JILA INFORMATION CENTER REPORT

No. 26

ANISOTROPIC SCATTERING OF ELECTRONS BY N_2 AND ITS EFFECTS ON ELECTRON TRANSPORT: TABULATIONS OF CROSS SECTION AND RESULTS

by

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May 1, 1985

Anisotropic scattering of electrons by N_2 and its effects on electron transport: Tabulations of cross section and results.

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This report is intended to supplement the paper "Anisotropic scattering of electrons by N_2 and its effects on electron transport" by A. V. Phelps and L. C. Pitchford which has been accepted by the Physical Review (Ref. 1). In this report we assume that the reader is familiar with Ref. 1.

Two sets of cross sections for low to moderate energy (0-1000 eV) electron which undergo elastic and inelastic scattering by ground state nitrogen molecules are tabulated here in a form suitable for application in Boltzmann or Monte Carlo calculations of electron energy distribution functions and electron transport and rate coefficients. The first cross section set, designated "JULY 82", is given in Table I. It consists of separate cross sections for rotational, vibrational ($v'=0$ to $v''=1$-8), and electronic (twelve singlet and triplet states) excitation as well as cross sections for ionization and for elastic momentum transfer and total scattering. The second, simplified cross section set, designated "N2MOD", is given in Table II. For applications with reduced requirements on the accuracy of the calculations, this set of inelastic cross sections, including cross sections for total vibrational excitation, total triplet and total singlet electronic excitation and ionization is suggested. Tabulations of calculated transport and reaction coefficients using the JULY 82 cross sections are given in Tables III and IV. Calculated transport coefficients using the N2MOD cross sections are given in Table V.

I. JULY 82 Cross Sections

The experimental and theoretical references from which the full set of cross sections, "JULY 82", was assembled are described fully by Phelps and Pitchford (ref. 1). That reference also compares calculated transport and rate coefficients using this set of cross sections with the experimental results. This data set evolved as new cross section data became available. Previous comparisons of calculated transport and rate coefficients (ref. 2) were based on earlier versions of the cross section data set. Our purpose in references 1 and 2 was to test more accurate computational techniques using the recent experimental and theoretical cross sections for comparison with swarm data, rather than to "fine tune" the cross sections to give the best possible fit to experimental electron transport and reaction coefficient data.

Analytical fits to the differential cross section data have been derived to describe the anisotropic electron scattering. Those results are discussed in ref. 1.

Tables I and II list the cross sections separately for the various inelastic and elastic scattering channels. Units are electron volts for the energies and $10^{-16}\ cm^2$ for the cross sections. The numbers in the tables are significant to about 1%. A one-line descriptor identifies each inelastic process. Electric field to gas density E/n ratios in this report are in Td, where 1 Td = 10^{-21} V m^2.

The "JULY 82" data set includes two tabulated rotational cross sections. When the continuous approximation for rotational excitation (CAR) (refs. 4 and 5) is used with a value of CAR = 2.47×10^{-4} for the combination of constants including the electric quadrapole moment for nitrogen, the first of the rotational cross sections should be used. If CAR = 0 is used in the calculation, then the second set of rotational cross sections, which approximates the effects of rotational excitation at low energies, should be used. The user must determine which of these two tabulations is appropriate to the calculational procedure and choose one or the other. The use of the continuous approximation to rotational excitation with the first of the tabulated cross sections is somewhat more accurate at $E/n < 1$ Td.

The tabulation of the cross section for electron excitation of the v = 1 level is divided into two parts so as to limit the number of entries in each table to less than the number allowed by the program BACPR (Ref. 5) and so as to allow adjustment of the magnitudes (via QSCALE from ref. 5) of the cross sections in the range of energies of the resonance (1.7 to 3.4 eV) without changing the cross sections near the vibrational excitation threshold. In the energy region of the transition between the two tables, i.e., 1.60 to 1.65 eV and 3.6 to 4.0 eV, the cross sections are chosen so that no discontinuity exists in the total cross section regardless of changes in the magnitude factors (QSCALE) applied to the input data (ref. 5).

In the usual two-term Boltzmann formulation (refs. 3, 4 and 5), the appropriate treatment of elastic scattering is through an "effective momentum transfer" cross section given in Table I. As explained in refs. 1 and 2, the multi-term Boltzmann analysis and Monte Carlo simulations do not rely on the approximations used in the two-term formulation which lead to the use of the effective momentum transfer cross section. The appropriate treatment of the elastic scattering in the multiterm and Monte Carlo codes is then through the differential elastic scattering cross section. The total (isotropic), $Q_0^{\ 0}$, and the first Legendre component (the cos θ component), $Q_1^{\ 0}$, of the elastic differential scattering cross section are given at the end of Table I, as well as the elastic momentum transfer cross section, $Q_m^{\ 0} = Q_0^{\ 0} - Q_1^{\ 0}$. The Legendre components used for excitation and ionization are given in Ref. 1. The choice of the elastic cross section to be used in a calculation depends on which description of elastic scattering is assumed in the calculational method (refs. 1 and 2).

II. N2MOD Cross Sections

For many applications, the accuracy required of the calculations does not need nor does the accuracy provided by the computational method make use of the intrinsic detail of the full set of electron scattering cross sections. For these applications, the simplified set of cross sections "N2MOD" is presented. Because the model contains only three inelastic processes and ionization, the computational complexity is significantly reduced. For $E/n > 100$ Td the "N2MOD" results agree fairly well with calculations using the "JULY 82" data; i.e., ionization rate coefficients are within 10%.

