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Bibliography on Electron Collisions with Molecules: Rotational and Vibrational Excitations, 1980-2000

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Bibliography on electron collisions with molecules: rotational and vibrational excitations, 1980-2000

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Abstract
A list of papers reporting cross sections for electron-impact excitations of rotational and vibrational states of molecules is presented. The list includes both the theoretical and the experimental papers published in 1980-2000. An index by molecular species is provided at the end of the bibliography.

Keywords
bibliography, electron-molecule collision, rotational excitation, vibrational excitation

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INTRODUCTION

Electron-molecule collision is a fundamental process in a low-temperature plasma, which is of importance both in nature (e.g., ionospheres of the Earth and other planets) and in industry (e.g., gaseous electronics and plasma processing). The electron-molecule collision also plays a fundamental role in the interaction of radiation with matter. Thus the cross section data for the electron-molecule collision are needed in a wide field of applications.

One of the specific features of the electron-molecule interaction is the presence of the degree of nuclear motion of the molecule (i.e., rotation and vibration). Excitation of molecular rotation and vibration makes the electron-molecule collision very much different from the electron-atom collision, particularly in the region of low collision energy (say, below several tens of eV). For instance, the behavior of the slowing down of an electron in a molecular gas at the energies below the threshold of the electronic excitation of the molecule is mainly determined by the excitation of the molecular rotation and vibration.

In the present paper, a list is given of the papers reporting cross section data on the electron-impact excitations of rotational and vibrational states of molecules. In the case of rotational and vibrational excitations, particularly in the former, experimental data are not sufficiently available. The present paper, therefore, lists theoretical, as well as experimental, papers. For readers' convenience, a short description of the content of each paper follows the bibliographic information. Also the molecular species dealt with in each paper is clearly indicated. An index by molecular species is provided at the end of the paper.

The present list includes the papers published in 1980-2000. For the papers published before 1980, a similar but more general bibliography is available elsewhere.[1-4]

EXPLANATION OF TABLES

Table I. Bibliography

Each paper is identified by a record number such as 80Chu1, where 80 means the year of publication (i.e., 1980) and Chu is the first three letters of the first author. The listing is arranged in the ascending order of the record number (i.e., the year and the first author). Each entry has the information

author(s)

journal name, volume, page and the year of publication

title

the name of the molecule(s), rotation or vibration (or both), experiment or theory (or both)

simple description of the content

In the description of the content, the following abbreviations are used:

CC close-coupling method

DCS differential cross section

DW distorted wave method

FNA fixed-nuclei approximation

FNO fixed-nuclear-orientation approximation

ICS integrated cross section

Th threshold

Table II. Index for rotational excitation

Papers reporting rotational cross section are indexed by molecular species. The letter in the parentheses after each record number indicates theoretical (T) or experimental (E) paper. The letter (R) means recommended cross sections given in the relevant paper.

Table III. Index for vibrational excitation

Papers reporting vibrational cross section are indexed by molecular species. The letter in the parentheses after each record number indicates theoretical (T) or experimental (E) paper. The letter (R) means recommended cross sections given in the relevant paper.

Acknowledgement

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References

1) L. J. Kieffer, Bibliography of Low Energy Electron and Photon Cross Section Data (through December 1974), NBS Special Publication 426 (NBS, 1976)

2) J. W. Gallagher, J. R. Rumble and E. C. Beaty, Bibliography of Low Energy Electron and

Photon Cross Section Data (January 1975 through December 1977), NBS Special Publication 426, Suppl. 1 (NBS, 1979)
3) J. W. Gallagher and E. C. Beaty, Bibliography of Low Energy Electron and Photon Cross Section Data (1978), JILA Information Center Report No.18 (University of Colorado, 1980)
4) J. W. Gallagher and E. C. Beaty, Bibliography of Low Energy Electron and Photon Cross Section Data (1979), JILA Information Center Report No.21 (University of Colorado, 1981)

Table I. Bibliography

80Chu1
A. Chutjian and H. Tanaka, J. Phys. B:At. Mol. Phys. **13**, 1901 (1980)
Electron impact cross sections for v=0→1 vibrational excitation in CO at electron energies of 3 to100 eV
[CO, vib, experiment]
ICS and DCS at 3-100 eV

80Ond1
K. Onda and D. G. Truhlar, J. Chem. Phys. **72**, 1415 (1980)
Comparison of local-exchange approximations for intermediate-energy electron-molecule differential cross sections
[N_2, rot, theory]
rotational CC with model potential; DCS at 30 eV

80Ond2
K. Onda and D. G. Truhlar, J. Chem. Phys. **72**, 5249 (1980)
State-to-state cross sections for elastic and inelastic electron scattering by N_2 at 20-35 eV, including resonant enhancement of vibrational excitation
[N_2, rot, vib, theory]
rot: rotational CC with model potential; DCS at 25 eV; ICS at 20, 25 and 30 eV; vib: vibrational adiabatic and rotational CC; ICS and DCS at 20, 25 and 30 eV

80Ond3
K. Onda and D. G. Truhlar, J. Chem. Phys. **73**, 2688 (1980)
Quantum mechanical study of elastic scattering and rotational excitation of CO by electrons
[CO, rot, theory]
rotational CC with model potential; DCS at 10 eV

80Reg1
D. F. Register, H. Nishimura and S. Trajmar, J. Phys. B:At. Mol. Phys. **13**, 1651 (1980)
Elastic scattering and vibrational excitation of CO_2 by 4, 10, 20 and 50 eV electrons
[CO_2, vib, experiment]
ICS and DCS at 4-50 eV

80Roh1
K. Rohr, J. Phys. B:At. Mol. Phys. **13**, 4897 (1980)
Cross beam experiment for the scattering of low-energy electrons from methane
[CH_4, vib, experiment]
DCS at 2 eV

80Thi1
D. Thirumalai, K. Onda and D. G. Truhlar, J. Phys. B:At. Mol. Phys. **13**, L619 (1980)
Excitation of the asymmetric stretch mode of CO_2 by electron impact
[CO_2, vib, theory]
rotational CC and vibrational adiabatic; DCS at 10 eV

81Sah1
S. Saha, S. Ray, B. Bhattacharyya and A. K. Barua, Phys. Rev. A **23**, 2926 (1981)
Rotational cross sections and rate coefficients for e-CO and e-HCN collisions under interstellar conditions
[CO, HCN, rot, theory]
rotational CC with a simple model potential; ICS at 0.0006-0.1 eV; rate coefficient for 5-100 K

81Sie1
J. Siegel, J. L. Dehmer and D. Dill, Phys. Rev. A **23**, 632 (1981)
Hybrid calculation of electron-polar-molecule scattering: Integrated and momentum-transfer cross sections for LiF

[LiF, rot, theory]
a hybrid method with the continuum multiple scattering method, the FNA, and the Born closure; ICS at 1-20 eV

81Tan1
H. Tanaka, T. Yamamoto and T. Okada, J. Phys. B:At. Mol. Phys. **14**, 2081 (1981)
Electron-impact cross sections for v = 0 → 1 vibrational excitation of N_2 at electron energies of 3 to 30 eV
[N_2, vib, experiment]
ICS and DCS at 3-30 eV

81Thi1
D. Thirumalai, K. Onda and D. G. Truhlar, J. Chem. Phys. **74**, 526 (1981)
Elastic scattering and rotational excitation of a polyatomic molecule by electron impact: Acetylene
[C_2H_2, rot, theory]
rotational CC with model potential; ICS and DCS at 10 eV

81Thi2
D. Thirumalai, K. Onda and D. G. Truhlar, J. Chem. Phys. **74**, 6792 (1981)
Electron scattering by CO_2: Elastic scattering, rotational excitation, and excitation of the asymmetric sretch at 10 eV impact energy
[CO_2, rot, vib, theory]
rotational CC and vibrational adiabatic with model potential; ICS and DCS at 10 eV

81Thi3
D. Thirumalai and D. G. Truhlar, J. Chem. Phys. **75**, 5207 (1981)
Improved calculation of the cross section for excitation of the asymmetric stretch of CO_2 by electron impact
[CO_2, vib, theory]
an improved version of 81Th2

82Bha1
P. K. Bhattacharyya and K. K. Goswami, Phys. Rev. A **26**, 2592 (1982)
Elastic and rotational excitation of the nitrogen molecule by intermediate-energy electrons
[N_2, rot, theory]
FNA with an eikonal amplitude; ICS at 20-200 eV; DCS at 20, 30, and 50 eV

82Fel1
A. N. Feldt and M. A. Morrison, J. Phys. B:At. Mol. Phys. **15**, 301 (1982)
Breakdown of the adiabatic-nuclear-rotation approximation for near-threshold e-H_2 collisions
[H_2, rot, theory]
validity of the FNA tested; ICS at 0.4-4 eV; DCS at 0.047, 0.1 and 1 eV

82Jun1
K. Jung, T. Antoni, R. Muller, K.-H. Kochem and H. Ehrhardt, J. Phys. B:At. Mol. Phys. **15**, 3535 (1982)
Rotational excitation of N_2, CO and H_2O by low-energy electron collisions
[N_2, CO, H_2O, rot, vib, experiment]
rot: for N_2, DCS at 2.22 and 2.47 eV; for CO, DCS at 1.8 and 2.1 eV; for H_2O, DCS at 2.14 and 6 eV; vib: for N_2, DCS at 2.47 eV; for CO, DCS at 1.8 eV

82Nor1
D. W. Norcross and N. T. Padial, Phys. Rev. A **25**, 226 (1982)
The multipole-extracted adiabatic-nuclei approximation for electron-molecule collisions
[CO, HCl, rot, theory]
a test of the multipole-extracted adiabatic-nuclei approximation (MEAN) method; for CO, ICS at 0.001-0.1 eV; for HCl, DCS at 11 eV

82Res1

T. N. Rescigno, A. E. Orel, A. U. Hazi and B. V. McKoy, Phys. Rev. A **26**, 690 (1982)
Ab initio study of vibrational excitation of HF by low-energy electrons
[HF, vib, theory]
FNA; ICS at 0.5-5 eV

82Whi1
B. L. Whitten and N. F. Lane, Phys. Rev. A **26**, 3170 (1982)
Near-threshold vibrational excitation in electron-CO_2 collisions: A simple model
[CO_2, vib, theory]
FNA with vibrational CC; ICS at Th-1 eV

83Abu1
N. Abusalbi, R. A. Eades, T. Nam, D. Thirumalai, D. A. Dixon, D. G. Truhlar and M. Dupuis, J. Chem. Phys. **78**, 1213 (1983)
Electron scattering by methane: Elastic scattering and rotational excitation cross sections calculated with ab initio interaction potentials
[CH_4, rot, theory]
rotational CC with model potential; DCS and ICS at 10 eV

