleus and G. A. Woolsey (Ed) : Discharges in Electronegative Gases,
Taylor and Francis (1972)

O J. J. Ewing and C. A. Brau : Phys. Rev. A12, 129-132 (1975a)・
Emission spectrum of XeI* in electron-beam-excited Xe/I_2 mixtures.
[E, I_2 + Xe]

O J. J. Ewing and C. A. Brau : Appl. Phys. Lett. 27, 557-559 (1975b)・
Laser action on the 342-nm molecular iodine band. [E, hν, I_2]

O W. Finkelnberg : Phys. Z. 31, 1-25 (1930)
Kontinuierliche Gasspektren.
[review, Cl_2 - I_2, H_2, Hg, etc. ; 323 references]

A R. E. Fox : Phys. Rev. 109, 2008-2011 (1958)
Dissociative attachment of electrons in iodine. Ⅱ. Mass spectrographic determination of the energy dependence of the cross section.
[E, I_2; 0 - 0.9 eV]

O J. Franck : Trans. Faraday Soc. 21, 536-542 (1925)
Elementary processes of photochemical reactions. [E, hν, Cl_2 - I_2]

D. C. Frost and C. A. McDowell : in Advances in Mass Spectrometry, Vol. 1,
Pergamon Press 413-430 (1958a)
Recent electron impact studies on simple molecules (O_2, Cl_2, I_2).
[review, I_2, Cl_2, O_2]

A D. C. Frost and C. A. McDowell : J. Chem. Phys. 29, 964-965 (1958b)
Formation of I^- ion from I_2 by resonance capture. [E, I_2; 0 - 1.1 eV]

I D. C. Frost and C. A. McDowell : Can. J. Chem. 38, 407-420 (1960)
A The ionization and dissociation of some halogen molecules by electron impact. [E, I_2, Cl_2, Br_2, ICl, IBr]

O D. C. Frost, C. A. McDowell and D. A. Vroom : J. Chem. Phys. 46, 4255-4259 (1967)
Photoelectron spectra of the halogens and the hydrogen halides.
[E, hν, F_2 - I_2, HF - HI]

S J. W. Gallagher, E. C. Beaty, J. Dutton and L. C. Pitchford : JILA Information Center Report No. 22, 1-258 (1982)
A compilation of electron swarm data in electron-negative gases. [compilation, F_2 - I_2, NF_3, etc.]

S J. W. Gallagher, E. C. Beaty, J. Dutton and L. C. Pitchford : J. Phys. Chem. Ref. Data 12, 109-152 (1983)・
An annotated compilation and appraisal of electron swarm data in electro-negative gases. [compilation, F_2 - I_2, NH_3, etc., 19 molecules]

O M. Geilhaupt and Th. Dorfmuller : Chem. Phys. 76, 443-451 (1983)
Solvent effects on the potential energy surfaces of molecular iodine : A spectroscopic study. [E, $h\nu$, I_2 + CCl_4, I_2 + CH_3OH, etc.]

O S. Gerstenkorn, P. Luc and A. Perrin : J. Mol. Spectrosc. 64, 56-69 (1977)
Rotational analysis of the 5350 A band of iodine by means of Fourier transform spectroscopy. [E, $h\nu$, I_2]

O S. Gerstenkorn and P. Luc : Atlas du Spectre d'Absorption de la Molecule l'Iode, CNRS, Paris (1978)

O S. Gerstenkorn and P. Luc : Rev. Physiq. Appl. 14, 791-794 (1979)
Absolute iodine (I_2) standards measured by means of Fourier transform spectroscopy. [E, $h\nu$, I_2]

O S. Gerstenkorn, P. Luc and J. Sinzelle : J. Physiq. 41, 1419-1430 (1980)
Study of the iodine absorption spectrum by means of Fourier spectroscopy in the region 12600 - 14000 cm^{-1}. [E, $h\nu$, I_2]

O S. Gerstenkorn, P. Luc and C. Amiot : J. Physiq. 46, 355-364 (1985a)
Analysis of the long range potential of iodine in the $B^3\Pi_{ou}^+$ state. [T, I_2; potential energy curve]

O S. Gerstenkorn and P. Luc : J. Physiq. 46, 867-881 (1985b)
Description of the absorption spectrum of iodine recorded by means of Fourier transform spectroscopy : the (B - X) system. [E, $h\nu$, I_2]

O S. Gerstenkorn, P. Luc and R. J. LeRoy : Can. J. Phys. 69, 1299-1303 (1991)・
Molecular constants describing the $B(^3\Pi_{ou}^+)$ - $X(^1\Sigma_g^+)$ transitions of $^{127,129}I_2$ and $^{129,129}I_2$. [T, $h\nu$, I_2]

O Ts. I. Glozman, Yu. G. Zakharenko, N. A. Melnikov, L. P. Tkachenko and Ya. A. Fofanov : Opt. Spectrosc. 41, 519-520 (1976)
Saturated absorption in $^{127}I_2$. [E, $h\nu$, I_2]

O E. V. Golikova, A. V. Mironov, V. E. Privalov and S. K. Savelev : Opt. Spectrosc. 75, 712-714 (1993)
On the absorption spectrum of molecular iodine. [E, $h\nu$, I_2; five lines]

O G. Gouedard, M. Broyer, J. Vigue and J. C. Lehmann : Phys. Rev. Lett. 36, 906-907 (1976), Errata 36, 996-996 (1976)
Comment on Lande factors and chemical shifts in molecular iodine. [E, $h\nu$, I_2]

O G. Gouedard, M. Broyer, J. Vigue and J. C. Lehmann : Chem. Phys. Lett. 43, 118-121 (1976)
Anomalous behaviour of the Lande factors and the chemical shift close to the dissociation limit of the B state of molecular iodine. [E. hν, I_2]

O A. L. Guy, K. S. Viswanathan, A. Sur and J. Tellinghuisen : Chem. Phys. Lett. 73, 582-588 (1980)
Reinterpretation of the emission spectrum of I_2 in argon.
[E. hν, I_2 + Ar; 360 and 810 K, 2380 - 5050 A]

O L. A. Hackel, K. H. Casleton, S. G. Kukolich and S. Ezekiel : Phys. Rev. Lett. 35, 568-571 (1975)
Observation of magnetic octupole and scalar spin-spin interactions in I_2 using laser spectroscopy. [E; hν, I_2]

O L. A. Hackel, K. H. Casleton, S. G. Kukolich and S. Ezekiel : Chem. Phys. Lett. 43, 104-104 (1976)
Reply to comment by B. M. Landsberg. Nuclear hyperfine splittings in the B - X electronic band system of $^{127}I_2$.
[reply, hν, I_2; see B. M. Landsberg (1976)]

O J. Ham : J. Am. Chem. Soc. 76, 3886-3887 (1954)
The spectra of iodine solutions. Ⅲ. The $^3\Pi_1 - {}^1\Sigma^+$ transition of the iodine molecule in solution. [E, hν, I_2]

O G. R. Hanes and C. E. Dahlstrom : Appl. Phys. Lett. 14, 362-364 (1969)
Iodine hyperfine structure observed in saturated absorption at 633 nm.
[E, hν, I_2; He - Ne laser]

O G. R. Hanes, J. Lapierre, P. R. Bunker and K. C. Shotton : J. Mol. Spectrosc. 39, 506-515 (1971)
Nuclear hyperfine structure in the electronic spectrum of $^{127}I_2$ by saturated absorption spectroscopy, and comparison with theory.
[E, hν, I_2]

O T. W. Hansch, M. D. Levenson and A. L. Schawlow : Phys. Rev. Lett. 26, 946-949 (1971)
Complete hyperfine structure of a molecular iodine line. [E, hν, I_2]

O P. B. V. Haranath and P. Tiruvenganna Rao : J. Mol. Spectrosc. 2, 428-463 (1958)
Band spectra of iodine, chlorine, and bromine in the spectral region 2400 - 1400 A. [E, I_2, Cl_2, Br_2]

O P. B. V. Haranath and T. A. Prasada : Indian J. Phys. 34, 123-130 (1960)
The emission band system of iodine in the blue violet. [E, hν, I_2]

O A. K. Hays, J. M. Hoffman and G. C. Tisone : Chem. Phys. Lett. 39, 353-357 (1976)
Molecular-iodine laser. [E, hν, I_2; 3460 - 3015 A]

S R. H. Healey : Phil. Mag. 26, 940-953 (1938)
The behaviour of electrons in iodine vapour. [E, I_2]

S R. H. Healey and J. W. Reed : The Behaviour of Slow Electrons in Gases, Amalgamated Wireless Limited (1941)

0 G. Herzberg : Molecular Spectra and Molecular structure. Spectra of Diatomic Molecules. D. Van Nostrand (1950)

0 B. R. Higginson, D. R. Lloyd and P. J. Roberts : Chem. Phys. Lett. 19, 480-482 (1973)
Variable temperature photoelectron spectroscopy. The adiabatic ionization potential of the iodine molecule. [E, hν, I_2; Ne I, 303 and 263 K]

E W. Hilgner and J. Kessler : Phys. Rev. Lett. 18, 983-984 (1967)
Electron spin polarization by electron-molecule collisions.
[E, I_2, C_2H_5I; relative DCS and polarization at 300 eV]

E W. Hilgner and J. Kessler : Z. Phys. 221, 305-323 (1969)
Zur Spinpolarisation langsamer Elektronen nach der Streuung an Molekulen. I. Jod und Athylijodid. [E, I_2,

0 E. Hirschlaff : Z. Phys. 75, 325-337 (1932)
Die Resonanzspektra des Joddampfes bei hohen Temperaturen.
[E, hν, I_2]

0 W. Holzer, W. F. Murphy and H. J. Bernstein : J. Chem. Phys. 52, 399-407 (1970a)
Resonance Raman effect and resonance fluorescence in halogen gases.
[E, hν, I_2, Cl_2, Br_2, BrCl, etc.]

0 W. Holzer, W. F. Murphy and H. J. Bernstein : J. Chem. Phys. 52, 469-470 (1970b)
Resonance fluorescence of iodine, bromine, and chlorine gases obtained with argon-ion laser excitation. [E, hν, I_2, Br_2, Cl_2]

0 W. F. Howard, Jr. and L. Andrews : J. Raman Spectrosc. 2, 447-462 (1974)
Matrix Raman spectra of the molecular halogens : Resonance Raman spectra of isolated and aggiegated I_2.
[E, hν, I_2, Br_2; I_2 + (Ar, Kr, Xe, N_2) at 16 K]

0 A. R. Hoy, S. M. Jaywant and J. C. D. Brand : Mol. Phys. 60, 749-759 (1987)
A rotationally-resolved Rydberg transition of I_2. The RO_u^+ state.
[E, hν, I_2]

0 A. R. Hoy and R. H. Lipson : Chem. Phys. 140, 187-193 (1990)
Reinvestigation of the Cordes band system of I_2 using a vacuum ultraviolet laser. [E, hν, I_2; 168 - 195 nm]

0 K. P. Huber and G. Herzberg : Molecular Spectra and Molecular Structure. IV. Constants of Diatomic Molecules, Van Nostrand 330-337 (1979)

0 B. M. Hughes, C. Lifshitz and T. O. Tiernan : J. Chem. Phys. 59, 3162-3181 (1973)
Electron affinities from endothermic negative-ion charge-transfer reactions. Ⅲ. NO, NO_2, SO_2, CS_2, Cl_2, Br_2, I_2, and C_2H_2.
[E, I_2, Cl_2, Br_2, etc.; 2.42 eV for I_2]

0 W. M. Huo : J. Chem. Phys. 52, 3110-3120 (1970)
Predissociations induced by a magnetic field.
[T, hν, I_2; see E. O. Degenkolb (1969)]

O J. M. Hutson, S. Gerstenkorn, P. Luc and J. Sinzelle : J. Mol. Spectrosc. 96, 266-278 (1982)
Use of calculated centrifugal distortion constants (Dv, Hv, Lv, and Mv) in the analysis of the B ← X system of I_2. [analysis, hν, I_2]

O K. K. Innes, S. J. Jackling III and T. W. Tolbert : J. Quant. Spectrosc. Radiat. Transf. 16, 443-450 (1976).
Pressure shift and/or broadening of lines in the electronic spectra of Cl_2, Br_2, I_2, O_2, HD, AlH and H_2CO.
[E, hν, Br_2, Cl_2, comparison, I_2, O_2, HD, H_2CO, etc.]