III. Transport and reaction coefficients

The transport and rate coefficients in Table III are calculated assuming that the two electrons produced by the ionizing collision share equally the available kinetic energy. The ionization coefficients in Table IV are calculated using the distributions in energy for the product electrons given by Eqs. (2) and (3) of Yoshida et al. (ref. 3). In both cases the temporal growth constant is included in the Boltzmann equation as discussed in this reference.

References

(1) A. V. Phelps and L. C. Pitchford, Phys. Rev. A (in press) (1984).

(2) L. C. Pitchford and A. V. Phelps, Phys. Rev. A 25, 540 (1982).
L. C. Pitchford and A. V. Phelps, Bull. Am. Phys. Soc. 27, 109 (1982).

(3) S. Yoshida, A. V. Phelps and L. C. Pitchford, Phys. Rev. A 27, 2858 (1983).

(4) L. S. Frost and A. V. Phelps, Phys. Rev. 127, 1621 (1962).

(5) P. E. Luft, JILA Information Center Report No. 14, 182 pages (1975).

Table. I. JULY 82 Cross Section Set for Electrons in N_2

ENERGY LOSS = 0.020 eV, N_2 ROTATIONAL EXCITATION

(SINGLE LEVEL APPROX. TO BE USED WITH CAR = 2.47×10^{-4})+

ENERGY eV	CROSS SECTION $10^{-16}cm^2$	ENERGY eV	CROSS SECTION $10^{-16}cm^2$
0.0000	0.0000	2.4000	6.0400
.0200	0.0000	2.5000	6.4500
.0300	0.0000	2.6000	5.1000
.4000	0.0000	2.7000	4.2400
.8000	0.0000	2.8000	3.7500
1.2000	.0600	2.9000	2.1100
1.6000	.1800	3.0000	2.3200
1.7000	.2300	3.1000	1.9400
1.8000	.4000	3.2000	1.4000
1.9000	1.4100	3.3000	.9400
2.0000	5.1300	3.6000	.3800
2.1000	5.4200	5.0000	0.0000
2.2000	5.1400	20.0000	0.0000
2.3000	6.9000	1000.0000	0.0000

+ Used in calculations of Table IV. See ref. 5 for units of CAR.

ENERGY LOSS = 0.020 eV, N_2 ROTATIONAL EXCITATION

(SINGLE LEVEL APPROX. TO BE USED WITH CAR = 0)++

ENERGY eV	CROSS SECTION $10^{-16}cm^2$	ENERGY eV	CROSS SECTION $10^{-16}cm^2$
0.0000	0.0000	2.4000	2.1900
.0200	0.0000	2.5000	2.4000
.0300	0.0250	2.6000	2.1700
.4000	0.0250	2.7000	1.6200
.8000	0.0250	2.8000	1.3800
1.2000	.0470	2.9000	1.1800
1.6000	.0860	3.0000	1.0300
1.7000	.0150	3.1000	.8400
1.8000	.2350	3.2000	.6900
1.9000	1.0800	3.3000	.5000
2.0000	1.9000	3.6000	.1700
2.1000	2.0300	5.0000	0.0000
2.2000	2.7700	20.0000	0.0000
2.3000	2.5000	1000.0000	0.0000

? 0,150

Looks low by ~2.5

++Used in calculations of Table III.

ENERGY LOSS = 0.290 eV, N_2 v=1 (ENERGIES BELOW 1.65 eV AND ABOVE 4 eV)

ENERGY eV	CROSS SECTION $10^{-16}cm^2$	ENERGY eV	CROSS SECTION $10^{-16}cm^2$
0.0000	0.0000	1.6500	0.0000
.2900	0.0000	3.6000	0.0000
.3000	.0010	4.0000	.0550
.3300	.0017	5.0000	.0350
.4000	.0025	15.0000	.0350
.7500	.0037	18.0000	.0400
.9000	.0055	20.0000	.0650
1.0000	.0065	22.0000	.0850
1.1000	.0090	23.0000	.0850
1.1600	.0110	25.0000	.0600
1.2000	.0125	29.0000	.0300
1.2200	.0135	32.0000	.0150
1.4000	.0700	50.0000	.0120
1.5000	.1000	80.0000	0.0000
1.6000	.1500	1000.0000	0.0000

ENERGY LOSS = 0.291 eV, N_2 v=1 (ENERGIES BETWEEN 1.6 AND 3.6 eV)

ENERGY eV	CROSS SECTION $10^{-16}cm^2$	ENERGY eV	CROSS SECTION $10^{-16}cm^2$
0.0000	0.0000	2.7000	1.5450
.2910	0.0000	2.7500	.6000
1.6000	0.0000	2.8000	1.3500
1.6500	.2700	2.9000	.5250
1.7000	.3150	3.0000	.8700
1.8000	.5400	3.1000	1.1700
1.9000	1.4850	3.2000	.8550
2.0000	4.8000	3.3000	.6600
2.1000	2.5650	3.4000	.6000
2.2000	1.2000	3.5000	.5850
2.3000	4.5000	3.6000	.5700
2.4000	2.7600	4.0000	0.0000
2.5000	1.5900	100.0000	0.0000
2.6000	3.1500	1000.0000	0.0000