83Bha1
P. K. Bhattacharyya and K. K. Goswami, Phys. Rev. A **28**, 713 (1983)
Elastic and rotational excitation of the oxgen molecule by intermediate-energy electrons
[O_2, rot, theory]
same as 82Bha1, but for O_2

83Bur1
P. G. Burke, C. J. Noble and S. Salvini, J. Phys. B:At. Mol. Phys. **16**, L113 (1983)
Electron scattering by nitrogen molecules at intermediate energies
[N_2, vib, theory]
FNA; ICS at 20-30 eV

83Fab1
I. I. Fabrikant, J. Phys. B:At. Mol. Phys. **16**, 1253 (1983)
Generalised quantum defect theory for electron scattering by polar molecules
[LiF, HF, rot, theory]
FNA and the effective range theory; ICS at 0.5-4 eV

83Had1
G. N. Haddad and H. B. Milloy, Aust. J. Phys. **36**, 473 (1983)
Cross sections for electron-carbon monoxide collisions in the range 1-4 eV
[CO, vib, experiment]
ICS at 0.3-4 eV, from swarm experiment

83Jai1
A. Jain and D. G. Thompson, J. Phys. B:At. Mol. Phys. **16**, L347 (1983)
Vibrational excitation of symmetric and bending modes of H_2O by slow electron impact
[H_2O, vib, theory]
FNA with model-exchange and model-polarization potential; ICS at 1-10 eV, DCS at 1-8 eV

83Jai2
A. Jain and D. G. Thompson, J. Phys. B:At. Mol. Phys. **16**, 2593 (1983)
Momentum transfer cross sections for the low-energy electron scattering by NH_3 molecules
[NH_3, rot, theory]
FNA with model-exchange and model-polarization potential; ICS at 0.01-10 eV

83Jai3

A. Jain and D. G. Thompson, J. Phys. B:At. Mol. Phys. **16**, 3077 (1983)
Rotational excitation of CH_4 and H_2O by slow electron impact

[CH_4, H_2O, rot, theory]

FNA with model-exchange and model-polarization potential; for CH_4, DCS at 5 and 10 eV, ICS at 1-15 eV; for H_2O, DCS at 2.14 and 6 eV, ICS at 1-10 eV, a comparison with experiment attempted

83Ond1
K. Onda and A. Temkin, Phys. Rev. A **28**, 621 (1983)
Calculation of the polarization potential for e-N_2 collisions

[N_2, vib, theory]

FNA with polarized-orbital method; ICS at 1.8-2.3 eV

83Pad1
N. T. Padial, D. W. Norcross and L. A. Collins, Phys. Rev. A **27**, 141 (1983)
Vibrationally elastic scattering of electrons by HCl
[HCl, rot, theory]
FNA with model-exchange and model-polarization potential; ICS at 0.01-10 eV

83Rum1
J. R. Rumble, D. G. Truhlar and M. A. Morrison, J. Chem. Phys. **79**, 1846 (1983)
State-to-state differential and integral cross sections for vibrational-rotational excitation and elastic scattering of electrons by N_2 at 5-50 eV: Calculations using extended-basis-set Hartree-Fock wave functions

[N_2, vib, theory]

FNA; ICS at 5-50 eV

83Soh1
W. Sohn, K. Jung and H. Ehrhardt, J. Phys. B:At. Mol. Phys. **16**, 891 (1983)
Threshold structures in the cross sections of low-energy electron scattering of methane
[CH_4, vib, experiment]

DCS at 0.3, 0.6 and 1 eV, also excitation function vs energy (Th-1.8 eV)

83Tan1
H. Tanaka, M. Kubo, N. Onodera and A. Suzuki, J. Phys. B:At. Mol. Phys. **16**, 2861 (1983)
Vibrational excitation of CH_4 by electron impact: 3-20 eV

[CH_4, vib, experiment]

ICS and DCS at 3-20 eV

83Var1
E. F. Varracchio and U. T. Lamanna, Chem. Phys. Lett. **101**, 38 (1983)
Off-shell adiabatic nuclei theory of e--H_2 rotational excitation

[H_2, rot, theory]

the off-shell adiabatic nuclear theory; ICS at 0.05-0.5 ev; DCS at 0.05 and 0.5 eV

84Fel1
A. N. Feldt and M. A. Morrison, Phys. Rev. A **29**, 401 (1984)
Scaled adiabatic-nuclear-rotation theory for near-threshold rotational excitation in electron-molecule scattering
[H_2, rot, theory]

a modified FNA; ICS at 0.04-0.5 eV

84Hal1
R. I. Hall and L. Andric, J. Phys. B:At. Mol. Phys. **17**, 3815 (1984)

Electron impact excitation of H_2 (D_2). Resonance phenomena associated with the $X^2\Sigma_g^+$ states of H_2^- in the 10 eV region

[H_2, vib, experiment]

ICS and DCS at 5 and 10 eV

84Jai1

A. Jain and D. G. Thompson, J. Phys. B:At. Mol. Phys. **17**, 443 (1984)

Low-energy electron scattering by H_2S molecules: elastic, rotational and vibrational excitation

[H_2S, rot, vib, theory]

FNA with model-exchange and model-polarization potential; rot: ICS at 0.5-10 eV; vib: ICS at 0.5-7 eV, DCS at 2 and 3 eV, a large disagreement with experiment

84Mor1

M. A. Morrison, A. N. Feldt and D. Austin, Phys. Rev. A **29**, 2518 (1984)

Adiabatic approximations for the nuclear excitaion of molecules by low-energy electron impact: Rotational excitation of H_2

[H_2, rot, theory]

test of FNA against rot CC with model-exchange and model-polarization potential; ICS at 0.05-6 eV, also DCS; the breakdown of the FNA shown near threshold

84Mor2

M. A. Morrison, A. N. Feldt and B. C. Saha, Phys. Rev. A **30**, 2811 (1984)

Validity of the adiabatic nuclei theory for vibrational excitation of molecules by electron impact: The e-H_2 system

[H_2, vib, theory]

test of the adiabatic nuclear theory; ICS at 0.7-4.5 eV, DCS at 0.7 eV

84Pad1

N. T. Padial and D. W. Norcross, Phys. Rev. A **29**, 1590 (1984)

Ro-vibrational excitation of HCl by electron impact

[HCl, vib, theory]

the multipole-extracted adiabatic-nuclei approximation (MEAN) method; ICS at 0.4-4.5 eV

84Sta1

G. Staszewska, D. W. Schwenke and D. G. Truhlar, J. Chem. Phys. **81**, 335 (1984)

Complex optical potential model for electron-molecule scattering, elastic scattering, and rotational excitation of H_2 at 10-100 eV

[H_2, rot, theory]

rot CC with optical potential; ICS at 10-100 eV; DCS at 10, 40 and 100 eV

84Sur1

S. Sur and A. S. Ghosh, Phys. Rev. A **29**, 2236 (1984)

Rotational excitation of hydrogen molecules by electron and positron impact

[H_2, rot, theory]

a DW approximation with a model potential; ICS at Th-10 eV

84Var1

E. F. Varracchio and U. T. Lamanna, J. Phys. B:At. Mol. Phys. **17**, 4395 (1984)

Threshold behaviour of rotational cross sections in e--H_2 scattering

[H_2, rot, theory]

an off-shell generalization of adiabatic nuclear model; ICS at 0.05-6 eV, DCS at 0.047 and 0.1 eV

85All1

M. Allan, J. Phys. B:At. Mol. Phys. **18**, L451 (1985)

Experimental observation of structures in the energy dependence of vibrational excitation in H_2 by electron impact in the $^2\Sigma_u^+$ resonance region

[H_2, vib, experiment]

ICS (relative) at the energy below 5 eV, resonance found for high-state excitation

85All2
M. Allan, J. Phys. B:At. Mol. Phys. **18**, 4511 (1985)
Excitation of vibrational levels up to v=17 in N_2 by electron impact in the 0-5 eV region

[N_2, vib, experiment]

ICS (relative) for the excitation up to v=17

85Buc1
S. J. Buckman and A. V. Phelps, J. Chem. Phys. **82**, 4999 (1985)
Vibrational excitation of D_2 by low energy electrons

[H_2, D_2, vib, experiment]

ICS at Th-10 eV, from swarm experiment

85Cur1
P. J. Curry, W. R. Newell and A. C. H. Smith, J. Phys. B:At. Mol. Phys. **18**, 2303 (1985)
Elastic and inelastic scattering of electrons by methane and ethane
[CH_4, C_2H_6, vib, experiment]

DCS at 7.5-20 eV

85Est1
H. Estrada and W. Domcke, J. Phys. B:At. Mol. Phys. **18**, 4469 (1985)
On the virtual-state effect in low-energy electron-CO_2 scattering

[CO_2, vib, theory]

a virtual state model for near-Th cross section

85Had1
G. N. Haddad, Aust. J. Phys. **38**, 677 (1985)
Low energy electron collision cross sections for methane
[CH_4, vib, experiment]

ICS at Th-10 eV, from swarm experiment

85Jai1
A. Jain and D. W. Norcross, Phys. Rev. A **32**, 134 (1985)
Ab initio calculations of low-energy electron scatteimg by HCN molecules
[HCN, rot, theory]
FNA with exact-exchange and model-polarization potential; ICS at 0.001-0.1 eV; DCS at 3 eV

85Jer1
K. A. Jerjian and R. J. W. Henry, Phys. Rev. A **31**, 585 (1985)
Energy-modified frame-transformation theory: Application to near-threshold rovibrational excitation of hydrogen molecules by electrons
[H_2, rot, vib, theory]

the energy-modified frame transformation theory; rot & vib: ICS at 0.6-10 eV, good agreement with experiment

85Koc1
K.-H. Kochem, W. Sohn, K. Jung, H. Ehrhardt and E. S. Chang, J. Phys. B:At. Mol. Phys. **18**, 1253 (1985)
Direct and resonant vibrational excitation of C_2H_2 by electron impact from 0 to 3.6 eV

[C_2H_2, vib, experiment]

ICS at 0.235-3.6 eV, DCS at 0.235-2.6 eV

85Koc2
K.-H. Kochem, W. Sohn, N. Hebel, K. Jung and H. Ehrhardt, J. Phys. B:At. Mol. Phys. **18**, 4455 (1985)
Elastic electron scattering and vibrational excitation of CO_2 in the threshold energy region

[CO_2, vib, experiment]

DCS at 0.33, 0.53 and 1.05 eV, also excitation function near Th

85Lee1
M.-T. Lee, L. F. C. Botelho and L. C. G. Freitas, J. Phys. B:At. Mol. Phys. **18**, L 633 (1985)
Vibrationally elastic and inelastic (0→1) scattering of electrons by H_2-a coherent renormalised multicentre potential model approach
[H_2, vib, theory]
FNA; ICS and DCS at 20-81 eV