O T. Ishiwata, A. Tokunaga, T. Shinzawa and I. Tanaka : J. Mol. Spectrosc. 117, 89-101 (1986)
An analysis of the F' (0_u^+) ion-pair state of I_2 by optical-optical double resonance. [E, hν, I_2]

O W. Jevons : Band Spectra of Diatomic Molecules, The Physical Soc., London (1932)

O J. Jortner and U. Sokolov : Nature 190, 1003-1004 (1961)
Spectrophotometric determination of the electron affinities of some diatomic molecules. [E, I_2, Cl_2, Br_2, ICl, O_2, NO]

O L. M. Julien and W. B. Person : J. Phys. Chem. 72, 3059-3061 (1968)
Contact charge-transfer spectra of iodine in some hydrocarbon solvents. [E, hν, I_2]

O I. L. Karle : J. Chem. Phys. 23, 1739-1739 (1955)
Anomalous electron scattering from iodine vapor. [E, I_2; 30 and 40 keV]

O I. L. Karle : J. Chem. Phys. 32, 617-617 (1960)
Remarks on the electron scattering by iodine. [E, I_2]

O J. Keck : Discuss, Faraday Soc. 33, 172-182 (1962)
Statistical investigation of dissociation cross-sections for diatoms.
[T, I_2, H_2, O_2]

A W. M. Keeffe : Sci. Rep. 172, Ionosphere Res. Labo., Pennsylvania State University, AFCRL-62-1007, AD-286 374, 1-66 (1962)
Experimental determination of the cross sections for dissociative attachment of electrons from negative ions of atomic iodine. [E, I_2]

O J.-C. Keller, M. Broyer et J. C. Lehmann : Compt. Rend. Acad. Sci. B277, 369-372 (1973)
Mesure directe de la duree de vie des facteurs de Lande du niveau $^3\Pi 0_u^+$, v' = 62, J' = 27 de la molecule I_2. [E, hν, I_2]

O W. Kiefer and H. J. Bernstein : J. Mol. Spectrosc. 43, 366-381 (1972)
Vibrational-rotational structure in the resonance Raman effect of iodine vapor. [E, hν, I_2]

0 M. Kimura and M. Miyanishi : Sci. Papers Inst. Phys. Chem. Res. Tokyo 10, 33-42 (1929)
A band absorption spectrum of iodine in an extreme ultra-violet region. [E, $h\nu$, I_2: KM bands]

0 G. W. King, I. M. Littlewood, J. R. Robins and N. T. Wijmeratne : Chem. Phys. 50, 291-299 (1980)
Energy levels of iodine-129 near the B state dissociation limit from two-photon spectroscopy. [E, $h\nu$, I_2]

0 G. W. King, I. M. Littlewood and J. R. Robins : Chem. Phys. 56, 145-156 (1981)
Two-photon sequential absorption spectroscopy of iodine-127 and 129 in the 5 eV region. [E, $h\nu$, I_2]

0 H. Kishi and H. Kawano : Int. J. Mass Spectrom. Ion Process. 88, 1-11 (1989)
Electron impact negative-ion mass spectrometry of atmospheric iodine. [E, I_2; $O^- + I_2 \rightarrow O + I^- + I$]

0 J. B. Koffend, R. Bacis and R. W. Field : J. Mol. Spectrosc. 77, 202-212 (1979)
Continuous wave optically pumped iodine laser. Spectroscopy and long range analysis of the $X^1\Sigma_g^+$ ground state of I_2. [E, $h\nu$, I_2]

0 J. B. Koffend, A. M. Sibai and R. Bacis : J. Physiq. 43, 1639-1651 (1982)
Collisionally induced optical double resonance in I_2 : Rotational analysis of the D' (2g) - A' (2u) laser transition. [E, $h\nu$, I_2]

0 J. Koo, G. Newton, K. F. Smith and D. A. Andrews : Phys. Lett. A58, 449-450 (1976)
A lifetime measurement of the h, i, j hyperfine components of the R(127) line of the 11 - 5 band of the $B^3\Pi_{ou}^+ - X^1\Sigma_{og}^+$ electronic transition in the iodine molecule. [E, $h\nu$, I_2]

0 G. Kortum und G. Friedheim : Z. Naturforsch. 2a, 20-27 (1947)
Lichtabsorption und Molekularzustand des Jods in Dampf und Losung. [E, $h\nu$, I_2; 353 and 613 K]

0 K. Kroll : Phys. Rev. Lett. 23, 631-633 (1969)
Hyperfine structure in the visible molecular-iodine absorption spectrum. [T, $h\nu$, I_2]

0 K. Kroll : J. Mol. Spectrosc. 36, 44-52 (1970a)
A calculation of the absorption continuum associated with the visible iodine spectrum. [T, $h\nu$, I_2; 4000 - 6000 A]

0 K. Kroll and K. K. Innes : J. Mol. Spectrosc. 36, 295-309 (1970b)
Molecular electronic spectroscopy by Fabry-Perot interferometry. Effect of nuclear quadrupole interactions on the line widths of the $B^3\Pi_o^+ - X^1\Sigma_g^+$ transition of the I_2 molecule. [E, $h\nu$, I_2]

0 H. Kuhn : Z. Phys. 39, 77-91 (1926)
Absorptionsspektren und Dissoziationswarmen von Halogenmolekulen. [E, $h\nu$, I_2, Br_2, Cl_2]

0 H. Kuhn : Z. Phys. 63, 458-476 (1930)
Uber die Deutung eines Typus von diffusen Bandenspektren.
[E, hν, I_2, Hg_2, AgBr, etc.]

A M. V. Kurepa, D. S. Babic and D. S. Belic : Chem. Phys. 59, 125-136 (1981)·
Attachment rate coefficients of halogen molecules (F_2, Cl_2, Br_2, I_2) for mean electron energies 10^{-2} to 10^{2} eV. [T, F_2 - I_2]

0 A. Kvaran, A. J. Yencha, D. K. Kela, R. J. Donovan and A. Hopkirk : Chem. Phys. Lett. 179, 263-267 (1991)
Vibrationally resolved excitation functions for direct ion-pair ($I^+ + I^-$) formation from photodissociation of I_2. [E, hν, I_2; 120 - 140 nm]

0 B. M. Landsberg : Chem. Phys. Lett. 43, 102-103 (1976)
Nuclear hyperfine splittings in the B - X electronic band system of $^{127}I_2$. [comment, hν, I_2]

0 J. C. Lehmann : Sov. J. Quant. Elect. 6, 442-443 (1976)
Investigation of excited-state lifetimes and predissociation of iodine molecules by selective excitation. [E, hν, I_2]

0 R. J. LeRoy and R. B. Bernstein : Chem. Phys. Lett. 5, 42-44 (1970a)
Dissociation energies of diatomic molecules from vibrational spacings of higher levels : Application to the halogens. [T, Cl_2 - I_2]

0 R. J. LeRoy : J. Chem. Phys. 52, 2678-2682 (1970b)
Spectroscopic reassignment and ground-state dissociation energy of molecular iodine. [T, hν, I_2]

0 R. J. LeRoy : J. Chem. Phys. 52, 2683-2689 (1970d)
Molecular constants and internuclear potential of ground-state molecular iodine. [T, I_2]

0 R. J. LeRoy and R. B. Bernstein : J. Mol. Spectrosc. 37, 109-130 (1971a)
Dissociation energies and long-range potentials of diatomic molecules from vibrational spacings : The halogens. [T, Cl_2 - I_2]

0 R. J. LeRoy : Can. J. Phys. 50, 953-959 (1972)
Dependence of the diatomic rotational constant B_v on the long-range internuclear potential. [T, Cl_2 - I_2]

0 R. J. LeRoy : in Molecular Spectroscopy, Vol. 1, R. F. Barrow, D. A. Long and D. J. Millen (Ed), The Chemical Soc. 113-176 (1973)
Energy levels of a diatomic near dissociation.
[T, review, I_2, Cl_2, Br_2, H_2, Ar_2, etc.]

0 R. J. LeRoy : Can. J. Phys. 52, 246-256 (1974)
Long-range potential coefficients from RKR turning points : C_6 and C_8 for $B(^3\Pi_{ou}^+)$-state Cl_2, Br_2, and I_2. [T, Cl_2 - I_2]

0 M. D. Levenson and A. L. Schawlow : Phys. Rev. A6, 10-20 (1972)
Hyperfine interactions in molecular iodine.
[E, hν, I_2; laser-saturated absorption]

0 J. Li and K. Balasubramanian : J. Mol. Spectrosc. 138, 162-180 (1989)
Spectroscopic properties and potential energy curves of I_2 and I_2^+.
[T, hν, I_2, I_2^+]

0 R. H. Lipson, A. R. Hoy and N. McDonald : Chem. Phys. Lett. 168, 25-29 (1990b)
The D' - A' transition of I_2 from a corona-excited jet discharge.
[E, hν, I_2; near 342 nm]

0 D. R. Lloyd : Chem. Phys. Lett. 234, 460-460 (1995)
Comment on "Threshold photoelectron spectroscopy of I_2".
[comment, hν, I_2; see A. J. Yencha (1994)]

0 P. Luc : J. Mol. Spectrosc. 80, 41-55 (1980)
Molecular constants and Dunham expansion parameters describing the B - X system of the iodine molecule. [E, hν, I_2]

0 W. Luck : Z. Naturforsch. 6a, 313-319 (1951)
Absorptionsuntersuchungen an der sichtbaren Bande des Joddampfes.
[E, hν, I_2]

0 F. Martin, R. Bacis, S. Churassy and J. Verges : J. Mol. Spectrosc. 116, 71-100 (1986)
Laser-induced-fluorescence Fourier transform spectrometry of the XO_g^+ state of I_2 : Extensive analysis of the $BO_u^+ \rightarrow XO_g^+$ fluorescence spectrum of $^{127}I_2$. [E, hν, I_2; up to v" = 107]

0 S. M. Mason and R. P. Tuckett : Chem. Phys. Lett. 160, 575-580 (1989)
The $A^2\Pi_u - X^2\Pi_g$ emission spectrum of I_2^+. [E, hν, I_2, I_2^+]

0 L. Mathieson and A. L. G. Rees : J. Chem. Phys. 25, 753-761 (1956)
Electronic states and potential energy diagram of the iodine molecule.
[analysis, I_2]

0 M. V. McCusker, R. M. Hill, D. L. Huestis, D. C. Lorents, R. A. Gutcheck and H. H. Nakano : Appl. Phys. Lett. 27, 363-365 (1975)・
The possibility of an efficient tunable molecular iodine laser near 340 nm. [E, hν, I_2]

0 J. C. McLennan : Proc. Roy. Soc. London A88, 289-296 (1913)
Fluorescence spectrum of iodine vapour. [E, hν, I_2]

0 J. C. McLennan : Proc. Roy. Soc. London A91, 23-29 (1914)
Fluorescence of iodine vapour excited by ultra-violet light.
[E, hν, I_2; 2100 - 4600 A]

0 R. G. McLoughlin, J. D. Morrison and D. L. Smith : Int. J. Mass Spectrom. Ion Process. 58, 201-215 (1984)・
Photodissociation of Cl_2^+, Br_2^+ and I_2^+. [E, hν, $Cl_2 - I_2$]

0 R. Mecke : Ann. Phys. 71, 104-134 (1923)
Das Bandenspektrum des Jod. [E, hν, I_2]

0 J. C. Miller and R. N. Compton : J. Chem. Phys. 75, 2020-2021 (1981)
Multiphoton ionization of iodine and benzene : Photoelectron and ion kinetic energy distributions. [E, hν, I_2, C_6H_6]

0 J. D. Morrison, H. Hurzeler, M. G. Inghram and H. E. Stanton : J. Chem. Phys. 33, 821-824 (1960)
Threshold law for the probability of excitation of molecules by photon impact. A study of the photoionization efficiencies of Br_2, I_2, HI and CH_3I. [E, hν, I_2, Br_2, HI, CH_3I]

0 R. S. Mulliken : Rev. Mod. Phys. 4, 1-86 (1932)
The interpretation of band spectra. Part Ⅲ. Electron quantum numbers and states of molecules and their atoms.
[review, F_2 - I_2, H_2, N_2, O_2, CO, NO, Li_2, etc.]

0 R. S. Mulliken : Phys. Rev. 46, 549-571 (1934)
The halogen molecules and their spectra. J-J-like coupling. Molecular ionization potentials. [T, F_2 - I_2, HF - HI, N_2, CO, etc.]