ENERGY LOSS = 0.590 eV, N_2 v=2

ENERGY eV	CROSS SECTION $10^{-16}cm^2$	ENERGY eV	CROSS SECTION $10^{-16}cm^2$
0.0000	0.0000	2.7000	1.0500
.5900	0.0000	2.7500	1.7250
1.7000	0.0000	2.8000	1.2750
1.8000	.0150	2.9000	.3300
1.9000	.6300	3.0000	.9000
2.0000	1.9350	3.1000	.6450
2.1000	3.3000	3.2000	.3750
2.2000	1.4700	3.3000	.3450
2.3000	.5400	3.4000	.3000
2.4000	2.1150	3.5000	.2130
2.5000	3.0000	3.6000	0.0000
2.6000	.5400	1000.0000	0.0000

ENERGY LOSS = 0.880 eV, N_2 v=3

ENERGY eV	CROSS SECTION $10^{-16}cm^2$	ENERGY eV	CROSS SECTION $10^{-16}cm^2$
0.0000	0.0000	2.7000	.4500
.8800	0.0000	2.7500	.9600
1.9000	0.0000	2.8000	.5400
2.0000	.9600	2.9000	.8550
2.1000	2.0550	3.0000	.4050
2.2000	2.7000	3.1000	.2820
2.3000	1.6950	3.2000	.2910
2.4000	.0750	3.3000	.0615
2.5000	.9600	3.4000	0.0000
2.6000	1.4700	1000.0000	0.0000

ENERGY LOSS = 1.17 eV, N_2 v=4

ENERGY eV	CROSS SECTION $10^{-16}cm^2$	ENERGY eV	CROSS SECTION $10^{-16}cm^2$
0.0000	0.0000	2.7000	1.2000
1.1700	0.0000	2.7500	1.0950
2.0000	0.0000	2.8000	.6750
2.1000	.2025	2.9000	.0300
2.2000	1.5150	3.0000	.3300
2.3000	2.3850	3.1000	.3150
2.4000	1.4400	3.2000	.0600
2.5000	.5550	3.3000	0.0000
2.6000	.0825	1000.0000	0.0000

ENERGY LOSS = 1.47 eV, N_2 v=5

ENERGY eV	CROSS SECTION $10^{-16}cm^2$	ENERGY eV	CROSS SECTION $10^{-16}cm^2$
0.0000	0.0000	2.7500	.3450
1.4700	0.0000	2.8000	.5400
2.1000	0.0000	2.9000	.6600
2.2000	.8250	3.0000	.2175
2.3000	1.2300	3.1000	.1050
2.4000	1.5300	3.2000	.3150
2.5000	1.4400	3.3000	.1035
2.6000	.3450	3.4000	0.0000
2.7000	.0225	1000.0000	0.0000

ENERGY LOSS = 1.76 eV, N_2 v=6

ENERGY eV	CROSS SECTION $10^{-16}cm^2$	ENERGY eV	CROSS SECTION $10^{-16}cm^2$
0.0000	0.0000	2.7500	.4500
1.7600	0.0000	2.8000	.3150
2.2000	0.0000	2.9000	.2460
2.3000	.0063	3.0000	.4800
2.4000	1.1250	3.1000	.1635
2.5000	1.7400	3.2000	0.0000
2.6000	1.3800	100.0000	0.0000
2.7000	.7800	1000.0000	0.0000

ENERGY LOSS = 2.06 eV, N_2 v=7

ENERGY eV	CROSS SECTION $10^{-16}cm^2$	ENERGY eV	CROSS SECTION $10^{-16}cm^2$
0.0000	0.0000	2.9000	.1800
2.0600	0.0000	3.0000	.0063
2.3000	0.0000	3.1000	.1920
2.4000	.0126	3.2000	.2040
2.5000	.3900	3.3000	.0780
2.6000	.6600	3.4000	.0189
2.7000	.9600	3.5000	0.0000
2.7500	.7950	100.0000	0.0000
2.8000	.6000	1000.0000	0.0000

ENERGY LOSS = 2.35 eV, N_2 v=8

ENERGY eV	CROSS SECTION $10^{-16}cm^2$	ENERGY eV	CROSS SECTION $10^{-16}cm^2$
0.0000	0.0000	3.0000	.2640
2.3500	0.0000	3.1000	.0375
2.5000	0.0000	3.2000	.0063
2.6000	.0189	3.3000	.1545
2.7000	.3600	3.4000	.0252
2.7500	.3600	3.5000	0.0000
2.8000	.3300	100.0000	0.0000
2.9000	.3450	1000.0000	0.0000

ENERGY LOSS = 6.17 eV, N_2 $A^3\Sigma$ (v=0-4)

ENERGY eV	CROSS SECTION $10^{-16} cm^2$	ENERGY eV	CROSS SECTION $10^{-16} cm^2$
0.0000	0.0000	18.0000	.0140
6.1700	0.0000	20.0000	.0120
7.0000	.0010	22.0000	.0100
7.8000	.0028	24.0000	.0089
8.5000	.0043	26.0000	.0076
9.0000	.0057	30.0000	.0059
10.0000	.0082	34.0000	.0049
11.0000	.0100	40.0000	.0039
12.0000	.0120	50.0000	.0034
13.0000	.0130	70.0000	.0007
14.0000	.0140	150.0000	0.0000
16.0000	.0150	500.0000	0.0000
17.0000	.0150	1000.0000	0.0000