85Mul1
R. Muller, K. Jung, K.-H. Kochem, W. Sohn and H. Ehrhardt, J. Phys. B:At. Mol. Phys. **18**, 3971 (1985)
Rotational excitation of CH_4 by low-energy-electron collisions
[CH_4, rot, vib, experiment]
rot: DCS at 0.5, 5, 7.5 and10 eV; vib: DCS at 0.5 and 7.5 eV

85Mun1
C. Mundel, M. Berman and W. Domcke, Phys. Rev. A **32**, 181 (1985)
Nuclear dynamics in resonant electron-molecule scattering beyond the local approximation: Vibrational excitation and dissocoative attachment in H_2 and D_2
[H_2, vib, theory]
resonance theory; ICS at 1-6 eV

85Nis1
H. Nishimura, A. Danjo and H. Sugahara, J. Phys. Soc. Jpn. **54**, 1757 (1985)
Differential cross sections of electron scattering from molecular hydrogen I. Elastic scattering and vibrational excitation ($X^1\Sigma_g^+$, v =0→1)
[H_2, vib, experiment]
ICS and DCS at 2.5-100 eV

85Nov1
J. P. Novak and M. F. Frechette, J. Appl. Phys. **57**, 4368 (1985)
Collisional cross sections of CCl_2F_2 and transport coefficients of CCl_2F_2 and N_2-CCl_2F_2 mixtures
[CCl_2F_2, vib, experiment]
ICS at 0.1-10 eV, from swarm experiment

85Ond1
K. Onda, J. Phys. Soc. Jpn. **54**, 4544 (1985)
Rotational excitation of molecular nitrogen by electron impact
[N_2, rot, theory]
FNA with model-exchange and model-polarization potential; partial differential equation approach; ICS at 0.01-3 eV, showing resonat structure

85Soh1
W. Sohn, K.-H. Kochem, K. Jung, H. Ehrhardt and E. S. Chang, J. Phys. B:At. Mol. Phys. **18**, 2049 (1985)
Electron scattering from CO below resonance energy
[CO, vib, experiment]
ICS at 0.37-1.26 eV, DCS at 0.45 and 1.26 eV

86Ant1
T. Antoni, K. Jung, H. Ehrhardt and E. S. Chang, J. Phys. B: At. Mol. Opt. Phys. **19**, 1377 (1986)
Rotational branch analysis of the excitation of the fundamental vibrational modes of CO_2 by slow electron collisions
[CO_2, vib, experiment]
ICS and DCS at 2 and 3.8 eV

86Fuj1
Y. Fujita, S. Yagi, S. S. Kano, H. Takuma, T. Ajiro, T. Takayanagi, K. Wakiya and H. Suzuki, Phys. Rev. A **34**, 1568 (1986)
Vibrational excitation cross sections for F_2 by electron impact
[F_2, vib, experiment]
ICS at 0.5-1.8 eV, DCS at 1.2 and 1.5 eV

86Huo1
W. M. Huo, V. McKoy, M. A. P. Lima and T. L. Gibson, Prog. Astron. Aeron. **103**, 152 (1986)
Electron-nitrogen molecule collisions in high-temperature nonequilibrium air
[N_2, vib, theory]
FNA with the multichannel Schwinger variational method; rate coefficients at T= 0.1-5.0 eV

86Lee1
J.-H. Lee, Prog. Astron. Aeron. **103**, 197 (1986)
Electron-impact vibrational excitation rates in the flowfield of aeroassisted orbital transfer vehicles
[N_2, vib, theory]
resonance cross sections calculated and used to derive excitation rate coefficient

86Mor1
L. A. Morgan, J. Phys. B:At. Mol. Phys. **19**, L439 (1986)
Resonant vibrational excitation of N_2 by low-energy electron impact
[N_2, vib, theory]
the R-matrix method; ICS (relative) for the resonance region

86Mor2
M. A. Morrison, J. Phys. B:At. Mol. Phys. **19**, L707 (1986)
A first-order non-degenerate adiabatic theory for calculating near-threshold cross sections for rovibrational excitation of molecules by electron impact
[H_2, rot, theory]
the first-order non-degenerate adiabatic theory (FONDA); ICS at 0.04-8 eV

86Mor3
M. A. Morrison and B. C. Saha, Phys. Rev. A **34**, 2786 (1986)
Investigation of parameter-free model polarization potentials for electron-molecule scattering calculations including the nuclear motion
[H_2, rot, vib, theory]
rot: rot CC with model-exchange and model-polarization potential; ICS at 0.08-10 eV, good agreement with experiment; vib: vibrational CC with a model polarization potential; ICS at 0.08-10 eV

86Ohm1
Y. Ohmori, K. Kitamori, M. Shimozuma and H. Tagashira, J. Phys. D: Appl. Phys. **19**, 437 (1986)
Boltzmann equation analysis of electron swarm behaviour in methane
[CH_4, vib, experiment]
ICS at Th-200 eV, from swarm experiment

86Soh1
W. Sohn, K.-H. Kochem, K.-M. Scheuerlein, K. Jung and H. Ehrhardt, J. Phys. B:At. Mol. Phys. **19**, 4017 (1986)
Near-threshold vibrational excitation and elastic electron scattering from N2
[N2, vib, experiment]
ICS and DCS at 0.5, 1.0 and 1.5 eV

87Abd1
M. Abdolsalami and M. A. Morrison, Phys. Rev. A **36**, 5474 (1987)
Calculating vibrational-excitation cross sections off the energy shell: A first-order adiabatic theory
[H_2, vib, theory]

the first-order adiabatic theory; ICS at 0.6-10 eV, DCS at 0.7 eV

87Gia1
F. A. Gianturco, A. Jain and L. C. Pantano, J. Phys. B:At. Mol. Phys. **20**, 571 (1987)
Electron-methane scattering via a parameter-free model interaction
[CH_4, rot, theory]

FNA with model-exchange and model-polarization potential; ICS at 2-20 eV, DCS at 10 eV, a fairly good agreement with experiment

87Gil1
C. J. Gillan, O. Nagy, P. G. Burke, L. A. Morgan and C. J. Noble, J. Phys. B:At. Mol. Phys. **20**, 4585 (1987)
Electron scattering by nitrogen molecules
[N_2, vib, theory]

the R-matrix method; DCS at 3-30 eV

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W. M. Huo, T. L. Gibson, M. A. P. Lima and V. McKoy, Phys. Rev. A **36**, 1632 (1987)
Schwinger multichannel study of the $^2\Pi_g$ shape resonance in N_2

[N_2, vib, theory]

the multichannel Schwinger variational method; ICS (relative) at Th-4 eV and absolute values of the peak cross section

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K. Jung, K.-M. Scheuerlein, W. Sohn, K.-H. Kochem and H. Ehrhardt, J. Phys. B:At. Mol. Phys. **20**, L327 (1987)
Breakdown of the adiabatic-nuclei approximation in the rotational excitation of H_2 by very slow electrons

[H_2, rot, experiment]

DCS measured at 0.2 and 0.6 eV, showing breakdown of the FNA

87Kno1
G. Knoth, M. Radle, H. Ehrhardt and K. Jung, Europhys. Lett. **4**, 805 (1987)
Rovibrational threshold structures in the electron scattering from hydrogen halides
[HCl, vib, experiment]
DCS at 0.5 eV, also DCS (90°) vs energy (Th-5.5 eV)

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M. A. Morrison, R. W. Crompton, B. C. Saha and Z. L. Petrovic, Aust. J. Phys. **40**, 239 (1987)
Near-threshold rotational and vibrational excitation of H_2 by electron impact: Theory and experiment

[H_2, rot, vib, theory, experiment]

rot: rot CC with exact-exchange and model-polarization potential; ICS at 0.05-10 eV, a detailed comparison with swarm result; vib: ICS at 0.5-1.5 eV, from swarm experiment

87Soh1
W. Sohn, K.-H. Kochem, K. M. Scheuerlein, K. Jung and H. Ehrhardt, J. Phys. B:At. Mol. Phys. **20**, 3217 (1987)
Low-energy electron impact spectroscopy of OCS and CS_2

[OCS, CS_2, vib, experiment]

For OCS, ICS at 0.4-4 eV, DCS at 0.6, 3 and 4 eV; for CS_2, ICS and DCS at 0.3-5 eV

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M. G. Curtis, I. C. Walker and K. J. Mathieson, J. Phys. D: Appl. Phys. **21**, 1271 (1988)
Electron swarm characteristic energies (Dr / μ) in tetrafluoromethane (CF_4) at low E/N

[CF_4, vib, experiment]

ICS at Th-2 eV, from swarm experiment

88Eng1

J. P. England, M. T. Elford and R. W. Crompton, Aust. J. Phys. **41**, 573 (1988)
A study of the vibrational excitation of H_2 by measurements of the drift velocity of electrons in H_2-Ne mixtures
[H_2, rot, vib, experiment]
rot: ICS at 0.04-10 eV, from swarm experiment; vib: ICS at 0.5-15 eV, from swarm experiment

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F. A. Gianturco, Phys. Scr. **T23**, 141 (1988)
Rotational excitations and resonant behaviour in electron-molecule collisions
[CH_4, rot, theory]
same as 87Gia1; DCS at 0.5-20 eV

88Mal1
L. Malegat and M. L. Dourneuf, J. Phys. B: At. Mol. Opt. Phys. **21**, 1237 (1988)
Resonant vibrational excitation of N_2 by electron impact in the 15-35 eV energy range
[N_2, vib, theory]
FNA with exact-exchange potential for the resonance symmetry; ICS at16-35 eV, DCS (90°) compared with experiment, agreement is not good

88Mor1
L. A. Morgan and P. G. Burke, J. Phys. B: At. Mol. Opt. Phys. **21**, 2091 (1988)
Low-energy electron scattering by HF
[HF, vib, theory]
the R-matrix method; ICS at 0.5-2 eV

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T. Reddish, F. Currell and J. Comer, J. Phys. E: Sci.Instrum. **21**, 203 (1988)
Studies of the 2 eV shape resonance in N_2 using a two-dimensional scanning technique
[N_2, vib, experiment]
DCS (70°) at 2 eV for the excitations up to v=8

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T. W. Shyn, S. Y. Cho and T. E. Cravens, Phys. Rev. A **38**, 678 (1988)
Vibrational-excitation cross sections of water molecules by electron impact
[H_2O, vib, experiment]
ICS and DCS at 2.2-20 eV

88Ste1
B. Stefanov, N. Popkirova and L. Zarkova, J. Phys. B: At. Mol. Opt. Phys. **21**, 3989 (1988)
Elastic and inelastic e-CF_4 cross sections at low energies: fit to the experimental data
[CF_4, vib, experiment]
ICS at Th-4 eV, from swarm experiment

89Bre1
L. M. Brescansin, M. A. P. Lima and V. McKoy, Phys. Rev. A **40**, 5577 (1989)
Cross sections for rotational excitation of CH_4 by 3-20 eV electrons
[CH_4, rot, theory]
FNA and the Schwinger multichannel variational method; DCS at 3-20 eV, some disagreement with experiment