0 R. S. Mulliken : J. Chem. Phys. 7, 20-34 (1939)
Intensities of electronic transitions in molecular spectra. Ⅱ. Charge-transfer spectra. [T, F_2 - I_2, H_2, O_2, HI, C_2H_4]

0 R. S. Mulliken : Phys. Rev. 57, 500-515 (1940)
Halogen molecule spectra. Ⅱ. Interval relations and relative intensities in the long wave-length spectra. [T, F_2 - I_2]

0 R. S. Mulliken and C. A. Rieke : Rept. Progr. Phys. 8, 231-273 (1941)
Molecular electronic spectra, dispersion and polarization. The theoretical interpretation and computation of oscillator strengths and intensities.
[review, F_2 - I_2, H_2, O_2, C_2H_4, HI, etc.]

0 R. S. Mulliken : Chem. Phys. Lett. 7, 11-14 (1970)
The role of kinetic energy in the Franck-Condon principle ; with applications to the iodine molecule emission spectrum. [T, hν, I_2]

0 R. S. Mulliken : J. Chem. Phys. 55, 288-309 (1971a)・
Iodine revisited. [review, T, I_2]

0 R. S. Mulliken : J. Chem. Phys. 55, 309-314 (1971b)・
Role of kinetic energy in the Franck-Condon principle. [general theory]

0 J. A. Myer and J. A. R. Samson : J. Chem. Phys. 52, 716-718 (1970)
Absorption cross section and photoionization yield of I_2 between 1050 and 2200 A. [E, hν, I_2]

0 G. Nakamura : Mem. Coll. Sci. Kyoto Univ. 9, 315-333 (1926a)
Studies of the band spectrum of halogen. Ⅰ. The absorption of iodine vapour. (High temperature and foreign gas effects). [E, hν, I_2]

0 G. Nakamura : Mem. Coll. Sci. Kyoto Univ. 9, 335-369 (1926b)
Studies of the band spectrum of halogen. Ⅱ. The analysis of the band spectrum of iodine, bromine and chlorine. [E, hν, I_2, Br_2, Cl_2]

0 A. Ya. Nasarenko, V. P. Spiridonov and B. S. Butayev : Chem. Phys. Lett. 103, 222-224 (1983)
The determination of the populations of vibrational levels of molecules from electron diffraction data. [E, I_2]

0 A. Ya. Nasarenko, V. P. Spiridonov, B. S. Butayev and A. G. Gershikov : J. Mol. Struct. 106 (Theochem 15), 233-240 (1984)
Second-order perturbation approach to anharmonic analysis of molecules by electron diffraction. Part 1. Diatomic molecules.
[T, I_2; 294 and 773 K]

0 A. Nobs and K. Wieland : Helv. Phys. Acta 39, 564-566 (1966)
The ultraviolet absorption spectrum of iodine (I_2) vapour — a forgotten problem of old time spectroscopy. [E, $h\nu$, I_2]

0 D. Normand and M. Schmidt : Phys. Rev. A53, R1958-R1961 (1996)
Multiple ionization of atomic and molecular iodine in strong laser fields. [E, $h\nu$, I_2, I]

0 M. N. Nowlin and M. C. Heaven : Chem. Phys. Lett. 239, 1-5 (1995)
Improved spectroscopic constants for I_2 $D^1\Sigma_u^+$. [E, $h\nu$, I_2]

A K. J. Nygaard, H. L. Brooks ans S. R. Hunter : IEEE J. Quant. Elect. 15, 1216-1223 (1979)
Negative ion production rates in rare gas-halide lasers.
[E, I_2, F_2, Cl_2, NF_3]

0 O. Oldenberg : Z. Phys. 18, 1-11 (1923)
Ultraviolette Resonanzspektren des Joddampfes. [E, $h\nu$, I_2]

0 O. Oldenberg : Z. Phys. 25, 136-159 (1924)
Elementarvorgange bei Ausstrahlung der Jodbanden. [E, $h\nu$, I_2]

0 R. J. Oldman, R. K. Sander and K. R. Wilson : J. Chem. Phys. 54, 4127-4129 (1971)
Reinterpretation of I_2 main visible continuum. [E, $h\nu$, I_2]

0 T. N. Olney, N. M. Cann, G. Cooper and C. E. Brion : Chem. Phys. 223, 59-98 (1997)
Absolute scale determination for photoabsorption spectra and the calculation of molecular properties using dipole sum-rules.
[E and T, Cl_2 - I_2, He - Xe, H_2O, SiH_4, PH_3, PF_3, etc.]

0 J. A. Paisner and R. Wallenstein : J. Chem. Phys. 61, 4317-4320 (1974)
Rotational lifetimes and self-quenching cross sections in the $B^3\Pi_{ou}^+$ state of $^{127}I_2$. [E, $h\nu$, I_2]

0 G. D. Patterson, S. H. Dworetsky and R. S. Hozack : J. Mol. Spectrosc. 55, 175-181 (1975)
Resonance fluorescence of I_2 at 5145 A. [E, $h\nu$, I_2; Ar ion laser]

0 W. B. Person : J. Chem. Phys. 38, 109-116 (1963)
Electron affinities of some halogen molecules and the charge-transfer frequency. [T, I_2, Cl_2, Br_2, ICl]

O A. W. Potts and W. C. Price : Trans. Faraday Soc. 67, 1242-1252 (1971)・
Photoelectron spectra of the halogens and mixed halides ICl and IBr.
[E, $h\nu$, F_2 - I_2, ICl, IBr]

E S. Pozdneev and V. Shcheglov : Chem. Phys. 123, 27-41 (1988)・
D Application of the quantum theory of scattering to the calculation of
A the simplest chemical reactions.
[T, Cl_2 - I_2, HCl, HBr, H_2, HD, D_2, N_2]

O P. Pringsheim und B. Rosen : Z. Phys. 50, 1-14 (1928)
Uber die Bandensysteme im spektrum des J_2 - Dampfes.
[E, $h\nu$, I_2; obserhalb von 773 K, PR bands]

O D. H. Rank : J. Opt. Soc. Am. 36, 239-241 (1946)
Resonance spectrum of iodine. [E, $h\nu$, I_2]

O D. H. Rank and W. M. Baldwin : J. Chem. Phys. 19, 1210-1211 (1951)
Molecular constants of the ground state of the I_2 molecules.
[E, $h\nu$, I_2]

O D. H. Rank and B. S. Rao : J. Mol. Spectrosc. 13, 34-42 (1964)
Molecular constants of the ground state of the I_2. [T, I_2]

E M. E. Riley, C. J. MacCallum and F. Biggs : Atomic Data Nucl. Data Tables 15, 443-475 (1975); Erratum 28, 379-379 (1983)
Theoretical electron-atom elastic scattering cross sections. Selected elements. 1 keV to 256 keV. [T, I, Cl, Br, etc.]

O D. L. Rousseau and P. F. Williams : Phys. Rev. Lett. 33, 1368-1372 (1974)
Discrete and diffuse emission following two-photon excitation of the E state in molecular iodine. [E, $h\nu$, I_2; E → B]

O D. L. Rousseau : J. Mol. Spectrosc. 58, 481-483 (1975)
Lifetime of E → B transition in molecular iodine. [E, $h\nu$, I_2]

O D. J. Ruben, S. G. Kukolich, L. A. Hackel, D. G. Youmans and S. Ezekiel : Chem. Phys. Lett. 22, 326-330 (1973)
Laser-molecular beam measurement of hyperfine structure in the I_2 spectrum. [E, $h\nu$, I_2]

V V. D. Rusanov, A. A. Fridman and G. V. Sholin : Sov. Phys. Usp. 24, 447-474 (1981)・
A The physics of a chemically active plasma with nonequilibrium vibrational excitation of molecules. [review, I_2, H_2, O_2, N_2, CO, CO_2, CH_4]

O W. G. Schweitzer, Jr., E. G. Kessler, Jr., R. D. Deslattes, H. P. Layer and J. R. Whetstone : Appl. Opt. 12, 2927-2938 (1973)
Description, performance, and wavelengths of iodine stabilized lasers.
[E, $h\nu$, I_2]

O J. E. Selwyn and J. I. Steinfeld : Chem. Phys. Lett. 4, 217-220 (1969)
Collision-induced predissociation by van der Waals' interaction.
[T, I_2; $B^3\Pi_{ou}^+$]

0 K. C. Shotton and G. D. Chapman : J. Chem. Phys. 56, 1012-1013 (1972)
Lifetimes of $^{127}I_2$ molecules excited by the 632.8 nm He/Ne laser.
[E, I_2; $B^3\Pi(O_u^+)$ state]

0 S. M. Singh and J. Tellinghuisen : J. Mol. Spectrosc. 47, 409-419 (1973)
The visible emission spectrum of iodine. [E, $h\nu$, I_2]

0 E. Skorko : Nature 131, 366-366 (1933)
Absorption bands of iodine vapour at high temperatures.
[E, $h\nu$, I_2; 2900 - 5000 A, 1070 - 1320 K]

0 E. Skorko : Acta Phys. Polonica 3, 191-196 (1934)
Absorption of iodine vapour at high temperatures. [E, $h\nu$, I_2]

0 B. M. Smirnov and A. S. Yatsenko : Phys. Usp. 39, 211-230 (1996)
Properties of dimers. [review, F_2 - I_2, He_2 - Xe_2, etc.]

0 R. Solarz and D. H. Levy : Chem. Phys. Lett. 17, 35-38 (1972)
Non-linear level crossing in the $X\ ^1\Sigma_g^+$ state of iodine. [E, $h\nu$, I_2]

0 M. S. Sorem, M. D. Levenson and A. L. Schawlow : Phys. Lett. A37, 33-34 (1971)
Saturation spectroscopy of molecular iodine using the 5017 A argon laser line. [E, $h\nu$, I_2]

0 M. S. Sorem, T. W. Hansch and A. L. Schawlow : Chem. Phys. Lett. 17, 300-302 (1972)
Nuclear quadrupole coupling in the $^1\Sigma_g^+$ and $^3\Pi_{ou}^+$ states of molecular iodine. [E, $h\nu$, I_2]

0 V. M. Soshnikov : Sov. Phys. Usp. 4, 425-440 (1961)
Absolute intensities of electronic transitions in diatomic molecules.
[review, $h\nu$, F_2 - I_2, HF - HI, H_2, N_2, O_2, Li_2, Na_2]

0 J. I. Steinfeld, R. N. Zare, L. Jones, M. Lesk and W. Klemperer : J. Chem. Phys. 42, 25-33 (1965a)
Spectroscopic constants and vibrational assignment for the $B^3\Pi_{ou}^+$ state of iodine. [E, $h\nu$, I_2]

0 J. I. Steinfeld and W. Klemperer : J. Chem. Phys. 42, 3475-3497 (1965b)
Energy-transfer processes in monochromatically excited iodine molecules.
I. Experimental results. [E, $h\nu$, I_2]

0 J. I. Steinfeld : J. Chem. Phys. 44, 2740-2749 (1966)
Wavelength dependence of the quenching of iodine fluorescence.
[E, $h\nu$, I_2; $B \rightarrow X$, by He, Xe, NO, CO_2, C_2H_4, C_2H_6, I_2]

0 J. I. Steinfeld, J. D. Campbell and N. A. Weiss : J. Mol. Spectrosc. 29, 204-215 (1969)
Spectroscopy of I_2 at the dissociation limit. [E, $h\nu$, I_2]

0 J. I. Steinfeld : Accounts Chem. Res. 3, 313-320 (1970)
Quenching of fluorescence in small molecules.
[review, E, $h\nu$, I_2, NO, N_2, etc.]