ENERGY LOSS = 7.00 eV, N_2 $A^3\Sigma$ (v=5-9)

ENERGY eV	CROSS SECTION $10^{-16} cm^2$	ENERGY eV	CROSS SECTION $10^{-16} cm^2$
0.0000	0.0000	18.0000	.0620
7.0000	0.0000	20.0000	.0530
7.3000	.0020	22.0000	.0450
7.8000	.0050	24.0000	.0380
8.5000	.0150	26.0000	.0330
9.0000	.0220	30.0000	.0250
10.0000	.0340	34.0000	.0210
11.0000	.0430	40.0000	.0170
12.0000	.0500	50.0000	.0140
13.0000	.0550	70.0000	.0029
14.0000	.0600	150.0000	0.0000
16.0000	.0650	500.0000	0.0000
17.0000	.0650	1000.0000	0.0000

ENERGY LOSS = 7.35 eV, N_2 $B^3\Pi$

ENERGY eV	CROSS SECTION $10^{-16}cm^2$	ENERGY eV	CROSS SECTION $10^{-16}cm^2$
0.0000	0.0000	18.0000	.1199
7.3500	0.0000	20.0000	.1112
8.0000	.0362	22.0000	.0951
9.0000	.0938	26.0000	.0804
10.0000	.1508	30.0000	.0677
11.0000	.1863	34.0000	.0563
12.0000	.2003	40.0000	.0429
13.0000	.1990	50.0000	.0268
14.0000	.1816	70.0000	.0067
15.0000	.1615	150.0000	0.0000
16.0000	.1447	500.0000	0.0000
17.0000	.1307	1000.0000	0.0000

ENERGY LOSS = 7.36 EV, N_2 $W^3\Delta$

ENERGY eV	CROSS SECTION $10^{-16}cm^2$	ENERGY eV	CROSS SECTION $10^{-16}cm^2$
0.0000	0.0000	22.0000	.1320
7.3600	0.0000	24.0000	.1025
8.0000	.0181	26.0000	.0844
9.0000	.0496	28.0000	.0724
10.0000	.0804	30.0000	.0630
11.0000	.1112	34.0000	.0496
12.0000	.1427	40.0000	.0348
14.0000	.2050	50.0000	.0201
15.0000	.2352	70.0000	.0101
16.0000	.2546	100.0000	.0047
17.0000	.2519	150.0000	0.0000
18.0000	.2345	500.0000	0.0000
20.0000	.1776	1000.0000	0.0000

ENERGY LOSS = 7.80 eV, N_2 $A^3\Sigma$ ($v=10-\infty$)

ENERGY eV	CROSS SECTION $10^{-16}cm^2$	ENERGY eV	CROSS SECTION $10^{-16}cm^2$
0.0000	0.0000	18.0000	.0630
7.8000	0.0000	20.0000	.0540
8.1000	.0015	22.0000	.0460
8.5000	.0040	24.0000	.0390
8.7000	.0070	26.0000	.0330
9.0000	.0110	30.0000	.0260
10.0000	.0290	34.0000	.0210
11.0000	.0440	40.0000	.0170
12.0000	.0510	50.0000	.0150
13.0000	.0560	70.0000	.0030
14.0000	.0600	150.0000	0.0000
16.0000	.0660	500.0000	0.0000
17.0000	.0670	1000.0000	0.0000

ENERGY LOSS = 8.16 eV, N_2 $B'^3\Sigma$

ENERGY eV	CROSS SECTION $10^{-16}cm^2$	ENERGY eV	CROSS SECTION $10^{-16}cm^2$
0.0000	0.0000	19.0000	.0409
8.1600	0.0000	20.0000	.0362
9.0000	.0107	22.0000	.0315
10.0000	.0235	26.0000	.0268
11.0000	.0369	30.0000	.0228
12.0000	.0496	34.0000	.0194
13.0000	.0630	40.0000	.0161
14.0000	.0757	50.0000	.0127
15.0000	.0838	70.0000	.0067
16.0000	.0764	150.0000	0.0000
17.0000	.0616	500.0000	0.0000
18.0000	.0489	1000.0000	0.0000

ENERGY LOSS = 8.40 eV, N_2 $a'^1\Sigma$

ENERGY eV	CROSS SECTION $10^{-16}cm^2$	ENERGY eV	CROSS SECTION $10^{-16}cm^2$
0.0000	0.0000	19.0000	.0308
8.4000	0.0000	20.0000	.0275
9.0000	.0067	24.0000	.0201
11.0000	.0302	30.0000	.0154
13.0000	.0536	40.0000	.0124
14.0000	.0643	50.0000	.0121
15.0000	.0697	70.0000	.0101
16.0000	.0570	150.0000	.0067
17.0000	.0429	500.0000	0.0000
18.0000	.0348	1000.0000	0.0000