89Bru1
M. J. Brunger, P. J. O. Teubner, A. M. Weigold and S. J. Buckman, J. Phys. B: At. Mol. Opt. Phys. **22**, 1443 (1989)
Vibrational excitation of N_2 in the $^2\Pi_g$ resonance region
[N_2, vib, experiment]
DCS at 2.1, 2.4 and 3.0 eV

89Dav1
D. K. Davies, L. E. Kline and W. E. Bies, J. Appl. Phys. **65**, 3311 (1989)
Measurements of swarm parameters and derived electron collision cross sections in methane
[CH_4, vib, experiment]
ICS at 0.16-200 eV, from swarm experiment

89Kno1
G. Knoth, M. Radle, M. Gote, H. Ehrhardt and K. Jung, J. Phys. B: At. Mol. Opt. Phys. **22**, 299 (1989)
Near-threshold electron impact rovibrational excitation of HCl and HF
[HCl, HF, vib, experiment]
ICS at Th-5 eV, DCS at 0.5-1.5 eV

89Kno2
G. Knoth, M. Gote, M. Radle, F. Leber, K. Jung and H. Ehrhardt, J. Phys. B: At. Mol. Opt. Phys. **22**, 2797 (1989)
Electron impact rovibrational excitation close to threshold of the v=2 and v=3 levels of HF and HCl
[HF, HCl, vib, experiment]
same as 89Kno1, but for the excitation of v=2, 3

89Kur1
M. Kurachi and Y. Nakamura, J. Phys. D: Appl. Phys. **22**, 107 (1989)
Electron collision cross sections for the monosilane molecule
[SiH_4, vib, experiment]
ICS at Th-50 eV, from swarm experiment

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M. Radle, G. Knoth, K. Jung and H. Ehrhardt, J. Phys. B: At. Mol. Opt. Phys. **22**, 1455 (1989)
Rotational and rovibrational excitation of HCl and HF by low-energy electron impact
[HF, HCl, rot, vib, experiment]
DCS measured at 0.5-10 eV

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L. Boesten, H. Tanaka, M. Kubo, H. Sato, M. Kimura, M. A. Dillon and D. Spence, J. Phys. B: At. Mol. Opt. Phys. **23**, 1905 (1990)
Vibrational excitation of ethane by electron impact
[C_2H_6, vib, experiment]
ICS and DCS at 3-20 eV

90Bru1
M. J. Brunger, S. J. Buckman and D. S. Newman, Aust. J. Phys. **43**, 665 (1990)
Low energy electron scattering from H_2
[H_2, vib, experiment]
ICS and DCS at 1.5 eV

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S. J. Buckman, M. J. Brunger, D. S. Newman, G. Snitchler, S. Alston, D. W. Norcross, M. A. Morrison, B. C. Saha, G. Danby and W. K. Trail, Phys. Rev. Lett. **65**, 3253 (1990)
Near-threshold vibrational excitation of H_2 by electron impact: Resolution of discrepancies between experiment and theory
[H_2, vib, experiment, theory]
experiment: ICS at 1-5 eV, DCS at 1.2 eV; theory: vibrational CC with non-local exchange effect, good agreement with the experiment

90Fur1
M. Furlan, M. J. Hubin-Franskin, J. Delwiche and J. E. Collin, J. Chem. Phys. **92**, 213 (1990)
Electron-impact excitation of the normal vibrational modes of NH_3 in the intermediate region (12-50 eV)
[NH_3, vib, experiment]

DCS (relative) at 25 and 50 eV

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G. A. Gallup, J. Phys. B: At. Mol. Opt. Phys. **23**, 2383S (1990)
A theory of low-energy electron impact excitation of dipole-allowed molecular vibrations. An application to acetylene, C_2H_2
[C_2H_2, vib, theory]
the Born approx.; DCS at 0.235 eV, also DCS(45°) vs energy

90Gal2
G. A. Gallup, J. Phys. B: At. Mol. Opt. Phys. **23**, 2397S (1990)
Low energy electron impact excitation of dipole allowed vibrations in CO and CO_2
[CO, CO_2, vib, theory]
the Born approx.; for CO, DCS at 0.45 eV, also DCS(12.5° , 90°) vs energy; for CO_2, DCS(39° , 54°) vs energy

90McN1
P. McNaughten, D. G. Thompson and A. Jain, J. Phys. B: At. Mol. Opt. Phys. **23**, 2405S (1990)
Low-energy electron-CH_4 collisions using exact exchange plus parameter-free polarisation potential
[CH_4, rot, theory]
FNA with exact-exchange and model-polarization potential; DCS at 0.5-10 eV, good agreement with experiment for some cases, but poor agreement for others; ICS at 0.1-20 eV, no comparison with experiment

90Mor1
L. A. Morgan, P. G. Burke and C. J. Gillan, J. Phys. B: At. Mol. Opt. Phys. **23**, 99 (1990)
Low-energy electron scattering by HCl
[HCl, vib, theory]
the R-matrix method; ICS near Th

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P. Pirgov and B. Stefanov, J. Phys. B: At. Mol. Opt. Phys. **23**, 2879 (1990)
Elastic and inelastic e-C_2F_6 and e-C_3F_8 cross sections from swarm data
[C_2F_6, C_3F_8, vib, experiment]
ICS at 0.1-8 eV, from swarm experiment

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B. I. Schneider, T. N. Rescigno and C. W. McCurdy, Phys. Rev. A **42**, 3132 (1990)
Resonant vibrational excitation of H_2CO by low-energy electron impact
[H_2CO, vib, theory]
FNA and the Kohn variational method; ICS at 0.2-2 eV

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G. Snitchler, D. Norcross, A. Jain and S. Alston, Phys. Rev. A **42**, 671 (1990)
Near-threshold vibrational excitation of HF by electron impact
[HF, vib, theory]
vibrational CC with exact-exchange and model-polarization potential; ICS at 0.5-1.4 eV, DCS at 0.49-1.1 eV

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H. Tanaka, L. Boesten, H. Sato, M. Kimura, M. A. Dillon and D. Spence, J. Phys. B: At. Mol. Opt. Phys. **23**, 577-588 (1990)
Elastic and vibrational differential cross sections for collisions of low- and intermediate-energy electrons with silane
[SiH_4, vib, experiment]
DCS at 2.15 and 5 eV

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W. K. Trail, M. A. Morrison, W. A. Isaacs and B. C. Saha, Phys. Rev. A **41**, 4868 (1990)

Simple procedure for including vibrational effects in the calculation of electron-molecule cross sections
[H_2, rot, theory]

a simple procedure proposed to include vibrational effects; ICS at 0.05-10 eV, better agreement with experiment

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M. J. Brunger, S. J. Buckman, D. S. Newman and D. T. Alle, J. Phys. B: At. Mol. Opt. Phys. **24**, 1435 (1991)
Elastic scattering and rovibrational excitation of H_2 by low-energy electrons

[H_2, vib, experiment]

ICS and DCS at 1-5 eV

91Fur1
M. Furlan, M. J. Hubin-Franskin, J. Delwiche and J. E. Collin, J. Chem. Phys. **95**, 1671 (1991)
Absolute vibrational differential cross sections of water vapor by 30 and 50 eV electron impact
[H_2O, vib, experiment]

DCS at 30 and 50 eV

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F. A. Gianturco, J. Phys. B: At. Mol. Opt. Phys. **24**, 3837 (1991)
Scattering of low-energy electrons from polyatomic targets: the water molecule example
[H_2O, rot, theory]

FNA with model-exchange and model-polarization potential; DCS at 2 and 6 eV, a fairly good agreement with experiment at 6 eV, but not at 2 eV

91Gia2
F. A. Gianturco, J. Phys. B: At. Mol. Opt. Phys. **24**, 4627 (1991)
Ab initio model calculations to treat electron scattering from polar polyatomic targets: H_2S and NH_3

[H_2S, NH_3, rot, theory]

FNA with model-exchange and model-polarization potential; NH_3, ICS at 0.1-20 eV; H_2S, DCS at 1-30 eV

91Jai1
A. Jain and D. G. Thompson, J. Phys. B: At. Mol. Opt. Phys. **24**, 1087 (1991)
Theoretical study of low-energy electron-SiH_4 collisions using exact-exchange plus parameter-free polarization potential
[SiH_4, rot, theory]

FNA with exact-exchange and model-polarization potential; DCS at 0.5-20 eV

91Jai2
A. Jain, Z. Phys. D **21**, 153 (1991)
Effect of gas temperature on the rotational excitation of spherical top molecules (CH_4 and SiH_4) by low-energy electrons
[CH_4, SiH_4, rot, theory]

FNA with exact-exchange and model-polarization potential; DCS and ICS at 0.5-20 eV

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A. Mengoni and T. Shirai, Phys. Rev. A **44**, 7258 (1991)
Algebraic-eikonal approach to the electron-molecule-collision process: Vibrational excitation and quadrupole interaction
[HF, HCl, vib, theory]
algebraic eikonal method; DCS at 20 eV

91Mor1
L. A. Morgan, J. Phys. B: At. Mol. Opt. Phys. **24**, 4649 (1991)
Low-energy electron scattering by CO
[CO, vib, theory]
the R-matrix method; ICS at 1-5 eV

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M. A. Morrison, M. Abdolsalami and B. K. Elza, Phys. Rev. A **43**, 3440 (1991)
Improved accuracy in adiabatic cross sections for low-energy rotational and vibrational excitation of molecules by electron impact
[H_2, rot, vib, theory]

the First Order Non-Adaibatic Theory (FONDA); rot: ICS at 0.05-10 eV, comparison with other calculations; vib: ICS at 0.5-10 eV, DCS at 0.7, 1.0 and 5 eV;

91Mor3
W. L. Morgan, Phys. Rev. A **44**, 1677 (1991)
Use of numerical optimization algorithms to obtain cross sections from electron swarm data
[CH_4, vib, experiment]

ICS at Th-2 eV, from swarm experiment

91Rob1
F. Robicheaux, Phys. Rev. A **43**, 5946 (1991)
Driving nuclei with resonant electrons: Ab initio study of $(e+H_2)\ ^2\Sigma_u^+$

[H_2, vib, theory]

FNA with the formulation of Greene and Jungen; ICS at 0.3-5 eV

91Sch1
O. Schafer and M. Allan, J. Phys. B: At. Mol. Opt. Phys. **24**, 3069 (1991)
Measurement of near-threshold vibrational excitation of HCl by electron impact
[HCl, vib, experiment]
relative DCS(a sum of 0° and 180° scattering) at 0.3-4.5 eV

91Sch2
B. Schmidt, J. Phys. B: At. Mol. Opt. Phys. **24**, 4809 (1991)
Anisotropic low energy electron collision cross sections for methane derived from transport coefficients
[CH_4, vib, experiment]