O P. Sulzer und K. Wieland : Helv. Phys. Acta 25, 653-676 (1952)
Intensitatsverteilung eines kontinuierlichen Absorptionsspektrums in Abhangigkeit von Temperature und Wellenzahl.
[E, $h\nu$, I_2, Cl_2, Br_2; 423 - 1323 K for I_2]

O A. Suwaiyan, J. Mastromarino and U. K. A. Klein : Chem. Phys. Lett. 192, 581-589 (1992)
Absorption, fluorescence and saturation of $^{127}I_2$ in the region 16999.100 - 17001.306 cm^{-1}. [E, $h\nu$, I_2]

A W. C. Tam and S. P. Wong : J. Chem. Phys. 68, 5626-5630 (1978) ○
Dissociative attachment of hologen molecules by 0 - 8 eV electrons.
[E, I_2, F_2, Cl_2, Br_2]

O P. W. Tasker, G. G. Balint-Kurti and R. N. Dixon : Mol. Phys. 32, 1651-1660 (1976)
A calculation for the potential curves for the halogen molecule negative ions. [T, I_2, Cl_2, Br_2, ClBr, ClI, BrI]

O J. Tellinghuisen : J. Chem. Phys. 57, 2397-2402 (1972)
Spontaneous predissociation in I_2. [E, $h\nu$, I_2]

O J. Tellinghuisen : J. Chem. Phys. 58, 2821-2834 (1973a)
Resolution of the visible-infrared absorption spectrum of I_2 into three contributing transitions. [E, $h\nu$, I_2; 4200 - 8000 A]

O J. Tellinghuisen : J. Chem. Phys. 59, 849-852 (1973b)
Continuous absorption below the band convergence limit in the I_2 B ← X transition. [T, $h\nu$, I_2]

O J. Tellinghuisen : Chem. Phys. Lett. 29, 359-363 (1974)
The McLennan bands of I_2 : A highly structured continuum. [E, $h\nu$, I_2]

O J. Tellinghuisen : Phys. Rev. Lett. 34, 1137-1140 (1975)
E → B structured continuum in I_2.
[T, I_2; E state potential energy curve]

O J. Tellinghuisen : J. Mol. Spectrosc. 62, 294-295 (1976)
Reassignment of I_2 B - X transitions near 5145 A. [T, $h\nu$, I_2]

O J. Tellinghuisen : Chem. Phys. Lett. 49, 485-490 (1977)
The ultraviolet laser transitions in I_2 and Br_2. [E, $h\nu$, I_2, Br_2]

O J. Tellinghuisen, M. R. McKeever and A. Sur : J. Mol. Spectrosc. 82, 225-245 (1980)
Reanalysis of the D → X fluorescence spectrum of I_2. [E, $h\nu$, I_2]

O J. Tellinghuisen : J. Mol. Spectrosc. 94, 231-252 (1982)
The D' → A' transition in I_2. [E, $h\nu$, I_2; 3300 - 3460 A]

O J. Tellinghuisen : J. Chem. Phys. 78, 2374-2380 (1983)
Direct fitting of spectroscopic data to near-dissociation expansions : I_2(D' - A'), Br_2(D' - A') and XeCl(B → X and D → X).
[T, hν, I_2, Br_2, XeCl]

O A. Terenin and H. Neujmin : J. Chem. Phys. 3, 436-437 (1935)
Photodissociation of polyatomic molecules in the Schumann ultraviolet.
[E, hν, I_2, H_2O, NH_3, CH_3OH, C_2H_5OH, etc.]

O M. Tesic and Y.-H. Pao : J. Mol. Spectrosc. 57, 75-96 (1975)
Theoretical assignment of the observed hyperfine structure in the saturated absorption spectra of I_2^{129} and $I^{127}I^{129}$ vapors in the 633 nm wavelength region. [T, hν, I_2]

O J. W. Tromp, R. J. LeRoy, S. Gerstenkorn and P. Luc : J. Mol. Spectrosc. 100, 82-94 (1983)
Reexamination of the I_2 spectrum near the $B(^3\Pi_{ou}^+)$ state dissociation limit. [T, hν, I_2; D_0 = 12440.18 cm^{-1}]

A F. K. Truby : Phys. Rev. 188, 508-512 (1969)
Temperature dependence of electron attachment in I_2 vapor.
[E, I_2; 253 - 467 K]

O L. A. Turner : Z. Phys. 65, 464-479 (1930)
Die magnetische Ausloschung der Jodfluoreszenz und ihr Zusammenhang mit Pradissoziationserscheinungen. [E, hν, I_2]

O L. A. Turner : Phys. Rev. 41, 627-634 (1932)
Optical dissociation of iodine and enhancement of predissociation by collisions. [E, hν, I_2]

O J. H. Van Vleck : Phys. Rev. 40, 544-568 (1932)
The theory of the magnetic quenching of iodine fluorescence and of Λ-doubling in $^3\Pi_o$ states. [T, hν, I_2]

O K. Venkateswarlu : Proc. Indian Acad. Sci. 25, 119-132 (1947a)
Emission bands of halogens. II. Iodine bands arising in $1_g(^3\Pi_{1g})$ and $\Pi_{2,1g}$ states. [E, hν, I_2; 2600 - 4800 A]

O K. Venkateswarlu : Proc. Indian Acad. Sci. 25, 133-137 (1947b)
Emission bands of halogens. III. Iodine bands arising in $1_u(^3\Sigma_u^+)$ and $1_g(^1\Pi_g)$ states. [E, hν, I_2; 4747, 4662, 4575 and 2400 - 2687 A]

O P. Venkateswarlu : Proc. Indian Acad. Sci. A24, 473-479 (1946a)
A new band system (Cordes bands) of iodine. [E, hν, I_2]

O P. Venkateswarlu : Proc. Indian Acad. Sci. A24, 480-486 (1946b)
Emission bands of halogens. I. Iodine bands arising in 0_u^+ state at 51683 cm^{-1}. [E, hν, I_2]

O P. Venkateswarlu : Indian J. Phys. 21, 43-49 (1947)
Absorption bands of iodine in quartz ultra-violet. [E, hν, I_2]

0 P. Venkateswarlu : Phys. Rev. 81, 821-829 (1951)
The spectrum of iodine excited in the presence of argon.
[E, $h\nu$, I_2; 2785 - 2750 A band system]

0 P. Venkateswarlu : Can. J. Phys. 48, 1055-1080 (1970)
Vacuum ultraviolet spectrum of the iodine molecule. [E, $h\nu$, I_2]

0 R. D. Verma : Proc. Indian Acad. Sci. A48, 197-226 (1958)
The spectrum of iodine excited in the presence of argon.
[E, $h\nu$, I_2 + Ar]

0 R. D. Verma : J. Chem. Phys. 32, 738-749 (1960)
Ultraviolat resonance spectrum of the iodine molecule.
[E, $h\nu$, I_2; 1830 - 2370 A]

0 R. D. Verma and R. J. LeRoy : J. Chem. Phys. 61, 438-438 (1974)
Comment on the UV resonance spectrum and ground-state dissociation energy of I_2. [E, $h\nu$, I_2]

0 J. Vigue, M. Broyer and J. C. Lehmann : J. Phys. B7, L158-L161 (1974)
Quantum interference effect between the magnetic and natural predissociations in the $B^3\Pi_{ou}^+$ state of I_2. A new experimental proof. [E, $h\nu$, I_2]

0 J. Vigue, M. Broyer and J. C. Lehmann : J. Chem. Phys. 62, 4941-4947 (1975)
Predissociation effects in the $B^3\Pi_{ou}^+$ state of iodine. [T, $h\nu$, I_2]

0 J. Vigue, M. Broyer and J. C. Lehmann : J. Phys. B10, L379-L383 (1977)
Fluorescence yield of individual hyperfine components in the B state of I_2 : A test of hyperfine predissociation. [E, $h\nu$, I_2]

0 J. Vigue, M. Broyer and J. H. C. Lehmann : J. Physiq. 42, 937-947 (1981a)
Natural hyperfine and magnetic predissociation of the I_2 B state.
I. - Theory. [T, $h\nu$, I_2]

0 J. Vigue, M. Broyer and J. H. C. Lehmann : J. Physiq. 42, 949-959 (1981b)
Natural hyperfine and magnetic predissociation of the I_2 B state.
II. - Experiments on natural and hyperfine predissociation.
[E, $h\nu$, I_2]

0 J. Vigue, M. Broyer and J. H. C. Lehmann : J. Physiq. 42, 961-978 (1981c)
Natural hyperfine and magnetic predissociation of the I_2 B state.
III. - Experiments on magnetic predissociation. [E, $h\nu$, I_2]

0 D. A. Vroom : Thesis, University of British Columbia 1-202 (1967)
Photoelectron spectroscopy of gases.
[E, $h\nu$, I_2, F_2, Cl_2, Br_2, N_2, O_2, NO, CO, HF, HCl, etc.]

0 R. Wallenstein, J. A. Paisner and A. L. Schawlow : Phys. Rev. Lett. 32, 1333-1336 (1974)
Observation of Zeeman quantum beats in molecular iodine.
[E, $h\nu$, I_2; $B^3\Pi_{ou}^+$ state]

0 D.T.Warren : Phys.Rev.47,1-6 (1935)
Ultraviolet absorption of iodine vapor. [E, hν, I_2; 1900 - 3413 A]

0 J.Waser and K.Wieland : Nature 160,643-644 (1947)
Emission spectrum of iodine molecules in the presence of an inert gas. [E, hν, I_2; 2500 - 5000 A]

0 E.Wasserman,W.E.Falconer and W.A.Yager : J.Chem.Phys.49,1971-1972 (1968a)
Direct predissociation of I_2 B($^3\Pi_{Ou}^+$). [E, hν, I_2; discussion]

0 E.Wasserman,W.E.Falconer and W.A.Yager : Ber.Bunsenges.Phys.Chem.72,248-252 (1968b)
Photodissociation of molecular iodine. [E, hν, I_2]

0 J.Wei and J.Tellinghuisen : J.Mol.Spectrosc.50,317-332 (1974)
Parameterizing diatomic spectra : "Best" spectroscopic constants for the I_2 B ←→ X transition. [review, E, I_2]

0 S.Weissman,J.T.Vanderslice and R.Batino : J.Chem.Phys.39,2226-2228 (1963)
On the recalculation of the potential curves for the ground states of I_2 and H_2. [T, I_2, H_2]

0 K.Wieland and J.Waser : Phys.Rev.85,385-386 (1952)
The molecular spectrum of iodine excited in the presence of an inert gas. [E, hν, I_2]

0 K.Wieland,J.B.Tellinghuisen and A.Nobs : J.Mol.Spectrosc.41,69-83 (1972)
The band systems E → B (4000 - 4360 A) and F → X (2530 - 2740 A) of $^{127}I_2$ and $^{129}I_2$, and the corresponding system E ←→ B of Br_2 and Cl_2. [E, hν, I_2, Cl_2, Br_2]

0 P.F.Williams,D.L.Rousseau and S.H.Dworetsky :.Phys.Rev.Lett.32,196-199 (1974)
Resonance fluorescence and resonance Raman scattering : Lifetimes in molecular iodine. [E, hν, I_2]

0 P.F.Williams,A.Fernandez and D.L.Rousseau : Chem.Phys.Lett.47,150-154 (1977)
Experimental measurement of dissociative molecular potential functions from continuum resonance Raman spectra. [E, hν, I_2]

0 R.W.Wood : Phys.Zeits.11,1195-1196 (1910)
Die Resonanzspektren des Jods. (The resonance spectra of iodine). [E, hν, I_2]

0 R.W.Wood : Phil.Mag.35,236-252 (1918)
Resonance spectra of iodine. [E, hν, I_2]

O K. K. Yee : J. Chem. Soc. Faraday Trans. II 72, 2113-2126 (1976)
$B^3\Pi O_u^+ - X^1\Sigma_g^+$ systems of $^{127}I_2$ and $^{129}I_2$. Molecular constants, laser-excited fluorescence and Franck-Condon factors.
[T, $h\nu$, I_2; RKR potentials, see R. F. Barrow (1973b)]

O K. K. Yee : Chem. Phys. Lett. 21, 334-337 (1973)
Analysis of RKR long-range potential of the $B^3\Pi O_u^+$ state of I_2.
[T, I_2]

O A. J. Yencha, M. C. R. Cockett, J. G. Goode, R. J. Donovan, A. Hopkirk and G. C. King : Chem. Phys. Lett. 229, 347-352 (1994)
Threshold photoelectron spectroscopy of I_2. [E, $h\nu$, I_2; 9 - 14 eV]

O M. Yoshino, A. Ida, K. Wakiya and H. Suzuki : J. Phys. Soc. Jpn. 27, 976-980 (1969)
Photoionization and absorption cross sections of I_2 in the 600 - 1000 A wavelength region. [E, $h\nu$, I_2, Ar]

O D. G. Youmans, L. A. Hackel and S. Ezekiel : J. Appl. Phys. 44, 2319-2321 (1973)
High-resolution spectroscopy of I_2 using laser-molecular-beam technique.
[E, $h\nu$, I_2; 5145 A Ar ion laser]

O R. N. Zare : J. Chem. Phys. 40, 1934-1944 (1964)
Calculation of intensity distribution in the vibrational structure of electronic transitions : The $B^3\Pi_{ou}^+ - X^1\Sigma_{og}^+$ resonance series of molecular iodine. [T, $h\nu$, I_2]

O R. N. Zare : Mol. Photochem. 4. 1-37 (1972)
Photoejection dynamics. [T, review, $h\nu$, general theory, I_2]

EX I. A. Zayats and M. Kishko : Opt. Spectrosc. 31, 285-286 (1971)
Spectrum and excitation functions of some I_2 bands.
[E, I_2; relative emission c. s. for three bands, 2 - 30 eV]

O X. Zheng, S. Fei, M. C. Heaven and J. Tellinghuisen : J. Chem. Phys. 96, 4877-4883 (1992)
Spectroscopy of metastable species in a free-jet expansion : The $D' \leftarrow A'$ transition of I_2. [E, $h\nu$, I_2]

Addenda of References for I_2

(published in 2000, plus some old papers)

2000

I H. Deutsch, K. Becker and T. D. Mark : Eur. Phys. J. D12, 283-287 (2000)
Calculation of absolute electron-impact ionization cross-sections of dimers and trimers. [T, I_2, F_2, Br_2, O_3, C_{60}, etc.]