ENERGY LOSS = 8.55 eV, N_2 $a^1\Pi$

ENERGY eV	CROSS SECTION $10^{-16}cm^2$	ENERGY eV	CROSS SECTION $10^{-16}cm^2$
0.0000	0.0000	30.0000	.1367
8.5500	0.0000	40.0000	.1065
9.0000	.0127	50.0000	.0851
14.0000	.1474	70.0000	.0603
15.0000	.1715	100.0000	.0402
16.0000	.1916	150.0000	.0268
17.0000	.2023	200.0000	.0201
18.0000	.1990	250.0000	.0161
19.0000	.1923	300.0000	.0134
20.0000	.1849	500.0000	.0082
24.0000	.1621	700.0000	.0060
26.0000	.1528	1000.0000	.0042

ENERGY LOSS = 8.89 eV, N_2 $w^1\Delta$

ENERGY eV	CROSS SECTION $10^{-16} cm^2$	ENERGY eV	CROSS SECTION $10^{-16} cm^2$
0.0000	0.0000	17.0000	.0442
8.8900	0.0000	18.0000	.0375
9.0000	.0013	20.0000	.0288
10.0000	.0261	22.0000	.0241
11.0000	.0476	30.0000	.0154
12.0000	.0663	38.0000	.0094
13.0000	.0784	50.0000	.0047
14.0000	.0771	150.0000	0.0000
15.0000	.0670	500.0000	0.0000
16.0000	.0543	1000.0000	0.0000

ENERGY LOSS = 11.03 eV, N_2 $C^3\Pi$

ENERGY eV	CROSS SECTION $10^{-16} cm^2$	ENERGY eV	CROSS SECTION $10^{-16} cm^2$
0.0000	0.0000	19.0000	.4050
11.0300	0.0000	20.0000	.3750
11.5000	.0405	22.0000	.3150
12.0000	.0930	24.0000	.2655
12.5000	.1965	26.0000	.2250
13.0000	.4350	28.0000	.2085
13.5000	.7350	30.0000	.1665
13.8000	.9300	36.0000	.1170
14.0000	.9750	40.0000	.0945
14.2000	.9600	50.0000	.0585
14.5000	.9450	70.0000	.0225
15.0000	.8250	100.0000	.0023
16.0000	.6450	150.0000	0.0000
17.0000	.5250	500.0000	0.0000
18.0000	.4500	1000.0000	0.0000

ENERGY LOSS = 11.88 eV, N_2 $E^3\Sigma$

ENERGY eV	CROSS SECTION $10^{-16} cm^2$	ENERGY eV	CROSS SECTION $10^{-16} cm^2$
0.0000	0.0000	26.0000	.0054
11.8700	0.0000	28.0000	.0044
12.9200	.0496	30.0000	.0034
12.7000	.0007	32.0000	.0027
17.0000	.0034	40.0000	.0012
19.0000	.0042	50.0000	.0005
20.0000	.0047	150.0000	0.0000
22.0000	.0052	500.0000	0.0000
24.0000	.0054	1000.0000	0.0000

ENERGY LOSS = 12.25 eV, N_2 $a''^1\Sigma$

ENERGY eV	CROSS SECTION $10^{-16}cm^2$	ENERGY eV	CROSS SECTION $10^{-16}cm^2$
0.0000	0.0000	30.0000	.0154
12.2500	0.0000	36.0000	.0114
13.0000	.0054	40.0000	.0107
15.0000	.0188	50.0000	.0090
16.0000	.0248	70.0000	.0068
17.0000	.0302	100.0000	.0050
18.0000	.0348	150.0000	.0036
19.0000	.0382	200.0000	.0029
20.0000	.0389	300.0000	.0020
22.0000	.0342	500.0000	.0013
24.0000	.0275	700.0000	.0010
26.0000	.0228	1000.0000	.0008

ENERGY LOSS = 13.0 eV, N_2 SUM OF SINGLET STATES

ENERGY eV	CROSS SECTION $10^{-16}cm^2$	ENERGY eV	CROSS SECTION $10^{-16}cm^2$
0.0000	0.0000	40.0000	1.6500
13.0000	0.0000	60.0000	1.7600
14.0000	.0810	80.0000	1.6800
15.0000	.1900	100.0000	1.5800
16.0000	.2500	150.0000	1.3300
17.0000	.4200	200.0000	1.1600
18.0000	.5200	250.0000	1.0500
20.0000	.7500	300.0000	.9600
22.0000	.9600	500.0000	.7400
25.0000	1.1900	700.0000	.6400
30.0000	1.4800	1000.0000	.5300

ENERGY LOSS = 15.6 eV, TOTAL IONIZATION

ENERGY eV	CROSS SECTION $10^{-16}cm^2$	ENERGY eV	CROSS SECTION $10^{-16}cm^2$
0.0000	0.0000	25.0000	.6370
15.6000	0.0000	30.0000	1.0300
16.0000	.0210	34.0000	1.2600
16.5000	.0460	45.0000	1.7700
17.0000	.0710	60.0000	2.1700
17.5000	.0980	75.0000	2.3800
18.0000	.1290	100.0000	2.5200
18.5000	.1630	150.0000	2.4400
19.0000	.1980	200.0000	2.2600
19.5000	.2290	300.0000	1.9100
20.0000	.2690	500.0000	1.4500
21.0000	.3420	700.0000	1.1600
22.0000	.4160	1000.0000	.9200
23.0000	.4900	1500.0000	.8000