ICS at 0.16-3 eV, from swarm experiment

91Shy1
T. W. Shyn, J. Phys. B: At. Mol. Opt. Phys. **24**, 5169 (1991)
Vibrational excitation cross sections of methane by electron impact
[CH_4, vib, experiment]

ICS and DCS at 5-15 eV

92Boe1
L. Boesten, H. Tanaka, A. Kobayashi, M. A. Dillon and M. Kimura, J. Phys. B: At. Mol. Opt. Phys. **25**, 1607 (1992)
Crossed-beam experiment for the scattering of low energy electrons from CF_4

[CF_4, vib, experiment]

DCS at 2 eV

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Elastic electron scattering and rovibrational excitation of N_2 at low incident energies

[N_2, vib, experiment]

ICS at 1.5-5.0 eV, DCS at 2.1 and 3.0 eV

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L. Gan and T. E. Cravens, Planet. Space Sci. **40**, 1535 (1992)
Electron impact cross-sections and cooling rates for methane

[CH_4, vib, theory]

based on a review of cross section data, an empirical formula is given

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H. Gao, Phys. Rev. A **45**, 6895 (1992)

Vibrational excitation of H_2 by electron impact: An energy-dependent vibrational-frame-transformation approach

[H_2, vib, theory]

the multichannel quantum defect theory (MQDT); ICS at 1-5 eV

92Gul1

R. J. Gulley, M. J. Brunger and S. J. Buckman, J. Phys. B: At. Mol. Opt. Phys. **25**, 2433 (1992)

Resonant excitation of NH_3 by low energy electron impact: the $\nu_{1,3}$ normal vibrational modes

[NH_3, vib, experiment]

DCS at 5.75 and 15 eV; also DCS(90°) vs energy (5-10 eV)

92Man1

A. Mann and F. Linder, J. Phys. B: At. Mol. Opt. Phys. **25**, 545 (1992)

Low-energy electron scattering from halomethanes: II. Direct and resonant vibrational excitation in e-CF_4 scattering

[CF_4, vib, experiment]

DCS at 5.5 and 7.5 eV; DCS(20°, 50°, 90°) vs energy (0.5-12 eV)

92Man2

A. Mann and F. Linder, J. Phys. B: At. Mol. Opt. Phys. **25**, 1621 (1992)

Low-energy electron scattering from halomethanes: III. e-CF_3Cl

[CF_3Cl, vib, experiment]

DCS at 1.7, 5.5 and 8.2 eV

92Man3

A. Mann and F. Linder, J. Phys. B: At. Mol. Opt. Phys. **25**, 1633 (1992)

Low-energy electron scattering from halomethanes: IV. e-CF_2Cl_2

[CCl_2F_2, vib, experiment]

DCS (90°) vs energy (0.5-10 eV)

92Mid1

A. G. Middleton, M. J. Brunger and P. J. O. Teubner, J. Phys. B: At. Mol. Opt. Phys. **25**, 3541 (1992)

Vibrational excitation in isoelectronic molecules by electron impact: CO and N_2

[CO, N_2, vib, experiment]

For CO, DCS at 20-50 eV; for N2, DCS at 20, 30 and 50 eV

92Mot1

F. Motte-Tollet, M.-J. Hubin-Franskin and J. E. Collin, J. Chem. Phys. **97**, 7314 (1992)

Vibrational excitation of methylamine by electron impact in the 4.5-30 eV energy range

[CH_3NH_2, vib, experiment]

DCS at 15 and 30 eV

92Pfi1

K. Pfingst, H. T. Thummel and S. D. Peyerimhoff, J. Phys. B: At. Mol. Opt. Phys. **25**, 2107 (1992)

Near-threshold rotational excitation in electron scattering by the HCl molecule

[HCl, rot, theory]

the variational R-matrix calculation with the Born closure; DCS and ICS at 0.5-10 eV; DCS at 1 eV agrees fairly well with experiment

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H. T. Thummel, R. K. Nesbet and S. D. Peyerimhoff, J. Phys. B: At. Mol. Opt. Phys. **25**, 4553 (1992)

Near-threshold rotational excitation in electron-polar molecule scattering
[HF, rot, theory]
the variational R-matrix method; DCS at 0.63 and 3.0 eV, a fairly good agreement with experiment

93Dav1
J. A. Davies, W. M. Johnstone, N. J. Mason, P. Biggs and R. P. Wayne, J. Phys. B: At. Mol. Opt. Phys. **26**, L767 (1993)
Vibrational excitation of ozone by electron impact
[O_3, vib, experiment]
DCS at 6 eV

93Dil1
M. A. Dillon, L. Boesten, H. Tanaka, M. Kimura and H. Sato, J. Phys. B: At. Mol. Opt. Phys. **26**, 3147 (1993)
Elastic and vibrationally inelastic cross sections and energy loss spectra for electron collisions with GeH_4
[GeH_4, vib, theory, experiment]
DCS at 2 eV; DCS (40°, 60°, 90°, 120°) vs energy (1-4 eV)

93Gal1
G. A. Gallup, J. Phys. B: At. Mol. Opt. Phys. **26**, 759 (1993)
A lowest-order theory of vibrational excitation of polyatomic molecules upon resonant electron impact. Vibrational excitation in CH_3Cl
[CH_3Cl, vib, theory]
analysis of resonant excitation; DCS at 3.5 and 5.5 eV

93Gul1
R. J. Gulley, M. J. Brunger and S. J. Buckman, J. Phys. B: At. Mol. Opt. Phys. **26**, 2913 (1993)
The scattering of low energy electrons from hydrogen sulphide
[H_2S, vib, experiment]
DCS at 2 and 3 eV

93Joh1
W. M. Johnstone, N. J. Mason and W. R. Newell, J. Phys. B: At. Mol. Opt. Phys. **26**, L147 (1993)
Electron scattering from vibrationally excited carbon dioxide
[CO_2, vib, experiment]
ICS for $v=1 \rightarrow 2$, $1 \rightarrow 0$ at 4 eV

93Kan1
I. Kanik, S. Trajmar and J. C. Nickel, J. Geophys. Res. **98**, 7447 (1993)
Total electron scattering and electronic state excitations cross sections for O_2, CO, and CH_4
[CO, CH_4, vib, recommended]
recommended data

93Kha1
M. A. Khakoo, T. Jayaweera, S. Wang and S. Trajmar, J. Phys. B: At. Mol. Opt. Phys. **26**, 4845 (1993)
Differential electron scattering from acetylene - elastic scattering and vibrational excitation
[C_2H_2, vib, experiment]
DCS at 5 and 10 eV

93Mor1
M. A. Morrison and W. K. Trail, Phys. Rev. A **48**, 2874 (1993)
The importance of bound-free correlation effects for vibrational excitation of molecules by electron impact: a sensitivity analysis
[H_2, vib, theory]
test of model-polarization potential; ICS at 0.5-6 eV

93Res1
T. N. Rescigno, B. K. Elza and B. H. Lengsfield, J. Phys. B: At. Mol. Opt. Phys. **26**, L567 (1993)
An ab initio treatment of near-threshold vibrational excitation of H_2 by electron impact: new perspectives on discrepancies between crossed-beam and swarm data
[H_2, vib, theory]
consideration of non-adiabatic effect; ICS at 0.5-7.0 eV, DCS at 1, 2.5 and 5 eV

93Shy1
T. W. Shyn and C. J. Sweeney, Phys. Rev. A **48**, 1214 (1993)
Vibrational-excitation cross sections of molecular oxygen by electron impact
[O_2, vib, experiment]
ICS and DCS at 5-15 eV

94Abo1
R. Abouaf, J. Pommier, S. Cvejanovic and B. Saubamea, Chem. Phys. **188**, 339 (1994)
Low energy electron collisions on OCS; differential vibrational cross sections and S^- production around 1 eV
[OCS, vib, experiment]
DCS(relative) at 0.6 and 1.2 eV

94Boe1
L. Boesten, M. A. Dillon, H. Tanaka, M. Kimura and H. Sato, J. Phys. B: At. Mol. Opt. Phys. **27**, 1845 (1994)
Elastic and vibrational excitation cross sections for electron collision with propane
[C_3H_8, vib, experiment]
DCS at 7.5 eV; also excitation function at 2-15 eV

94Bon1
R. A. Bonham, Jpn. J. Appl. Phys. **33**, 4157 (1994)
Electron impact cross section data for carbon tetrafluoride
[CF_4, vib, recommended]
recommended data at 0.08-100 eV

94Dil1
M. A. Dillon, L. Boesten, H. Tanaka, M. Kimura and H. Sato, J. Phys. B: At. Mol. Opt. Phys. **27**, 1209 (1994)
Elastic scattering and some vibrational excitation cross sections for electron collisions with Si_2H_6
[Si_2H_6, vib, experiment]
DCS at 2 eV

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R. Greer and D. Thompson, J. Phys. B: At. Mol. Opt. Phys. **27**, 3533 (1994)
The scattering of low energy electrons by H_2O and H_2S
[H_2O, rot, theory]
FNA with exact-exchange and model-polarization potential; DCS at 6 eV, good agreement with experiment

94Kaz1
A. K. Kazansky and L. Y. Sergeeva, J. Phys. B: At. Mol. Opt. Phys. **27**, 3217 (1994)
On the local theory of resonant inelastic collisions of slow electrons with carbon dioxide
[CO_2, vib, theory]
the boomerang model for resonance; ICS at1.5-5.5 eV

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W. Liu and G. A. Victor, Astrophys. J. **435**, 909 (1994)
Electron energy deposition in carbon monoxide gas
[CO, vib, recommended]
recommended data at 0.4-4 eV

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S. L. Lunt, J. Randell, J. P. Ziesel, G. Mrotzek and D. Field, J. Phys. B: At. Mol. Opt. Phys. **27**, 1407 (1994)
Low-energy electron scattering from CH_4, C_2H_4 and C_2H_6

[CH_4, C_2H_4, C_2H_6, vib, experiment]

excitation function

94Map1

B. Mapstone and W. R. Newell, J. Phys. B: At. Mol. Opt. Phys. **27**, 5761 (1994)
Vibrational excitation of methane by electron impact
[CH_4, vib, experiment]

DCS at 3.2-15.4 eV

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B. Schmidt, K. Berkhan, B. Gotz and M. Muller, Phys. Scr. **T53**, 30 (1994)
New experimental techniques in the study of electron swarms in gases and their impact on the determination of low energy electron scattering cross sections
[H_2, vib, experiment]

ICS at 0.5-2.3 eV, from swarm experiment

94Tak1

T. Takagi, L. Boesten, H. Tanaka and M. A. Dillon, J. Phys. B: At. Mol. Opt. Phys. **27**, 5389 (1994)
Elastic scattering and vibrational excitation cross sections for electron collisions with C_2F_6

[C_2F_6, vib, experiment]

DCS at 5 eV; also excitation function vs energy (1-16 eV)