Addenda (1901 - 1999)

K. Asagoe : Sci. Rep. Tokyo Bunrika Daigaku 2, 9- (1935a)

K. Asagoe and Y. Inuzuka : Sci. Rep. Tokyo Bunrika Daigaku 2, 73- (1935b)

O V. H. Dibeler, J. A. Walker, K. E. McCulloh and H. M. Rosenstock : Int. J. Mass Spectrom. Ion Phys. 7, 209-219 (1971)・
Effect of hot bands on the ionization threshold of some diatomic halogen molecules. [E, F_2 - I_2, ICl, IBr]

Author Index for I_2 References

Some Comments on Electron Collision Cross Sections for F_2, Cl_2, Br_2 and I_2

The pioneer work on electron collision cross section set for F_2 is given by authors, M.Hayashi and T.Nimura in 1983a. Almost no exact experimental data for F_2 cross sections, because experiments are extremely difficult. Our cross section set for F_2 is still tentative value. Now author cannot improve the cross section set, in spite of twenty years are passed.

Now I do not like this F_2 cross section set by another reason. All molecules have the component M(g), M(r), M(v) and M_n (n = 2), depend on the pressure and temperature condition of the experiment. In F_2, there are some concentration of F_2(g) component, and plus many F_2(r) and small F_2(v) components. On the other hand, in I_2 molecules, there are no concentration of I_2(g), almost I_2 are I_2(r) of large j values and plus I_2(v) components at usual experimental conditions.

Many scientists requested the cross section set for Cl_2 to the author during these twenty years or so. The cross section sets for Cl_2 are given by G.L.Rogoff (1986), W.L.Morgan (1991), (1992), (1999), E.S.Aydil (1992), N.Pinhao (1995), and G.I.Font (1997). Recently, L.G.Christophorou and J.K. Olthoff (1999) compiled the cross sections for Cl_2. The summary said that we need more experimental studies of cross sections and other processes in Cl_2. Temperature dependence of electron collisions and other processes are interesting subject for this molecules.

Almost theoretical results of electron collision cross sections for molecules are for M(g). Theoretical studies involving the M(r) and M(v) are urgently required for many molecules.

I would like to present our two papers on F_2 and recent report on all molecules at the end of this report.

M.Hayashi and T.Nimura : J.Appl.Phys. 54, 4879-4882 (1983a)
M.Hayashi : Jpn.J.Appl.Phys. 22, L565-L566 (1983b)

M.Hayashi and Y.Nakamura : EMS-99, Tokyo 175-176 (1999)

Calculation of electron swarm parameters in fluorine

M. Hayashi and T. Nimura
Nagoya Institute of Technology, Gokiso-cho, Syowa-ku, Nagoya, 466, Japan

(Received 25 March 1983; accepted for publication 9 June 1983)

Swarm parameters of electrons have been calculated for fluorine by a Monte Carlo simulation and the Boltzmann equation method for the first time. Values of these parameters have been obtained for ratios of the electric field to the gas number density E/N from 100 to 3000 Td ($E/p_0 = 35 \sim 1000$ V/cm Torr). Available experimental and theoretical cross sections were used for the calculations.

PACS numbers: 51.50. + v, 52.80.Dy, 52.25.Fi, 52.20.Fs

I. INTRODUCTION

The role of negative ions in gas lasers is important.[1] Rare-gas fluoride lasers are being investigated extensively. Experimental values of electron transport parameters for fluorine are not available. The high chemical activity of F_2 makes it difficult to obtain reliable values of the electron cross sections and the electron swarm parameters in F_2. In this paper, values of the electron drift velocity W, the characteristic energy eD_T/μ, the mean electron energy $\langle\epsilon\rangle$, the Townsend's ionization coefficient α, the attachment coefficient η, and the energy distribution functions $f(\epsilon)$ calculated by the Boltzmann equation and a Monte Carlo simulation method are reported. The calculated range of the electric field to the gas number density E/N is from about 100 to 3000 Td.

II. COLLISION CROSS SECTIONS

The cross sections used in this paper are shown in Fig. 1.

The theoretical values for elastic total cross sections q_t were given by Schneider and Hay[2] and Rescigno *et al.*[3] for the electron energy from about 0.03 to 14 eV. In Ref. 2, there are two calculated results for the values of q_t, one has a resonance at 1.8 eV (F_2 core orbitals) and another one has no resonance (F_2^- core orbitals). The result of Ref. 3 has a resonance at about 2.2 eV. Here the values of q_t, which have a resonance, were chosen, and calculations using the values of q_t of nonresonance were not carried out. These values of q_t are almost the same as q_t in N_2.[4] It is quite a coincidence. The assumption was therefore made that the values for elastic momentum transfer cross section q_m were equal to the values for q_t for F_2, as is approximately the case with N_2. The values for q_m at energies greater than 14 eV were assumed to be equal to the values for q_m in N_2.[4]

There is one theoretical paper giving values for the vibrational excitation cross section q_v.[5] These values were used for these calculations. The threshold energy is 0.11 eV.

Values for electronic excitation cross sections q_e were calculated by Fliflet *et al.*[6] for the lowest excitation level $a^3\Pi_u$ (threshold 3.16 eV), and by Hazi[7] for the two levels $C\,^1\Sigma_u$ (threshold 11.57 eV) and $H\,^1\Pi_u$ (threshold 13.08 eV). The values for q_e of triplet level $a^3\Pi_u$ were connected smoothly and decreased rapidly with electron energy. The energy dependence of the values for q_e for the two singlet states are similar to those for q_e in H_2. The values for q_e for the $C\,^1\Sigma_u$ and $H\,^1\Pi_u$ levels were extrapolated for higher energies.

The other q_e values for dissociative level $A\,^1\Pi_u$ (threshold 4.34 eV) were assumed. There are no theoretical and experimental data for this energy level. There is no base for the determination of the peak value of q_e, so we chose about half peak value of q_e compared with the peak value of q_e for $a^3\Pi_u$ level. The level $A\,^1\Pi_u$ is a singlet state, so the electron energy dependence on q_e is spread widely, as it is at q_e for $C\,^1\Sigma_u$.

The values for the four q_e's are small compared with the values for q_m and ionization cross section q_i as shown in Fig. 1. Consequently, the influence of the values chosen for q_e on the swarm parameters is small. If the values for q_e are much larger than the values used, the effect would be important. However, the values for q_e are sensitive to the values for α at low E/N.[8] Consequently, there is a possibility that the values for α at low E/N are affected by the values of q_e. However, the values of η are much larger than the values of α at low E/N. Therefore, we believe that the reasonable values of $(\alpha - \eta)$ were obtained, without large influence by the values of q_e.

Values of q_e for other electronic excitaion levels were

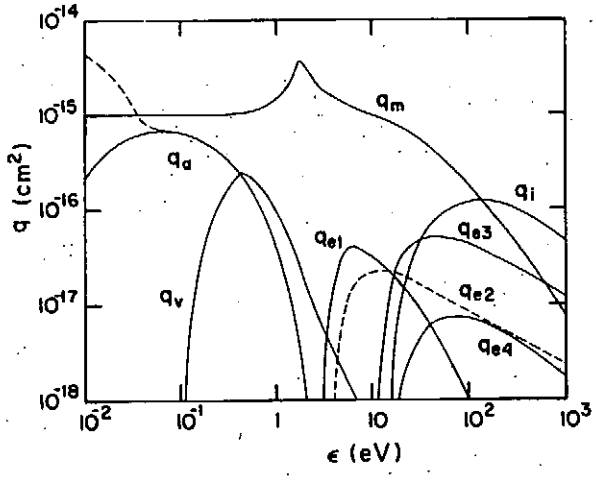


FIG. 1. Cross sections of electrons in F_2 used in this paper. The dotted curve for q_a is the low energy part of the attachment cross section obtained by Chantry. The solid curve for q_a was used for this calculation. The curves for q_{e1}, q_{e2}, q_{e3} and q_{e4} show the excitation cross sections of $a^3\Pi_u$, $A\,^1\Pi_u$, $C\,^1\Sigma_u^+$, and $H\,^1\Pi_u$ levels, respectively. The dotted curve for q_{e2} was assumed.

 0021-8979/83/094879-04$02.40

neglected. More detailed information about q_e is needed.[9]

Recently measured values of ionization cross sections q_i were used in these calculations. The data were measured by Stevie and Vasile[10] and covered the energy range from threshold, 15.69 eV, to about 100 eV. The values for q_i above 100 eV were extrapolated smoothly using the usual energy dependence of q_i in many gases.

There are experimental values for attachment cross section q_a given by Chantry[1,11] at 365 K. Calculated values for q_a are given by Hazi *et al.*[11] The values of Hazi *et al.* were used below about 0.1 eV. There is little effect of the two values for q_a on swarm parameters for the range of E/N which is reported in this paper. For higher energies, Chantry's values were employed. There is a maximum value for q_a and the value is 7.0×10^{-19} cm^2 at 6.2 eV. These two values for q_a are shown in Fig. 1, however, a small peak at 6.2 eV is not shown in this figure.

III. PROCEDURES

The Monte Carlo simulation (MCS) method used in this paper has been discussed previously.[12]

The well-established two-term approximation was used to solve the Boltzmann equation.[13] The energy distribution functions of electrons $f^0(\epsilon)$ and $f^1(\epsilon)$ are described by the equations

$$\frac{(\alpha-\eta)\sqrt{\epsilon}}{3}f^1(\epsilon)+\frac{eE\sqrt{\epsilon}}{3}\frac{d}{d\epsilon}[\sqrt{\epsilon}f^1(\epsilon)]$$
$$=2\frac{m}{M}\frac{d}{d\epsilon}\left\{\epsilon\sqrt{\epsilon}Nq_m f^0(\epsilon)+kT\epsilon^2Nq_m\frac{d}{d\epsilon}\left[\frac{1}{\sqrt{\epsilon}}f^0(\epsilon)\right]\right\}$$
$$+\sum_j\left[\sqrt{\epsilon+\epsilon_e^j}\,Nq_{ex}^j(\epsilon+\epsilon_e^j)f^0(\epsilon+\epsilon_e^j)\right]$$
$$+2\int_\epsilon^\infty\frac{1}{\epsilon'}\sqrt{\epsilon'+\epsilon_i}\,Nq_i(\epsilon'+\epsilon_i)f^0(\epsilon'+\epsilon_i)\,d\epsilon'$$
$$-\sqrt{\epsilon}\left[\sum_j Nq_{ex}^j(\epsilon)+Nq_i(\epsilon)+Nq_a(\epsilon)\right]f^0(\epsilon),$$

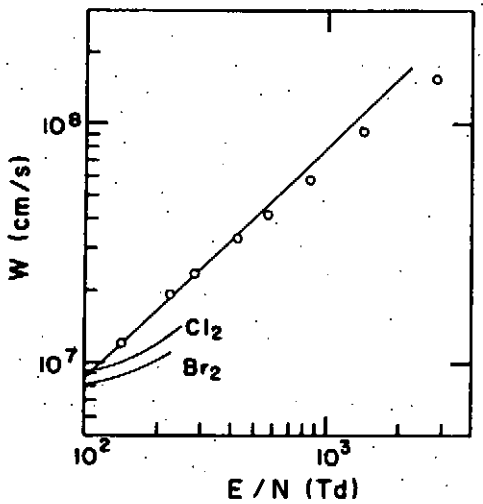


FIG. 2. Drift velocity of electrons W. Solid curve is the present calculation for F_2 by *B Eq* and the circles are the present calculated values for F_2 by MCS. Values for W in Cl_2 and Br_2, taken from references, are shown for comparison.