EFFECTIVE MOMENTUM-TRANSFER CROSS SECTION FOR USE WITH BACKPR (2-TERM CODE)

ENERGY eV	CROSS SECTION $10^{-16} cm^2$	ENERGY eV	CROSS SECTION $10^{-16} cm^2$
0.0000	1.1000	1.9000	19.6000
.0010	1.3600	2.1000	27.0000
.0020	1.4900	2.2000	28.5000
.0030	1.6200	2.5000	30.0000
.0050	1.8100	2.8000	28.0000
.0070	2.0000	3.0000	21.7000
.0085	2.1000	3.3000	17.2000
.0100	2.1900	3.6000	14.7000
.0150	2.5500	4.0000	12.6000
.0200	2.8500	4.5000	11.3000
.0300	3.4000	5.0000	10.9000
.0400	3.8500	6.0000	10.4000
.0500	4.3300	7.0000	10.1000
.0700	5.1000	8.0000	10.0000
.1000	5.9500	10.0000	10.4000
.1200	6.4500	12.0000	10.9000
.1500	7.1000	15.0000	11.0000
.1700	7.4000	17.0000	10.7000
.2000	7.9000	20.0000	10.2000
.2500	8.5000	25.0000	9.5000
.3000	9.0000	30.0000	9.0000
.3500	9.4000	50.0000	8.6000
.4000	9.7000	75.0000	6.6000
.5000	9.9000	100.0000	5.8000
.7000	10.0000	150.0000	4.9000
1.0000	10.0000	200.0000	4.2000
1.2000	10.4000	300.0000	3.3000
1.3000	11.0000	500.0000	2.4400
1.5000	12.0000	700.0000	1.9600
1.7000	13.8000	1000.0000	1.5500

MOLECULAR WEIGHT 27.794 amu

CAR 2.470000E-04

ELASTIC CROSS SECTIONS FOR USE WITH MULTI-TERM CODE

ENERGY	Q_0^0	Q_1^0	$Q_0^0-Q_1^0$
eV	$10^{-16}cm^2$	$10^{-16}cm^2$	$10^{-16}cm^2$
0	1.1	0	1.1
0.010	1.920	-.270	2.19
0.015	2.23	-.319	2.55
0.020	2.49	-.357	2.85
0.030	2.95	-.42	3.38
0.040	3.35	-.471	3.82
0.05	3.78	-.522	4.30
0.07	4.48	-.598	5.08
0.10	5.26	-.668	5.92
0.12	5.72	-.703	6.42
0.15	6.33	-.740	7.08
0.17	6.62	-.750	7.38
0.20	7.11	-.767	7.88
0.25	7.70	-.770	8.48
0.30	8.22	-.760	8.98
0.35	8.62	-.738	9.36
0.40	8.96	-.710	9.67
0.50	9.24	-.625	9.87
0.70	9.52	-.451	9.97
1.0	9.74	-.218	9.96
1.2	10.26	-.082	10.34
1.3	10.91	-.014	10.92
1.5	11.99	.120	11.87
1.7	13.78	.313	13.47

ENERGY	Q_0^0	Q_1^0	$Q_0^0-Q_1^0$
eV	$10^{-16}cm^2$	$10^{-16}cm^2$	$10^{-16}cm^2$
1.9	16.98	.568	16.41
2.1	17.62	.767	16.85
2.2	18.94	.916	18.02
2.5	19.11	1.184	17.92
2.8	22.7	1.692	21.0
3.0	18.74	1.547	17.20
3.3	16.88	1.584	15.30
3.6	15.59	1.628	13.96
4.0	14.08	1.658	12.42
4.5	12.90	1.717	11.19
5.0	12.74	1.876	10.86
6.0	12.53	2.167	10.36
7.0	12.43	2.432	10.00
8.0	13.01	2.81	10.2
10.0	13.23	3.33	9.9
12.0	13.23	3.73	9.5
15.0	12.80	4.10	8.7
17.0	12.56	4.30	8.26
20.0	12.10	4.50	7.6
25.0	11.41	4.71	6.7
30.0	10.67	4.77	5.9
50.0	8.30	4.50	3.8
75.0	6.66	4.10	2.56
100.0	5.38	3.58	1.8
150.	4.18	3.05	1.13
200.	3.50	2.70	.800
300.	2.70	2.22	.480
500.	1.831	1.60	.230
700.	1.455	1.312	.143
1000.	1.029	.952	.077

Table II. N2MOD Cross Section Set for Electrons in N_2.*

ENERGY LOSS = 1.00 eV, N_2 SINGLE LEVEL APPROX. TO VIBRATIONAL EXCITATION.