94Wea1

C. A. Weatherford and A. Temkin, Phys. Rev. A **49**, 2580 (1994)
Completion of a hybrid-theory calculation of the Π_g resonance in electron-N_2 scattering

[N_2, vib, theory]

vibrational CC; DCS at 1.5, 2.05 and 3 eV, good agreement with experiment

95All1

M. Allan, J. Phys. B: At. Mol. Opt. Phys. **28**, 5163 (1995)
Measurement of absolute differential cross sections for vibrational excitation of O_2 by electron impact

[O_2, vib, experiment]

energy-integrated ICS for the resonant excitation

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S. C. Althorpe, F. A. Gianturco and N. Sanna, J. Phys. B: At. Mol. Opt. Phys. **28**, 4165 (1995)
Calculation of integral cross sections for vibrationally inelastic electron-methane scattering
[CH_4, vib, theory]

FNA with non-adiabatic correction; ICS at Th-12 eV

95Gia1

F. A. Gianturco, J. A. Rodrigues-Ruiz and N. Sanna, J. Phys. B: At. Mol. Opt. Phys. **28**, 1287 (1995)
The Ramsauer minimum of methane
[CH_4, rot, theory]

FNA with exact-exchange interaction and dynamical correlation using the density functional theory; DCS at 0.2, 1.5 and 5.0 eV

95Gia2

F. A. Gianturco, J. A. Rodriguez-Ruiz and N. Sanna, Phys. Rev. A **52**, 1257 (1995)
Elastic scattering of electrons by methane molecules
[CH_4, rot, theory]

the same as 95Gia1, but at 10 and 50 eV

95Got1

M. Gote and H. Ehrhardt, J. Phys. B: At. Mol. Opt. Phys. **28**, 3957 (1995)
Rotational excitation of diatomic molecules at intermediate energies: absolute differential state-to -state transition cross sections for electron scattering from N_2, Cl_2, CO and HCl

[N_2, CO, Cl_2, HCl, rot, experiment]

DCS at 2-200 eV

95Hig1

K. Higgins, C. J. Gillan, P. G. Burke and C. J. Noble, J. Phys. B: At. Mol. Opt. Phys. **28**, 3391 (1995)
Low-energy electron scattering by oxygen molecules: II. Vibrational excitation
[O_2, vib, theory]

the R-matrix method; resonance cross section below 1 eV

95Joh1

W. M. Johnstone, P. Akther and W. R. Newell, J. Phys. B: At. Mol. Opt. Phys. **28**, 743 (1995)
Resonant vibrational excitation of carbon dioxide
[CO_2, vib, experiment]

DCS (20°) vs energy (1-7 eV)

95Kut1

H. Kutz and H.-D. Meyer, Phys. Rev. A **51**, 3819 (1995)
Rotational excitation of N_2 and Cl_2 molecules by electron impact in the energy range 0.01-1000 eV: Investigation of excitation mechanisms
[N_2, Cl_2, rot, theory]

FNA with model-exchange and model-polarization potential; ICS at 0.001-1000 eV; rotational rainbow effects discussed

95Moj1

B. Mojarrabi, R. J. Gulley, A. G. Middleton, D. C. Cartwright, P. J. O. Teubner, S. J. Buckman and M. J. Brunger, J. Phys. B: At. Mol. Opt. Phys. **28**, 487 (1995)
Electron collisions with NO: elastic scattering and rovibrational (0→1,2,3,4) excitaiton cross sections
[NO, vib, experiment]
ICS and DCS at 7.5-40 eV

95Nak1

Y. Nakamura, Aust. J. Phys. **48**, 357 (1995)
Drift velocity and longitudinal diffusion coefficient of electrons in CO_2-Ar mixtures and electron collision cross sections for CO_2 molecules

[CO_2, vib, experiment]

ICS at Th-100 eV, from swarm experiment

95Nis1

T. Nishimura and Y. Itikawa, J. Phys. B: At. Mol. Opt. Phys. **28**, 1995 (1995)
Electron-impact vibrational excitation of water molecules
[H_2O, vib, theory]

FNA with model-exchange and model-polarization potential; ICS and DCS at 6-50 eV, a fairly good agreement with experiment

95Sun1

W. Sun, M. A. Morrison, W. A. Isaacs, W. K. Trail, D. T. Alle, R. J. Gulley, M. J. Brennan and S. J. Buckman, Phys. Rev. A **52**, 1229 (1995)
Detailed theoretical and experimental analysis of low-energy electron-N_2 scattering

[N_2, vib, experiment, theory]

detailed comparison between theory and experiment; theory, FNO with vibrational CC, DCS at 0.55-10 eV;

experiment, DCS at resonant peaks

96Boe1
L. Boesten, Y. Tachibana, Y. Nakano, T. Shinohara, H. Tanaka and M. A. Dillon, J. Phys. B: At. Mol. Opt. Phys. **29**, 5475 (1996)
Vibrationally inelastic and elastic cross sections for e+NF_3 collisions
[NF_3, vib, experiment]
DCS at 3 eV, also excitation function vs energy (1.5-9 eV)

96Bor1
M. C. Bordage, P. Segur and A. Chouki, J. Appl. Phys. **80**, 1325 (1996)
Determination of a set of electron impact cross sections in tetrafluoromethane consistent with experimental determination of swarm parameters
[CF_4, vib, experiment]
ICS at Th-100 eV, from swarm experiment

96Chr1
L. G. Christophorou, J. K. Olthoff and M. V. V. S. Rao, J. Phys. Chem. Ref. Data **25**, 1341 (1996)
Electron interactions with CF_4
[CF_4, vib, recommended]
recommended data

96Dan1
G. Danby, B. K. Elza, M. A. Morrison and W. K. Trail, J. Phys. B: At. Mol. Opt. Phys. **29**, 2265 (1996)
The separable representation of exchange in electron-molecule scattering: I. Elastic scattering and rotational excitation
[H_2, rot, theory]
test of separable exchange model; ICS, 0.05-10 eV, DCS

96Gib1
J. C. Gibson, L. A. Morgan, R. J. Gulley, M. J. Brunger, C. T. Bundschu and S. J. Buckman, J. Phys. B: At. Mol. Opt. Phys. **29**, 3197 (1996)
Low energy electron scattering from CO: absolute cross section measurements and R-matrix calculations
[CO, vib, theory, experiment]
experiment: ICS and DCS at 1-30 eV, also DCS (20°, 60°) vs energy for resonant excitation; theory: the R-matrix method, DCS at 1-3 eV

96Gri1
T. Grimm-Bosbach, H. T. Thummel, R. K. Nesbet and S. D. Peyerimhoff, J. Phys. B: At. Mol. Opt. Phys. **29**, L105 (1996)
Calculation of cross sections for rovibrational excitation of N_2 by electron impact
[N_2, vib, theory]
the R-matrix method with non-adiabatic correction; ICS at 1.5-3.5 eV

96Hor1
J. Horacek and W. Domcke, Phys. Rev. A **53**, 2262 (1996)
Calculation of cross sections for vibrational excitation and dissociative attachment in electron collisions with HBr and DBr
[HBr, vib, theory]
the non-local resonance model; ICS at Th-5 eV

96Kaz1
A. K. Kazanskii, Opt. Spectrosc. **80**, 798 (1996)
Calculation of the vibrational excitation cross sections for H_2, HD, and D_2 molecules in collisions with slow electrons within the framework of nonstationary nonlocal theory
[H_2, vib, theory]

a model of resonace excitation; ICS at Th-7 eV

96Nag1
R. Nagpal, A. Garscadden and J. D. Clark, App. Phys. Lett. **68**, 2189 (1996)
Electron impact vibrational excitation cross sections of SiF_4

[SiF_4, vib, experiment]

ICS at Th-10 eV, from swarm experiment

96Nis1
T. Nishimura and Y. Itikawa, J. Phys. B: At. Mol. Opt. Phys. **29**, 4213 (1996)
Vibrationally elastic and inelastic scattering of electrons by hydrogen sulphide molecules
[H_2S, vib, theory]

FNO with vibrational CC with model-exchange and model-polarization potential; ICS and DCS at 6-50 eV

96Nob1
C. J. Noble, K. Higgins, G. Woste, P. Duddy, P. G. Burke, P. J. O. Teubner, A. G. Middleton and M. J. Brunger, Phys. Rev. Lett. **76**, 3534 (1996)
Resonant mechanisms in the vibrational excitation of ground state O_2

[O_2, vib, theory, experiment]

ICS at 4-15 eV; measured values compared with the R-matrix method calculation

96Ran1
J. Randell, R. J. Gulley, S. L. Lunt, J.-P. Ziesel and D. Field, J. Phys. B: At. Mol. Opt. Phys. **29**, 2049 (1996)
Very low energy electron scattering in CO
[CO, rot, experiment]
ICS estimated with the experimental data on the backward cross sections and the Born approximation; 0.001-0.2 eV

96Shi1
X. Shi, V. K. Chan, G. A. Gallup and P. D. Burrow, J. Chem. Phys. **104**, 1855 (1996)
Low energy electron scattering from CH_3Cl

[CH_3Cl, vib, experiment]

DCS at 3.2 and 5.5 eV, also DCS (100°) vs energy (1.5-8 eV)

96Vic1
M. Vicic, G. Poparic and D. S. Belic, J. Phys. B: At. Mol. Opt. Phys. **29**, 1273 (1996)
Large vibrational excitation of N_2 by low-energy electrons

[N_2, vib, experiment]

ICS for $v=0 \rightarrow 8,9$ at 2-4.5 eV

96You1
M. Yousfi and M. D. Benabdessadok, J. Appl. Phys. **80**, 6619 (1996)
Boltzmann equation analysis of electron-molecule collision cross sections in water vapor and ammonia
[H_2O, NH_3, vib, experiment]

ICS at Th-100 eV, from swarm experiment

97Alv1
H. Alvarez-Pol, I. Duran and R. Lorenzo, J. Phys. B: At. Mol. Opt. Phys. **30**, 2455 (1997)
On the cross section of low-energy electron collisions on CH_4 and CO_2

[CO_2, CH_4, vib, experiment]

ICS at Th-10 eV, from swarm experiment

97Bun1
C. T. Bundschu, J. C. Gibson, R. J. Gulley, M. J. Brunger, S. J. Buckman, N. Sanna and F. A. Gianturco, J. Phys. B: At. Mol. Opt. Phys. **30**, 2239 (1997)
Low-energy electron scattering from methane

[CH_4, vib, theory, experiment]

ICS and DCS at 2-5.4 eV

97Chr1

L. G. Christophorou, J. K. Olthoff and Y. Wang, J. Phys. Chem. Ref. Data **26**, 1205 (1997)
Electron interactions with CCl_2F_2

[CCl_2F_2, vib, recommended]

recommended data

97Gia1

F. A. Gianturco, P. Paioletti and N. Sanna, J. Phys. B: At. Mol. Opt. Phys. **30**, 4535 (1997)
Electron scattering from SO_2 molecules: elastic processes and rotational excitations