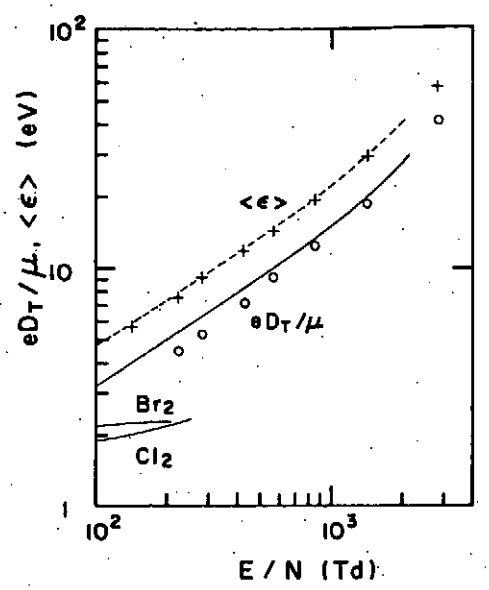


FIG. 3. Characteristic energy eD_T/μ and mean electron energy $\langle\epsilon\rangle$ in F_2. Solid and dotted curves are present calculated values for eD_T/μ and $\langle\epsilon\rangle$ by *B Eq* and circle and plus points are present calculated values of eD_T/μ and $\langle\epsilon\rangle$ by MCS, respectively. Values for eD_T/μ in Cl_2 and Br_2 taken from references are also shown.

and

$$f^1(\epsilon)=-\frac{1}{NQ(\epsilon)}\left\{(\alpha-\eta)f^0(\epsilon)+eE\sqrt{\epsilon}\frac{d}{d\epsilon}\left[\frac{1}{\sqrt{\epsilon}}f^0(\epsilon)\right]\right\},$$

where e and m are the electron charge and mass, M is the

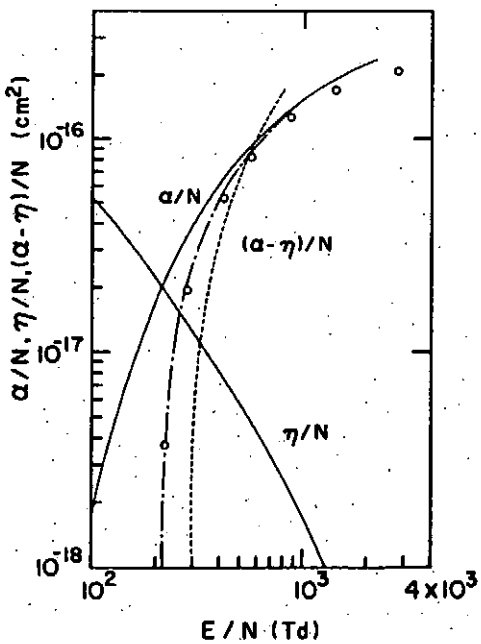


FIG. 4. Townsend's ionization coefficient α, attachment coefficient η, and effective ionization coefficient $(\alpha-\eta)$ in F_2. Solid curves are the present calculated values for α and η obtained by *B Eq*. Dot-dashed curve is the present calculated values for $(\alpha-\eta)$. Circles are present calculated values for $(\alpha-\eta)$ obtained by MCS. The dotted curve is the experimental values for $(\alpha-\eta)$ in Cl_2 and Br_2 for comparison. In Cl_2 and Br_2, values for $(\alpha-\eta)$ are almost the same.

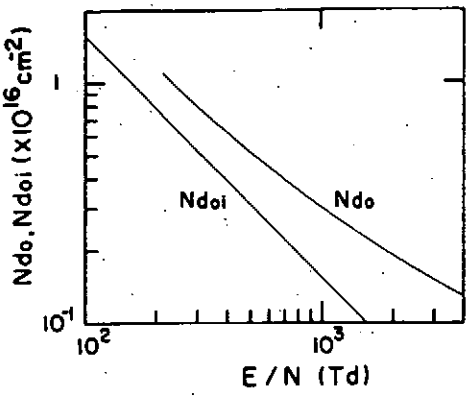


FIG. 5. Values of d_0 relating to the nonequilibrium distance in F_2 calculated by MCS. Straight line shows the values of $Nd_{0i} = V_i/(E/N)$.

mass of gas atom, ϵ is the energy of electrons, k is the Boltzmann constant, T is the gas temperature, and $\int_0^\infty f^0(\epsilon)\,d\epsilon = 1$. The total collision cross section Q is defined by

$$Q(\epsilon) = q_m(\epsilon) + \sum q_{\text{inel}}(\epsilon),$$

where the second term on the right side denotes the summation of all the inelastic collision cross sections. q_{ex} is the excitation cross section of all kinds, including $q_v, q_{e1}, \ldots, q_{e4}$, in this case. ϵ_e^j is the excitation energy loss for jth kind or state of species, and ϵ_i is the ionization energy loss.

The swarm parameters are given by

$$W = -\frac{1}{3}\sqrt{\frac{2}{m}}eE\int_0^\infty \frac{\epsilon}{NQ(\epsilon)}\frac{d}{d\epsilon}\left[\frac{1}{\sqrt{\epsilon}}f^0(\epsilon)\right]d\epsilon,$$

$$D = \frac{1}{3}\sqrt{\frac{2}{m}}\int_0^\infty \frac{\sqrt{\epsilon}}{NQ(\epsilon)}f^0(\epsilon)\,d\epsilon,$$

$$\langle\epsilon\rangle = \int_0^\infty \epsilon f^0(\epsilon)\,d\epsilon,$$

$$\nu_i = \sqrt{\frac{2}{m}}\int_0^\infty \sqrt{\epsilon} f^0(\epsilon) N q_i(\epsilon)\,d\epsilon,$$

$$\nu_a = \sqrt{\frac{2}{m}}\int_0^\infty \sqrt{\epsilon} f^0(\epsilon) N q_a(\epsilon)\,d\epsilon,$$

$$\alpha = \frac{\nu_i}{\frac{W}{2} + \sqrt{\left(\frac{W}{2}\right)^2 - (\nu_i - \nu_a)D}},$$

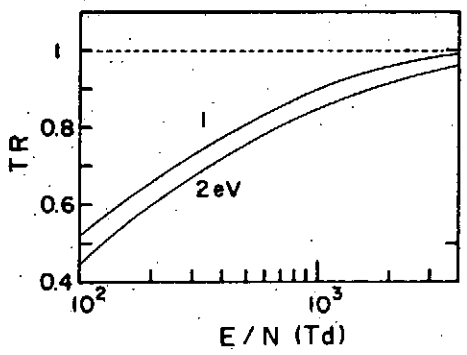
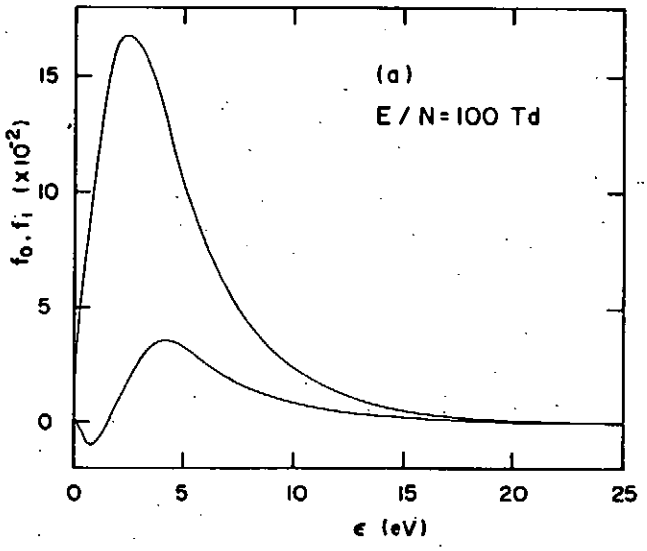
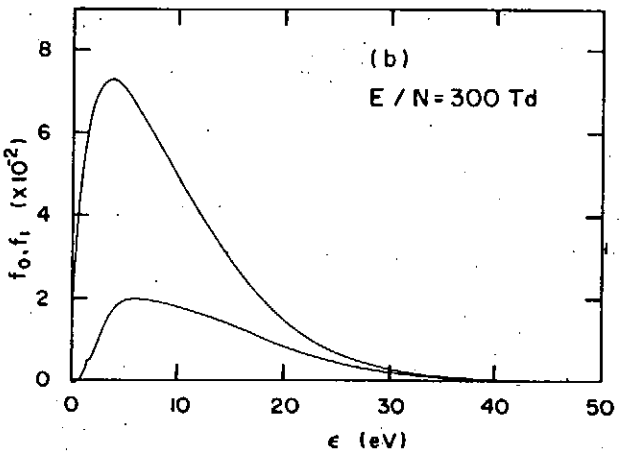


FIG. 6. Present calculated values for the transmission coefficient TR in F_2 by MCS for initial energy of electrons of 1 and 2 eV. The reflection coefficient of electrons at the cathode is assumed to be 0.5.





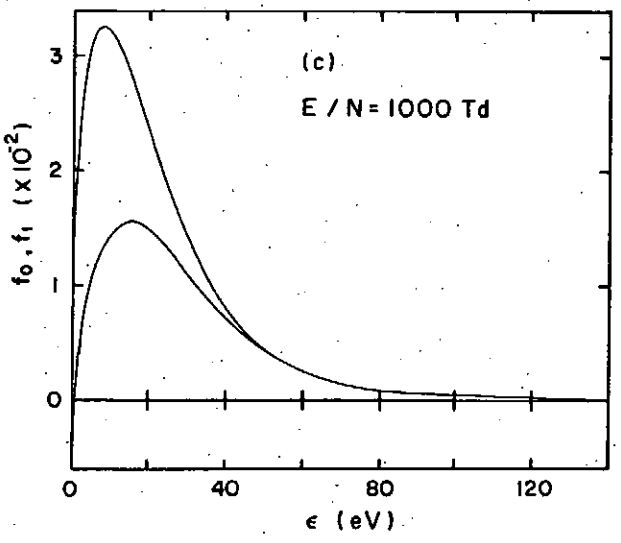


FIG. 7. Energy distribution function of electrons in F_2 calculated by B Eq at $E/N = 100$, 300, and 1000 Td, respectively.

and

$$\eta = \frac{\nu_a}{\frac{W}{2} + \sqrt{\left(\frac{W}{2}\right)^2 - (\nu_i - \nu_a) D}},$$

where ν_i and ν_a are ionization frequency and attachment frequency, respectively.

IV. RESULTS

Calculated values for W are shown in Fig. 2. There are no experimental data for W in F_2. However there are some old data for W in Cl_2 (Ref. 14) and Br_2.[15] These values are shown in Fig. 2 for comparison. The values for W at high E/N calculated by B Eq are higher than the values for W by MCS method.

The calculated values for eD_T/μ and $\langle\epsilon\rangle$ are shown in Fig. 3. Values for eD_T/μ in Cl_2 and Br_2 are also shown in Fig. 3. The values for eD_T/μ in Cl_2 and Br_2 were calculated from the equation $eD_T/\mu = 2.48\times10^{-2}\,K$, where K is the mean energy of agitation of an electron in terms of the mean energy of agitation of a molecule at 15 °C, given in Refs. 14 and 15.

The calculated values for α, η, and $(\alpha - \eta)$ are shown in Fig. 4. Experimental values for $(\alpha - \eta)$ in Cl_2 (Ref. 16) and Br_2 (Ref. 17) are also shown in Fig. 4 for comparison purposes. In Cl_2 and Br_2, values for $(\alpha - \eta)$ are almost the same.

The values d_0 relating to the nonequilibrium distance[18] were calculated by the MCS method. The values of Nd_0 as a function of E/N are shown in Fig. 5, along with the values of $Nd_{0i} = V_i/(E/N)$, where V_i is the voltage at which the electron runs to get the ionization energy of F_2.

The values for the transmission coefficient TR calculated by MCS are shown in Fig. 6 for the initial electron energies of 1 and 2 eV. In this case, the reflection coefficient of electrons at the cathode surface is assumed to be 0.5.

Some examples of the energy distribution functions of electrons at an equilibrium conditions are shown in Fig. 7.

It is difficult to estimate the errors of these swarm parameters. Determination of a more comprehensive set of cross sections or experimental swarm data will provide a basis for further analysis.