ENERGY eV	CROSS SECTION $10^{-16}cm^2$	ENERGY eV	CROSS SECTION $10^{-16}cm^2$
0.0000	0.0000	2.4000	8.0550
1.0000	0.0000	2.5000	9.7050
1.1000	.0044	2.6000	6.9600
1.1600	.0053	2.7000	7.0950
1.2000	.0060	2.7500	7.0950
1.2200	.0066	2.8000	5.7750
1.4000	.0345	2.9000	3.7200
1.5000	.0480	3.0000	3.3300
1.6000	.0660	3.1000	2.2650
1.6500	.0780	3.2000	1.6950
1.7000	.0915	3.3000	1.1250
1.8000	.1650	3.4000	.4500
1.9000	.8025	3.5000	.2955
2.0000	3.3750	3.6000	.1650
2.1000	4.7400	4.0000	0.0000
2.2000	6.5700	100.0000	0.0000
2.3000	7.7250	1000.0000	0.0000

ENERGY LOSS = 7.50, SUM OF TRIPLET CROSS SECTIONS

ENERGY eV	CROSS SECTION $10^{-16}cm^2$	ENERGY eV	CROSS SECTION $10^{-16}cm^2$
0.0000	0.0000	22.0000	.8500
7.5000	0.0000	24.0000	.7100
8.0000	.1000	26.0000	.6200
9.0000	.2940	28.0000	.5200
10.0000	.4800	30.0000	.4800
11.0000	.6400	34.0000	.3600
12.0000	1.0200	40.0000	.2900
14.0000	1.7700	50.0000	.1960
15.0000	1.7400	70.0000	.0960
16.0000	1.6700	100.0000	.0440
17.0000	1.4500	150.0000	0.0000
18.0000	1.3000	500.0000	0.0000
20.0000	1.0400	1000.0000	0.0000

ENERGY LOSS = 13.00, SUM OF SINGLET CROSS SECTIONS.

ENERGY eV	CROSS SECTION $10^{-16}cm^2$	ENERGY eV	CROSS SECTION $10^{-16}cm^2$
0.0000	0.0000	40.0000	1.7900
13.0000	0.0000	60.0000	1.8600
14.0000	.2600	80.0000	1.7500
15.0000	.5200	100.0000	1.6400
16.0000	.6200	150.0000	1.3700
17.0000	.7300	200.0000	1.1900
18.0000	.8300	250.0000	1.0900
20.0000	1.0400	300.0000	.9800
22.0000	1.1900	500.0000	.7500
25.0000	1.4200	700.0000	.6500
30.0000	1.6700	1000.0000	.5400

*The elastic and ionization cross sections of Table I were used with this set of inelastic cross sections.

Table III. Electron Transport Coefficients Calculated using the Cross Sections of Table I and Multiterm Code with Approximations of Ref. 1.

a) EXPONENTIAL TEMPORAL GROWTH MODEL

E/n	cases+	W	$\epsilon_K = D_T/\mu$	$\langle\epsilon\rangle$	ν_m/n	ν_u/n	k_i	$D_T n$	$D_L n$	α_A/n	α_i/n*	k_i/W
Td		cm/s	eV	eV	cm^3/s	cm^3/s	cm^3/s	$cm^{-1}s^{-1}$	$cm^{-1}s^{-1}$	cm^2	cm^2	cm^3s^{-1}
10	2,iso	1.806(6)		.955	9.73 (-8)		--	1.746(22)	7.20 (21)	--	--	
	2,aniso	1.806(6)		.955	9.73 (-8)		--	1.746(22)	7.20 (21)	--	--	
	6,iso	1.803(6)		.956	9.75 (-8)		--	1.737(22)	7.87 (21)	--	--	
	6,aniso	1.802(6)		.956	9.75 (-8)		--	1.736(22)	7.88 (21)	--	--	
20	2,iso	3.01 (6)		1.038	1.167(-7)		--			--	--	
	2,aniso	3.01 (6)		1.038	1.167(-7)		--	1.764(22)	6.12 (21)	--	--	
	6,iso	3.00 (6)		1.040	1.173(-7)		--	1.716(22)	8.96 (21)	--	--	
	6,aniso	2.98 (6)		1.061	1.180(-7)		--			--	--	
40	2,iso	5.20 (6)	1.339	1.109	1.353(-7)	1.553(-9)	--	1.740(22)	7.84 (21)	--	--	
	2,aniso	5.20 (6)	1.322	1.109	1.353(-7)	1.573(-9)	--	1.718(22)	7.98 (21)	--	--	
	6,iso	5.14 (6)	1.280	1.120	1.362(-7)	1.606(-9)	--	1.646(22)	7.85 (21)	--	--	
	6,aniso	5.14 (6)	1.272	1.117	1.362(-7)	1.616(-9)	--	1.634(22)	7.98 (21)	--	--	
70	2,iso	8.04 (6)	1.576	1.416	1.531(-7)	3.57 (-9)	--	1.811(22)	8.18 (21)	5.08 (-18)	--	
	2,aniso	8.04 (6)	1.559	1.416	1.531(-7)	3.61 (-9)	--	1.791(22)	8.88 (21)	5.07 (-18)	--	
	6,iso	7.94 (6)	1.487	1.505	1.550(-7)	3.74 (-9)	--	1.686(22)	8.99 (21)	7.07 (-18)	--	
	6,aniso	7.93 (6)	1.469	1.503	1.552(-7)	3.78 (-9)	--	1.664(22)	9.71 (21)	7.14 (-18)	--	
100	2,iso	1.062(7)	2.05	2.24	1.656(-7)	5.18 (-9)	--	2.17 (22)	1.250(22)	2.69 (-17)	--	
	2,aniso	1.062(7)	2.03	2.24	1.656(-7)	5.23 (-9)	--	2.16 (22)	1.231(22)	2.69 (-17)	--	
	6,iso	1.052(7)	1.943	2.39	1.672(-7)	5.41 (-9)	--	2.04 (22)	1.390(22)	3.14 (-17)	--	
	6,aniso	1.050(7)	1.920	2.39	1.675(-7)	5.47 (-9)	--	2.02 (22)	1.377(22)	3.16 (-17)	--	
200	2,iso	1.881(7)	3.76	5.05	1.870(-7)	1.001(-8)	5.76(-11)	3.53 (22)	1.528(22)	1.26 (-16)	3.07 (-17)	3.06 (-18)
	2,aniso	1.879(7)	3.73	5.05	1.872(-7)	1.008(-8)	5.75(-11)	3.50 (22)	1.516(22)	1.26 (-16)	3.07 (-17)	3.06 (-18)
	6,iso	1.870(7)	3.49	5.08	1.881(-7)	1.072(-8)	6.68(-11)	3.26 (22)	1.930(22)	1.26 (-16)	3.58 (-17)	3.57 (-18)
	6,aniso	1.867(7)	3.48	5.08	1.884(-7)	1.073(-8)	6.74(-11)	3.25 (22)	1.920(22)	1.266(-16)	3.62 (-17)	3.61 (-18)
300	2,iso	2.63 (7)	4.88	6.75	2.01 (-7)	1.617(-8)	3.39(-10)	4.27 (22)	3.23 (22)	1.77 (-16)	1.310(-17)	1.289(-17)
	2,aniso	2.62 (7)	4.84	6.74	2.01 (-7)	1.624(-8)	3.39(-10)	4.24 (22)	3.21 (22)	1.77 (-16)	1.315(-17)	1.294(-17)
	6,iso	2.59 (7)	4.47	6.70	2.03 (-7)	1.738(-8)	3.70(-10)	3.86 (22)	3.66 (22)	1.73 (-16)	1.453(-17)	1.423(-17)
	6,aniso	2.60 (7)	4.39	6.67	2.03 (-7)	1.777(-8)	3.40(-10)	3.81 (22)	3.58 (22)	1.73 (-16)	1.332(-17)	1.308(-17)
500	2,iso	3.92 (7)	6.72	9.48	2.24 (-7)	2.92 (-8)	1.842(-9)	5.28 (22)	3.98 (22)	2.08 (-16)	4.95 (-17)	4.70 (-17)
	2,aniso	3.94 (7)	6.69	9.49	2.23 (-7)	2.94 (-8)	1.858(-9)	5.27 (22)	4.08 (22)	2.08 (-16)	4.97 (-17)	4.72 (-17)
	6,iso	3.87 (7)	5.96	9.38	2.27 (-7)	3.25 (-8)	1.963(-9)	4.61 (22)	5.01 (22)	2.02 (-16)	5.46 (-17)	5.07 (-17)
	6,aniso	3.90 (7)	5.95	9.37	2.25 (-7)	3.28 (-8)	1.964(-9)	4.63 (22)	4.87 (22)	2.00 (-16)	5.40 (-17)	5.04 (-17)