[SO_2, rot, theory]

FNA with exact-exchange and model-polarization potential; DCS at 1 and 30 eV; ICS at 1-30 eV

97Gia2

F. A. Gianturco and T. Stoecklin, Phys. Rev. A **55**, 1937 (1997)
Calculation of rotationally inelastic processes in electron collisions with CO_2 molecules

[CO_2, rot, theory]

FNA with separable-exchange and model-polarization potential; DCS and ICS at 2-10 eV

97Maj1

T. Majeed and D. J. Strickland, J. Phys. Chem. Ref. Data **26**, 335 (1997)
New survey of electron impact cross sections for photoelectron and auroral electron energy loss calculations
[N_2, O_2, vib, recommended]

recommended data; for N_2, ICS at 1.3-6 eV; for O_2, ICS at 1-30 eV

97Mor1

M. A. Morrison, W. Sun, A. Isaacs and W. K. Trail, Phys. Rev. A **55**, 2786 (1997)
Ultrasimple calculation of very-low-energy momentum-transfer and rotational-excitaion cross sections: e-N_2 scattering
[N_2, rot, theory]

the modified effective range theory to provide cross section very near threshold

97Mot1

F. Motte-Tollet, J. Heinesch, J. M. Gingell and N. J. Mason, J. Chem. Phys. **106**, 5990 (1997)
Vibrational excitation of methane by 15 and 30 eV intermediate-energy electron impact
[CH_4, vib, experiment]

DCS at 15 and 30 eV

97Rob1

A. G. Robertson, M. T. Elford, R. W. Crompton, M. A. Morrison, W. Sun and W. K. Trail, Aust. J. Phys. **50**, 441 (1997)
Rotational and vibrational excitation of nitrogen by electron impact
[N_2, vib, theory]

FNO with vibrational CC; ICS at 0.29-10 eV

97Shi1

Y. Shishikura, K. Asano and Y. Nakamura, J. Phys. D: Appl. Phys. **30**, 1610 (1997)
Low-energy electron collision cross sections of ethane by electron swarm study
[C_2H_6, vib, experiment]

ICS at 0.1-100 eV, from swarm experiment

97Swe1

C. J. Sweeney and T. W. Shyn, Phys. Rev. A **56**, 1384 (1997)
Measurement of absolute differential cross sections for the vibrational excitation of molecular nitrogen by electron impact in the $^2\Pi_g$ shape resonance region

[N_2, vib, experiment]

ICS and DCS at 1.9-2.6 eV (resonance region)

97Var1
M. T. d. N. Varella, M. H. F. Bettega and M. A. P. Lima, Z. Phys. D **39**, 59 (1997)
Cross sections for rotational excitations of CH_4, SiH_4, GeH_4, SnH_4 and PbH_4 by electron impact

[CH_4, SiH_4, GeH_4, SnH_4, PbH_4, rot, theory]

FNA with the Schwinger multichannel variational method with pseudopotential (SMCPP); no polarization considered; DCS and ICS at 7.5-30 eV; DCS for CH_4 agrees fairly well with experiment, except in the forward direction

98Bru1
M. J. Brunger, A. G. Middleton and P. J. O. Teubner, Phys. Rev. A **57**, 208 (1998)
Differential cross sections for rovibrational ($v'=0\rightarrow1,2,3,4$) excitation of the electronic ground state of O_2 by electron impact

[O_2, vib, experiment]

DCS at 5-20 eV

98Gia1
F. A. Gianturco, S. Meloni, P. Paioletti, R. R. Lucchese and N. Sanna, J. Chem. Phys. **108**, 4002 (1998)
Low-energy electron scattering from the water molecule: Angular distributions and rotational excitation
[H_2O, rot, theory]

FNA with exact-exchange and model-polarization potential; ICS at 2-50 eV; DCS at 2, 6, 30 and 50 eV

98Gia2
F. A. Gianturco, P. Paioletti and N. Sanna, Phys. Rev. A **58**, 4484 (1998)
Angular distributions and rotational excitations for electron scattering from ozone molecules
[O_3, rot, theory]

FNA with exact-exchange and model-polarization potential; ICS at 3-20 eV

98Kim1
M. Kimura, M. Takekawa, Y. Itikawa, H. Takaki and O. Sueoka, Phys. Rev. Lett. **80**, 3936 (1998)
Mode dependence in vibrational excitation of CO_2 molecule by electron and positron impacts

[CO_2, vib, theoey, experiment]

ICS at 2-8 eV, theory compared to experiment

98Tak1
M. Takekawa and Y. Itikawa, J. Phys. B: At. Mol. Opt. Phys. **31**, 3245 (1998)
Vibrational excitation of carbon dioxide by electron impact: symmetric and antisymmetric stretching modes
[CO_2, vib, theory]

FNO with vibrational CC; ICS and DCS at 4-50 eV

99Bor1
M.-C. Bordage, P. Segur, L. G. Christophorou and J. K. Olthoff, J. Appl. Phys. **86**, 3558 (1999)
Boltzmann analysis of electron swarm parameters in CF_4 using independently assessed electron-collision cross sections

[CF_4, vib, experiment]

ICS at Th-100 eV, from swarm experiment

99Chr1
L. G. Christophrou and J. K. Olthoff, J. Phys. Chem. Ref. Data **28**, 131 (1999)

Electron interactions with Cl_2
[Cl_2, vib, recommended]

99Dal1
A. Dalgarno, M. Yan and W. Liu, Astrophys. J. Supp. **125**, 237 (1999)
Electron energy deposition in a gas mixture of atomic and molecular hydrogen and helium
[H_2, vib, selected]
selected data

99Joh1
W. M. Johnstone, M. J. Brunger and W. R. Newell, J. Phys. B: At. Mol. Opt. Phys. **32**, 5779 (1999)
Differential electron scattering from the (010) excited vibrational mode of CO_2
[CO_2, vib, experiment]
excitation from the excited state; DCS at 3.8 eV

99Maz1
S. Mazevet, M. A. Morrison, O. Boydstun and R. K. Nesbet, Phys. Rev. A **59**, 477 (1999)
Inclusion of nonadiabiatic effects in calculations on vibrational excitation of molecular hydrogen by low-energy electron impact
[H_2, vib, theory]
correction of non-adiabatic effect; ICS and DCS at 0.6-8 eV

99Maz2
S. Mazevet, M. A. Morrison, O. Boydstun and R. K. Nesbet, J. Phys. B: At. Mol. Opt. Phys. **32**, 1269 (1999)
Adiabatic treatments of vibrational dynamics in low-energy electron-molecule scattering
[H_2, vib, theory]
the energy-modified adiabatic phase matrix method; ICS and DCS at 0.5-10 eV

99Nat1
A. P. P. Natalense, M. T. d. N. Varella, M. H. F. Bettega, L. G. Ferreira and M. A. P. Lima, J. Phys. B: At. Mol. Opt. Phys. **32**, 5523 (1999)
Elastic and rotationally inelastic cross sections for low-energy electron scattering by SO_2 molecules
[SO_2, rot, theory]
FNA and the Schwinger multichannel variational method with pseudopotential (SMCPP); no polarization taken considered; DCS and ICS at 5-30 eV; some disagreement with 97Gia1

99Shi1
M. Shimoi and Y. Itikawa, J. Phys. B: At. Mol. Opt. Phys. **32**, 65 (1999)
Electron collisions with HCl: elastic scattering and rotational excitation
[HCl, rot, theory]
FNA with model-exchange and model-polarization potential; DCS at 5-30 eV, a fairly good agreement with experiment; ICS at 5-50 eV

99Tak1
M. Takekawa and Y. Itikawa, J. Phys. B: At. Mol. Opt. Phys. **32**, 4209 (1999)
Theoretical study of electron scattering from carbon dioxide: excitation of bending vibration
[CO_2, vib, theory]
FNO with vibrational CC; ICS and DCS at 2-50 eV

99Tan1
H. Tanaka, Y. Tachibana, M. Kitajima, O. Sueoka, H. Takaki, A. Hamada and M. Kimura, Phys. Rev. A **59**, 2006 (1999)
Total cross sections of electron and positron collisions with C_3F_8 and C_3H_8 molecules and differential elastic and vibrational excitation cross sections by electron impact on these molecules
[C_3F_8, C_3H_8, vib, theory, experiment]

DCS at 3, 6.5 and 9 eV

99Var1
M. T. d. N. Varella, A. P. P. Natalense, M. H. F. Bettega and M. A. P. Lima, Phys. Rev. A **60**, 3684 (1999)
Low-energy electron scattering by CF_4, CCl_4, $SiCl_4$, $SiBr_4$, and SiI_4

[CF_4, CCl_4, $SiCl_4$, $SiBr_4$, SiI_4, rot, theory]

FNA and the Schwinger multichannel variational method with pseudopotential (SMCPP); DCS and ICS at 7.5-30 eV

99Var2
M. T. d. N. Varella, M. H. F. Bettega, A. J. R. da Silva and M. A. P. Lima, J. Chem. Phys. **110**, 2452 (1999)
Cross sections for rotational excitations of NH_3, PH_3, AsH_3, and SbH_3 by electron impact

[NH_3, PH_3, AsH_3, SbH_3, rot, theory]

FNA and the Schwinger multichannel variational method with pseudopotential (SMCPP); DCS and ICS at 7.5-30 eV; for NH_3, not much difference from 91Gia2

00Chr1
L. G. Christophorou and J. K. Olthoff, J. Phys. Chem. Ref. Data **29**, 267 (2000)
Electron interactions with SF_6

[SF_6, vib, recommended]

recommended data

00Elz1
A. El-Zein, M. J. Brunger and W. R. Newell, Chem. Phys. Lett. **319**, 701 (2000)
Resonance phenomena in electron impact excitation of the fundamental vibrational modes of water
[H_2O, vib, experiment]

DCS at 7.5 eV

00Elz2
A. A. A. El-Zein, M. J. Brunger and W. R. Newell, J. Phys. B: At. Mol. Opt. Phys. **33**, 5033 (2000)
Excitation of vibrational quanta in water by electron impact
[H_2O, vib, experiment]

ICS and DCS at 6-20 eV

00Kaw1
M. K. Kawada, O. Sueoka and M. Kimura, J. Chem. Phys. **112**, 7057 (2000)
Vibrational excitation of carbon oxysulfide molecules by positron and electron impacts
[OCS, vib, experiment, theory]
ICS at 1-8 eV; experimental data compared with the continuum multiple-scattering (CMS) calculation

00Kit1
M. Kitajima, Y. Sakamoto, R. J. Gulley, M. Hoshino, J. C. Gibson, H. Tanaka and S. J. Buckman, J. Phys. B: At. Mol. Opt. Phys. **33**, 1687 (2000)
Electron scattering from N_2O: absolute elastic scattering and vibrational excitation