ACKNOWLEDGMENTS

The author wishes to thank Professor L. H. Fisher, Professor M. A. Biondi, Professor A. V. Phelps, and Professor Y. Itikawa for useful discussions and encouragement. The author also wishes to thank Mr. S. Ushiroda and T. Kamisaki for assistance. This work was supported in part by a Grant-in-Aid for Scientific Research by the Ministry of Education. The Facom M-200 Computer of the Institute for Molecular Science was used for these calculations.

[1] P. J. Chantry, *Applied Atomic Collisions Physics, Vol. 3: Gas Lasers*, edited by E. W. McDaniel and W. L. Nighan (Academic, New York, 1982), p. 35.
[2] B. I. Schneider and P. J. Hay, J. Phys. B **9**, L165 (1976); Phys. Rev. A **13**, 2049 (1976).
[3] T. N. Rescigno, C. F. Bender, C. W. McCurdy, and V. McKoy, J. Phys. B **9**, 2141 (1976).
[4] M. Hayashi, Inst. Plasma Physics, Nagoya University Report IPPJ-AM-19 (1981).
[5] R. J. Hall, J. Chem. Phys. **68**, 1803 (1978).
[6] A. W. Fliflet, V. McKoy, and T. N. Rescigno, Phys. Rev. A **21**, 788 (1980).
[7] A. U. Hazi, Phys. Rev. A **23**, 2232 (1981).
[8] M. Hayashi, J. Phys. D **16**, 581 (1983).
[9] H. Nishimura, D. C. Cartwright, and S. Trajmar, J. Chem. Phys. **71**, 5039 (1979).
[10] F. A. Stevie and M. J. Vasile, J. Chem. Phys. **74**, 5106 (1981).
[11] A. U. Hazi, A. E. Orel, and T. N. Rescigno, Phys. Rev. Lett. **46**, 918 (1981).
[12] M. Hayashi, J. Phys. D **15**, 1411 (1982).
[13] For example, W. P. Allis, *Handb. der Physik*, Band 21 (Springer, Berlin, 1956), p. 411.
[14] V. A. Bailey and R. H. Healey, Philos. Mag. **19**, 725 (1935).
[15] J. E. Bailey, R. E. B. Makinson, and J. M. Somerville, Philos. Mag. **24**, 177 (1937).
[16] S. E. Bozin and C. C. Goodyear, Brit. J. Appl. Phys. **18**, 49 (1967).
[17] S. A. A. Razzak and C. C. Goodyear, J. Phys. D **2**, 1577 (1969).
[18] M. Hayashi, J. Phys. D **16**, 591 (1983).

JAPANESE JOURNAL OF APPLIED PHYSICS
VOL. 22, NO. 9, SEPTEMBER, 1983 pp. L565–L566

Calculation of Electron Attachment Rate Coefficient in Fluorine

Makoto HAYASHI

Nagoya Institute of Technology, Gokiso-cho, Syowa-ku, Nagoya, 466

(Received June 17, 1983; accepted for publication August 20, 1983)

Electron attachment rate coefficients have been calculated for fluorine by the Boltzmann equation. The range of E/N, ratio of the electric field to the gas number density, for which the coefficients were calculated ranged from 70 to 2000 Td.

§1. Introduction

Swarm parameters of electrons have been calculated for pure fluorine for the first time.[1] In these calculations, values of the electron drift velocity W and attachment coefficient η were obtained. From these values, electron attachment rate coefficients k_a have been determined and compared with available experimental data in dilute fluorine as well as with calculated data. It is concluded that the present calculated values of k_a are reasonable, in spite of the fact that values of cross sections used in the calculations are incomplete.

The methods of calculation and the cross sections used in this paper are given in detail in reference 1).

§2. Calculated Results

Calculated values of k_a are shown in Figs. 1 and 2.

Measurements of electron attachment rate coefficient studies for mixtures of gases including F_2 have been made by

Sides *et al.*[2],	0.065% F_2 in Ar,
Chen *et al.*[3],	0.25% F_2 in N_2,
Schneider and Brau[4],	0.01~0.03% F_2 in N_2 and Ar,
Trainor and Jacob[5],	0.13% F_2 in N_2, and
Nygaard *et al.*[6],	1% F_2 in He.

Calculated values of k_a for dilute F_2 have been given by

Hazi *et al.*[7],	F_2 in N_2 and Ar, and
Mitchell[8],	F_2 in He and N_2.

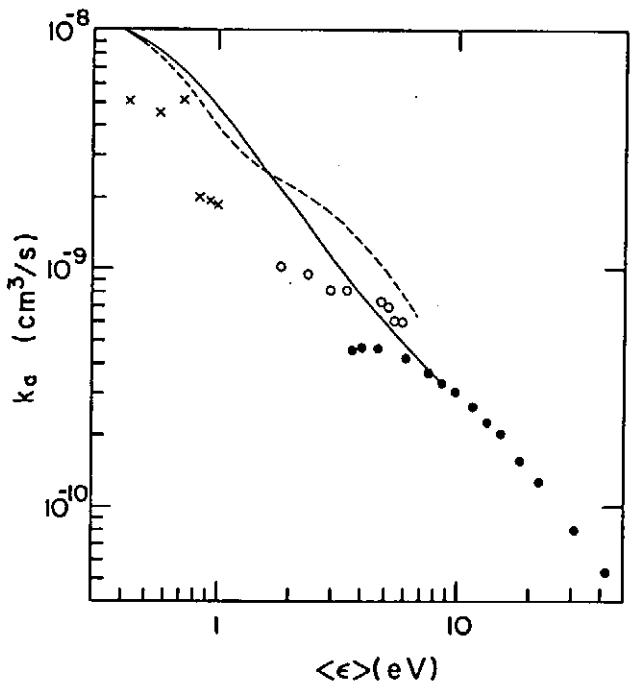


Fig. 1. Attachment rate coefficient k_a for F_2 as a function of electron mean energy. ● Values in pure F_2 calculated in the present work. ○ Experimental values obtained by Nygaard *et al.*[6] × Experimental values given by Chen *et al.*[3] ——, ---- Calculated values of Mitchell.[8]

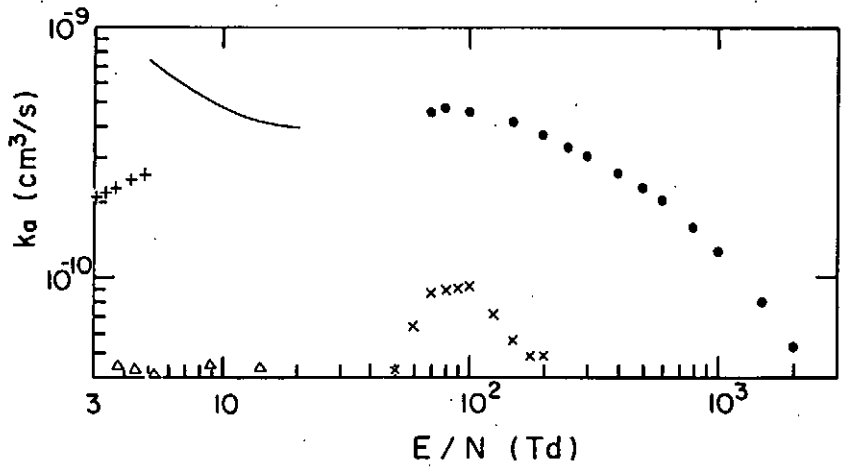


Fig. 2. Attachment rate coefficient k_a for F_2 as a function of E/N. ● Present calculated values. —— Nighan's experimental value. The symbols +, Δ and × are comparative experimental values for HCl: Christophorou *et al.*,[11] Sierra *et al.*[12] and Davies,[13] respectively.

These values have been summarized in a recent report.[9] Some examples of the values of k_a given in these references are also shown in Fig. 1 (k_a versus electron mean energy $<\varepsilon>$) for comparison.

Nighan has given the only experimental determination of k_a in dilute fluorine as a function of E/N[10]; the solid curve in Fig. 2 shows his results. Values of k_a for HCl measured by Christophorou *et al.*,[11] Sierra *et al.*[12] and Davies,[13] are also shown in Fig. 2 for comparison.

From these figures, it seems that the present calculated values of k_a are reasonable. We feel that some of the cross sections used in the present calculations are uncertain. In order to get more exact values of k_a, better experimental values of cross sections are needed.

Below $E/N=70$ Td, swarm parameters could not be calculated with our program code. It is of interest to determine whether or not electron swarms have equilibrium values of transport coefficients at low E/N in strong attaching gases.

Acknowledgements

It is a pleasure to acknowledge the valuable comments and encouragement of Professors L. H. Fisher, M. A. Biondi, A. V. Phelps, Y. Itikawa and Y. Hatano.

The present work was supported in part by a Grant-in-Aid for Scientific Research from the Ministry of Education, Science and Culture of Japan.

References

1) M. Hayashi and T. Nimura: to be published in J. Appl. Phys. 54 (1983).
2) G. D. Sides, T. O. Tiernan and R. J. Hanrahan: J. Chem. Phys. 65 (1976) 1966.
3) H. L. Chen, R. E. Center, D. W. Trainor and W. I. Fyfe: J. Appl. Phys. 48 (1977) 2297.
4) B. I. Schneider and C. A. Brau: Appl. Phys. Lett. 33 (1978) 569.
5) D. W. Trainor and J. H. Jacob: Appl. Phys. Lett. 35 (1979) 920.
6) K. J. Nygaard, H. L. Brooks and S. R. Hunter: IEEE J. Quantum Electron. 15 (1979) 1216.
7) A. U. Hazi, A. E. Orel and T. N. Rescigno: Phys. Rev. Lett. 46 (1981) 918.
8) Mitchell (1978), from ref. 9).
9) J. W. Gallagher, E. C. Beaty, J. Dutton and L. C. Pitchford: JILA Information Center Report No. 22 (1982) 181.
10) W. L. Nighan: IEEE J. Quantum Electron. 14 (1978) 714.
11) L. G. Christophorou, R. N. Compton and H. W. Dickson: J. Chem. Phys. 48 (1968) 1949.
12) T. A. Sierra, H. L. Brooks and K. J. Nygaard: *Electron and Ion Swarms*, ed. L. G. Christophorou (Pergamon Press, New York, 1981) p. 219.
13) D. K. Davies: *Applied Atomic Collision Physics*, Vol. 3, Gas Lasers, ed. E. W. McDaniel and W. L. Nighan (Academic Press, New York, 1982) Chap. 2, by P. J. Chantry, p. 64.

May We Measure the Exact Values of Electron Collision Cross Sections for Molecules by Beam and Swarm Experiments ?

M. Hayashi and Y. Nakamura*

Gaseous Electronics Institute
4-15-14-503 Sakae, Nakaku, Nagoya 460-0008 Japan
**Faculty of Science and Technology, Keio University*
3-14-1 Hiyoshi, Yokohama 223-8522 Japan

We cannot measure the exact values of DCS for molecules intrinsically. Of course, we can measure the approximate values of DCS for molecules, but can measure the exact values of DCS for atoms. The reason is very simple.

Target molecule M in both beam and swarm experiments consists of the mixture of different states :

$$M = M(g) + M(r_J) + M(v_1) + M_N$$

where $M(g)$, $M(r_J)$, $M(v_1)$ and M_N represent the completely ground state molecules, the rotationally excited molecules, the vibrationally excited molecules and the van der Waals clusters consisting of N molecules ($N \geqq 2$), respectively. Usually beam and swarm experiments are carried out at about 300 K. The concentration of $M(g)$ is small compared to $M(r_J)$ (except H_2 molecules) at 300 K. Then the molecule M is always mixture of $M(r_J)$ and $M(v_1)$, and the concentration of $M(r_J)$ and $M(v_1)$ changes with temperature. And electron collision cross section sets from elastic to inelastic collision processes for $M(r)$ and $M(v)$ are different each other. The target molecules M in the beam and swarm experiments are always mixtures of different molecules $M(r_J)$ and $M(v_1)$. In the case of H_2, the target gas consists of $M(g)$ and $M(r_J)$, especially $M(g)$ and $M(r_1)$ at 78 K.

Most clear change of cross sections of $M(r_J)$ and $M(v_1)$ will occur for triatomic molecules. CO_2, N_2O and so on. Triatomic molecules can change from linear to bend, or vice versa easily. The authors [1] have presented the different elastic momentum transfer cross sections q_{mr} and q_{mv} for $CO_2(r)$ and $CO_2(v)$, where they assumed that all other inelastic cross sections of $CO_2(r)$ and $CO_2(v)$ are practically the same. Then they have calculated the electron drift velocity W as a function of gas temperature T. When T increas, concentrations of $CO_2(v)$ increases, then W decreases with T at the same E/N, the electric field over the gas number density, around 50 Td.