[N_2O, vib, experiment]

ICS and DCS at 2.4 and 8.0 eV

00Kit2
M. Kitajima, S. Watanabe, H. Tanaka, M. Takekawa, M. Kimura and Y. Itikawa, Phys. Rev. A **61**, 060701 (2000)
Strong mode dependence of the 3.8-eV resonance in CO_2 vibrational excitation by electron impact

[CO_2, vib, theory, experiment]

ICS and DCS at 2-6 eV; experimental data compared with theory

00Map1
B. Mapstone, M. J. Brunger and W. R. Newell, J. Phys. B: At. Mol. Opt. Phys. **33**, 23 (2000)
Vibrational excitation of ethane and ethene by electron impact

[C_2H_4, C_2H_6, vib, experiment]
DCS at 3.2-15.4 eV

00Ser1
A.-C. Sergenton and M. Allan, Chem. Phys. Lett. **319**, 179 (2000)
Excitation of vibrational levels of HI up to v=8 by electron impact
[HI, vib, experiment]
ICS (relative) at Th-3 eV

00Ser2
A.-C. Sergenton, L. Jungo and M. Allan, Phys. Rev. A **61**, 062702 (2000)
Excitation of vibrational levels of HF up to v=4 by electron impact
[HF, vib, experiment]
ICS (relative) near Th

00Zub1
M. Zubek, B. Mielewska and G. C. King, J. Phys. B: At. Mol. Opt. Phys. **33**, L527 (2000)
Absolute differential cross sections for electron elastic scattering and vibrational excitation in nitrogen in the angular range from 120° to 180°
[N_2, vib, experiment]
DCS at 5 eV

Table II. Index for rotational excitation

AsH_3	99Var2 (T)
CCl_4	99Var1(T)
CF_4	99Var1(T)
CH_4	83Abu1(T)
CH_4	83Jai3(T)
CH_4	85Mul1(E)
CH_4	87Gia1(T)
CH_4	88Gia1(T)
CH_4	89Bre1(T)
CH_4	90McN1(T)
CH_4	91Jai2(T)
CH_4	95Gia1(T)
CH_4	95Gia2(T)
CH_4	97Var1(T)
C_2H_2	81Thi1(T)
CO	80Ond3(T)
CO	81Sah1(T)
CO	82Jun1(E)
CO	82Nor1(T)
CO	95Got1(E)
CO	96Ran1(E)
CO_2	81Thi2(T)
CO_2	97Gia2(T)
Cl_2	95Got1(E)
Cl_2	95Kut1(T)
GeH_4	97Var1(T)
HCN	81Sah1(T)
HCN	85Jai1(T)
HCl	82Nor1(T)
HCl	83Pad1(T)
HCl	89Rad1(E)
HCl	92Pfi1(T)
HCl	95Got1(E)
HCl	99Shi1(T)
HF	83Fab1(T)
HF	89Rad1(E)
HF	92Thu1(T)
H_2	82Fel1(T)
H_2	83Var1(T)
H_2	84Fel1(T)

H_2	84Mor1(T)
H_2	84Sta1(T)
H_2	84Sur1(T)
H_2	84Var1(T)
H_2	85Jer1(T)
H_2	86Mor2(T)
H_2	86Mor3(T)
H_2	87Jun1(E)
H_2	87Mor1(T)
H_2	88Eng1(E)
H_2	90Tra1(T)
H_2	91Mor2(T)
H_2	96Dan1(T)
H_2O	82Jun1(E)
H_2O	83Jai3(T)
H_2O	91Gia1(T)
H_2O	94Gre1(T)
H_2O	98Gia1(T)
H_2S	84Jai1(T)
H_2S	91Gia2(T)
LiF	81Sie1(T)
LiF	83Fab1(T)
NH_3	83Jai2(T)
NH_3	91Gia2(T)
NH_3	99Var2(T)
N_2	80Ond1(T)
N_2	80Ond2(T)
N_2	82Bha1(T)
N_2	82Jun1(E)
N_2	85Ond1(T)
N_2	95Got1(E)
N_2	95Kut1(T)
N_2	97Mor1(T)
O_2	83Bha1(T)
O_3	98Gia2(T)
PH_3	99Var2(T)
PbH_4	97Var1(T)
SO_2	97Gia1(T)
SO_2	99Nat1(T)

SbH_3	99Var2(T)
$SiBr_4$	99Var1(T)
$SiCl_4$	99Var1(T)
SiH_4	91Jai1(T)
SiH_4	91Jai2(T)
SiH_4	97Var1(T)
SiI_4	99Var1(T)
SnH_4	97Var1(T)

Table III. Index for vibrational excitation

CCl_2F_2	85Nov1(E)
CCl_2F_2	92Man3(E)
CCl_2F_2	97Chr1(R)
CF_3Cl	92Man2(E)
CF_4	88Cur1(E)
CF_4	88Ste1(E)
CF_4	92Boe1(E)
CF_4	92Man1(E)
CF_4	94Bon1(R)
CF_4	96Bor1(E)
CF_4	96Chr1(R)
CF_4	99Bor1(E)
C_2F_6	90Pir1(E)
C_2F_6	94Tak1(E)
C_3F_8	90Pir1(E)
C_3F_8	99Tan1(E,T)
CH_3Cl	93Gal1(T)
CH_3Cl	96Shi1(E)
CH_3NH_2	92Mot1(E)
CH_4	80Roh1(E)
CH_4	83Soh1(E)
CH_4	83Tan1(E)
CH_4	85Cur1(E)
CH_4	85Had1(E)
CH_4	85Mul1(E)
CH_4	86Ohm1(E)
CH_4	89Dav1(E)
CH_4	91Mor3(E)
CH_4	91Sch2(E)
CH_4	91Shy1(E)
CH_4	92Gan1(T)
CH_4	93Kan1(R)
CH_4	94Lun1(E)
CH_4	94Map1(E)
CH_4	95Alt1(T)
CH_4	97Alv1(E)
CH_4	97Bun1(E,T)
CH_4	97Mot1(E)

C_2H_2	85Koc1(E)
C_2H_2	90Gal1(T)
C_2H_2	93Kha1(E)
C_2H_4	94Lun1(E)
C_2H_4	00Map1(E)
C_2H_6	85Cur1(E)
C_2H_6	90Boe1(E)
C_2H_6	94Lun1(E)
C_2H_6	97Shi1(E)
C_2H_6	00Map1(E)
C_3H_8	94Boe1(E)
C_3H_8	99Tan1(E,T)
CO	80Chu1(E)
CO	82Jun1(E)
CO	83Had1(E)
CO	85Soh1(E)
CO	90Gal2(T)
CO	91Mor1(T)
CO	92Mid1(E)
CO	93Kan1(R)
CO	94Liu1(R)
CO	96Gib1(E,T)
CO_2	80Reg1(E)
CO_2	80Thi1(T)
CO_2	81Thi2(T)
CO_2	81Thi3(T)
CO_2	82Whi1(T)
CO_2	85Est1(T)
CO_2	85Koc2(E)
CO_2	86Ant1(E)
CO_2	90Gal2(T)
CO_2	93Joh1(E)
CO_2	94Kaz1(T)
CO_2	95Joh1(E)
CO_2	95Nak1(E)
CO_2	97Alv1(E)
CO_2	98Kim1(E,T)
CO_2	98Tak1(T)
CO_2	99Joh1(E)
CO_2	99Tak1(T)
CO_2	00Kit2(E,T)
CS_2	87Soh1(E)

Cl_2	99Chr1(R)
F_2	86Fuj1(E)
GeH_4	93Dil1(E,T)
HBr	96Hor1(T)
HCl	84Pad1(T)
HCl	87Kno1(E)
HCl	89Kno1(E)
HCl	89Kno2(E)
HCl	89Rad1(E)
HCl	90Mor1(T)
HCl	91Men1(T)
HCl	91Sch1(E)
HF	82Res1(T)
HF	88Mor1(T)
HF	89Kno1(E)
HF	89Kno2(E)
HF	89Rad1(E)
HF	90Sni1(T)
HF	91Men1(T)
HF	00Ser2(E)
HI	00Ser1(E)
H_2	84Hal1(E)
H_2	84Mor2(T)
H_2	85All1(E)
H_2	85Buc1(E)
H_2	85Jer1(T)
H_2	85Lee1(T)
H_2	85Mun1(T)
H_2	85Nis1(E)
H_2	86Mor3(T)
H_2	87Abd1(T)
H_2	87Mor1(E,T)
H_2	88Eng1(E)
H_2	90Bru1(E)
H_2	90Buc1(E,T)
H_2	91Bru1(E)
H_2	91Mor2(T)
H_2	91Rob1(T)
H_2	92Gao1(T)
H_2	93Mor1(T)
H_2	93Res1(T)
H_2	94Sch1(E)
H_2	96Kaz1(T)
H_2	99Dal1(R)

H_2 99Maz1(T)

H_2 99Maz2(T)

H_2 00Zub1(E)

H_2CO 90Sch1(T)

H_2O 82Jun1(E)

H_2O 83Jai1(T)

H_2O 88Shy1(E)

H_2O 91Fur1(E)

H_2O 95Nis1(T)

H_2O 96You1(E)

H_2O 00Elz1(E)

H_2O 00Elz2(E)

H_2S, 84Jai1(T)

H_2S 93Gul1(E)

H_2S 96Nis1(T)

NF_3 96Boe1(E)

NH_3 90Fur1(E)

NH_3 92Gul1(E)

NH_3 96You1(E)

NO 95Moj1(E)

N_2 80Ond2(T)

N_2 81Tan1(E)

N_2 82Jun1(E)

N_2 83Bur1(T)

N_2 83Ond1(T)

N_2 83Rum1(T)

N_2 85All2(E)

N_2 86Huo1(T)

N_2 86Lee1(T)

N_2 86Mor1(T)

N_2 86Soh1(E)

N_2 87Gil1(T)

N_2 87Huo1(T)

N_2 88Mal1(T)

N_2 88Red1(E)

N_2 89Bru1(E)

N_2 92Bre1(E)

N_2 92Mid1(E)

N_2 94Wea1(T)

N_2 95Sun1(E,T)

N_2 96Gri1(T)

N_2	96Vic1(E)	Si_2H_6	94Dil1(E)
N_2	97Maj1(R)		
N_2	97Rob1(T)		
N_2	97Swe1(E)		
N_2O	00Kit1(E)		
OCS	87Soh1(E)		
OCS	94Abo1(E)		
OCS	00Kaw1(E,T)		
O_2	93Shy1(E)		
O_2	95All1(E)		
O_2	95Hig1(T)		
O_2	96Nob1(E,T)		
O_2	97Maj1(R)		
O_2	98Bru1(E)		
O_3	93Dav1(E)		
SF_6	00Chr1(R)		
SiF_4	96Nag1(E)		
SiH_4	89Kur1(E)		
SiH_4	90Tan1(E)		

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