We have a comment to the interesting and important paper of W. Johnstone, et al. [2]. They have measured the temperature dependence of elastic DCS for CO_2 at 4.0 eV. Unfortunitly, q_{mv} for $CO_2(v)$ at 4 eV is almost equal to q_{mr} for $CO_2(r)$ [1]. Then we propose the same experiments at about 3.4 eV for CO_2, because the temperature dependence of DCS seems to be very large there.

Winstead and McKoy [3] calculated the elastic DCS for $N_2O(g)$ at low electron energies and compare the experimental DCS data for $N_2O(r) + N_2O(v)$ mixture at 300 K. We can see large discrepancy between them at lower than about 10 eV. We urge Winstead and Mckoy to calculate the DCS

for N_2O(v) and also N_2O(r) for comparison. We can see the same discrepancy of DCS for CO_2 [4] [5] at low electron energies..

H_2 molecules have the famous long standing controversy in the vibrational excitation cross section [6]. A possible way to solve the problem may be as follows. At first, theoreticians calculate the q_{mg}, q_{mr}, q_{mv}, q_{rg}, q_{rr}, q_{rv}, q_{vg}, q_{vr}, and q_{vv} for H_2(g), H_2(r_1) and H_2(v_1), as a function of electron energies. Using these data, we calculate the electron swarm parameters. From beam experiments, we cannot determine the values of q_{mg}, q_{mr}, q_{rg}, q_{rr} for H_2(g) and H_2(r_1) at the same time. It is clear that the threshold energies of q_r and q_v for H_2(g) and H_2(r_1) are different. Bhattacharyya, et al. [7] have shown that elastic integral cross sections q_{tr} are larger than q_{tg} for 20 to 200 eV for H_2(g) and H_2(r_1). We want the elastic DCS values for H_2(g) and H_2(r_1) at low electron energies lower than 10 eV. Swarm experiments also carried out in the mixtures of H_2(g) and H_2(r_1), except for para-H_2(g) at 78 K (concentration of H_2(g) is 99.3 %). We compare the experimental and calculated swarm parameters at given conditions.

Usually, theoreticians calculate the DCS for M(g), not for M(r_J) and M(v_i), for most molecules. Theoretical studies involving the rotationally and vibrationally excited species are urgently required for many molecules. There is a interesting paper given by A. Jain [8].

If we have the cross section sets for excited inert gas clusters, we can calculate the electron swarm parameters of inert gases at high pressure and low temperature conditions. The concentration of the clusters for atoms and molecules are important at low temperature and high pressure conditions.

Most interesting temperature dependence occur for attachment cross sections q_a [9]-[13]. The values of non-dissociative q_{an} and dissociative q_{ad} are quite different for M(r) and M(v), and M(r) and M(v) have the definit and individual cross sections, independ on the temperature. Apparent temperature dependence of attachment cross section is caused through different concentration of the excited components M(r) and M(v) at different temperatures.

[1] M. Hayashi and Y. Nakamura, 51th GEC, Maui, JTP7.07, 265 (1998) CO_2
[2] W. M. Johnston, N. J. Mason and W. R. Newell, J. Phys. B26, L147 (1993) CO_2
[3] C. Winstead and V. McKoy, Phys. Rev. A57, 3589 (1998) N_2O
[4] H. Tanaka, T. Ishikawa, T. Masai, T. Sagara, L. Boesten, M. Takekawa, Y. Itikawa and M. Kimura, Phys. Rev. A57, 1798 (1998) CO_2
[5] J. C. Gibson, M. A. Green, K. W. Trantham, S. J. Buckman, P. J. O. Teubner and M. J. Brunger, J. Phys. B32, 213 (1999) CO_2
[6] R. W. Crompton and M. A. Morrison, Aust. J. Phys. 46, 203 (1993) H_2
[7] P. K. Bhattacharyya, D. K. Syamal and B. C. Saha, Phys. Rev. A32, 854 (1985)
[8] A. Jain, Z. Phys. D21, 153 (1991) CH_4, SiH_4 H_2
[9] W. M. Hickam and D. Berg, J. Chem. Phys. 29, 517 (1958) SF_6, et al.
[10] M. Allan and S. F. Wong, Phys. Rev. Lett. 41, 1791 (1978) H_2
[11] D. M. Pearl, P. D. Burrow, I. I. Fabrikant and G. A. Gallup, J. Chem. Phys. 102, 2737 (1995) CH_3Cl
[12] W. Wang, L. G. Christophorou and J. Vergrugge, J. Chem. Phys. 109, 8304 (1998) CCl_2F_2
[13] L. G. Christophorou, 20th ICPIG, Pisa 3-13 (1991) review

2003. 9. 22.

Numbers of References

on Electron and Photon Collisions with Atoms and Molecules published in the 20th Century

Atoms (17)			Molecules (51)					
A + e,	A + hν		M + e,		M + hν,			
He 2	2170 *		2	H_2, D_2	2000		CH_4	780
Ne 10	1140 *			N_2	2240 ○			
Ar 18	1960 ○			O_2	1700		CF_4	390
Kr 36	1000			CO	1190		CCl_4	210
Xe 54	1180 ○			NO	880		CCl_2F_2	250
							CH_3Cl	90
Li 3	450			F_2	190 ○			
Na 11	800			Cl_2	360 ○		SiH_4	230
				Br_2	140 ○		SiF_4	140
K 19	370			I_2	240 ○		GeH_4	50
Rb 37	220							
Cs 55	370			HF	260	6	C_2H_4	370
				HCl	320		CH_3OH	350
O 8	390			HBr	200			
				HI	130	7	SF_6	920 ○
F 9	90							
Cl 17	130		3	CO_2	1240 ○			
						8	C_2H_6	260
Cu 29	180			H_2O	930		C_2F_6	150
Cd 48	210			H_2S	270		Si_2H_6	70
Ba 56	340			O_3	480			
				N_2O	450	9	C_3H_6	120
Hg 80	600			NO_2	300		C_2H_5OH	60
				SO_2	260			
				CS_2	260			
				OCS	280	11	C_3H_8	190
not final, but							C_3F_8	100
finished mostly			4	C_2H_2	390			
						12	C_4F_8	100
include electron				NH_3	500		C_6H_6	240
swarm papers				NF_3	110		C_6F_6	100
				BF_3	110			
include				BCl_3	90	60	C_{60}	300
review papers				PH_3	80			
				H_2CO	180		$M_r + M_v$	850

* He(Ne) + e only. Not include He(Ne) + hν papers.

○ The bibliography was published already.

Recent Issues of NIFS-DATA Series

NIFS-DATA-55 H.P. Summers, H. Anderson, T. Kato and S. Murakami,
Hydrogen Beam Stopping and Beam Emission Data for LHD: Nov. 1999

NIFS-DATA-56 S. Born, N. Matsunami and H. Tawara,
A Simple Theoretical Approach to Determine Relative Ion Yield (RIY) in Glow Discharge Mass Spectrometry (GDMS): Jan. 2000

NIFS-DATA-57 T. Ono, T. Kawamura, T. Kenmotsu, Y. Yamamura,
Simulation Study on Retention and Reflection from Tungsten Carbide under High Fluence of Helium Ions: Aug. 2000

NIFS-DATA-58 J.G. Wang, M. Kato and T. Kato,
Spectra of Neutral Carbon for Plasma Diagnostics: Oct. 2000

NIFS-DATA-59 Yu. V. Ralchenko, R. K. Janev, T. Kato, D.V. Fursa, I. Bray and F.J. de Heer
Cross Section Database for Collision Processes of Helium Atom with Charged Particles.
I. Electron Impact Processes: Oct. 2000

NIFS-DATA-60 U.I. Safronova, C. Namba, W.R. Johnson, M.S. Safronova,
Relativistic Many-Body Calculations of Energies for n = 3 States in Aluminiumlike Ions: Jan. 2001

NIFS-DATA-61 U.I. Safronova, C. Namba, I. Murakami, W.R. Johnson and M.S. Safronova,
E1,E2, M1, and M2 Transitions in the Neon Isoelectronic Sequence: Jan. 2001

NIFS-DATA-62 R. K. Janev, Yu.V. Ralchenko, T. Kenmotsu,
Unified Analytic Formula for Physical Sputtering Yield at Normal Ion Incidence: Apr. 2001

NIFS-DATA-63 Y. Itikawa,
Bibliography on Electron Collisions with Molecules: Rotational and Vibrational Excitations, 1980-2000 Apr. 2001

NIFS-DATA-64 R.K. Janev, J.G. Wang and T.Kato,
Cross Sections and Rate Coefficients for Charge Exchange Reactions of Protons with Hydrocarbon Molecules: May 2001

NIFS-DATA-65 T. Kenmotsu, Y. Yamamura, T. Ono and T. Kawamura,
A New Formula of the Energy Spectrum of Sputtered Atoms from a Target Material Bombarded with Light Ions at Normal Incidence: May 2001

NIFS-DATA-66 I. Murakami, U. I. Safronova and T. Kato,
Dielectronic Recombination Rate Coefficients to Excited States of Be-like Oxygen: May 2001

NIFS-DATA-67 N. Matsunami, E. Hatanaka, J. Kondoh, H. Hosaka, K. Tsumori, H. Sakaue and H. Tawara,
Secondary Charged Particle Emission from Proton Conductive Oxides by Ion Impact: July 2001

NIFS-DATA-68 R.K. Janev, J.G. Wang, I. Murakami and T. Kato,
Cross Sections and Rate Coefficients for Electron-Impact Ionization of Hydrocarbon Molecules: Oct. 2001

NIFS-DATA-69 S. Zou, T. Kato, I. Murakami,
Charge Exchange Recombination Spectroscopy of Li III Ions for Fusion Plasma Diagnostics: Oct. 2001

NIFS-DATA-70 I. Murakami, T. Kato, A. Igarashi, M. Imai, Y. Itikawa, D. Kato, M. Kimura, T. Kusakabe, K. Moribayashi, T. Morishita, K. Motohashi, L. Pichl
AMDIS and CHART update (I): Oct. 2002

NIFS-DATA-71 S. Zou, L. Pichl, M. Kimura and T. Kato
Total, Partial and Differential Ionization Cross Sections in Proton-hydrogen Collisions at Low Energy: Jan. 2003

NIFS-DATA-72 M. Hayashi
Bibliography of Electron and Photon Cross Sections with Atoms and Molecules Published in the 20th Century – Argon –: Jan. 2003

NIFS-DATA-73 J. Horacek, K. Houfek, M. Cizek, I. Murakami and T. Kato
Rate Coefficients for Low-Energy Electron Dissociative Attachment to Molecular Hydrogen: Feb. 2003

NIFS-DATA-74 M. Hayashi
Bibliography of Electron and Photon Cross Sections with Atoms and Molecules Published in the 20th Century – Carbon Dioxide –: Apr. 2003

NIFS-DATA-75 X. Ma, H.P. Liu, Z.H. Yang, Y.D. Wang, X.M. Chen, Z.Y. Liu, I. Murakami and C. Namba
Cross-section Data Measured at Low Impact Energies for Ar^{q+} Ions on Argon and Neon Targets. Apr. 2003

NIFS-DATA-76 M. Hayashi
Bibliography of Electron and Photon Cross Sections with Atoms and Molecules Published in the 20th Century – Sulphur Hexafluoride –; May 2003

NIFS-DATA-77 M. Hayashi
Bibliography of Electron and Photon Cross Sections with Atoms and Molecules Published in the 20th Century – Nitrogen Molecule – ; June 2003

NIFS-DATA-78 A. Iwamae, T. Fujimoto, H. Zhang, D. P. Kilcrease, G. Csanak and K.A. Berrington
Population Alignment Collisional Radiative Model for Helium-like Carbon:Polarization of Emission Lines and Anisotropy of the Electron Velocity Distribution Function in Plasmas: Aug. 2003

NIFS-DATA-79 M. Hayashi
Bibliography of Electron and Photon Cross Sections with Atoms and Molecules Published in the 20th Century – Xenon – ; Sep. 2003

NIFS-DATA-80 M. Hayashi
Bibliography of Electron and Photon Cross Sections with Atoms and Molecules Published in the 20th Century – Halogen Molecules – ; Dec. 2003