Table III. Electron Transport Coefficients Calculated using the Cross Sections of Table I and Multiterm Code with Approximations of Ref. 1. (continued).

a) EXPONENTIAL TEMPORAL GROWTH MODEL

E/n	cases+	W	$\varepsilon_K = D_T/\mu$	$\langle\varepsilon\rangle$	ν_m/n	ν_u/n	k_i	$D_T n$	$D_L n$	α_A/n	α_i/n*	k_i/W
Td		cm/s	eV	eV	cm^3/s	cm^3/s	cm^3/s	$cm^{-1}s^{-1}$	$cm^{-1}s^{-1}$	cm^2	cm^2	cm^3s^{-1}
1000	2,iso	6.51 (7)	11.01	15.88	2.70 (-7)	5.91 (-8)	1.005(-8)	7.16 (22)	5.16 (22)	1.82 (-16)	1.801(-16)	1.544(-16)
	2,aniso	6.70 (7)	11.05	16.10	2.62 (-7)	6.06 (-8)	1.043(-8)	7.41 (22)	6.27 (22)	1.77 (-16)	1.892(-16)	1.557(-16)
	6,iso	6.39 (7)	9.32	16.82	2.75 (-7)	6.86 (-8)	1.030(-8)	5.96 (22)	8.43 (22)	1.78 (-16)	2.32 (-16)	1.612(-16)
	6,aniso	6.63 (7)	8.96	16.03	2.65 (-7)	7.40 (-8)	1.070(-8)	5.94 (22)	8.72 (22)	1.71 (-16)	2.32 (-16)	1.614(-16)
1500	2,iso	8.59 (7)	15.44	22.6	3.07 (-7)	8.34 (-8)	2.15 (-8)	8.84 (22)	7.00 (22)	1.428(-16)	3.50 (-16)	2.50 (-16)
	2,iso,@	8.62 (7)	15.46	22.5	3.06 (-7)	8.36 (-8)	2.15 (-8)	8.88 (22)				
	2,aniso	9.18 (7)	15.78	23.3	2.87 (-7)	8.73 (-8)	2.28 (-8)	9.66 (22)	8.77 (22)	1.86 (-16)	4.05 (-16)	2.48 (-16)
	2,aniso,@	9.22(7)	14.72	23.3	2.86 (-7)	9.40 (-8)	2.28 (-8)	9.04 (22)				
	6,iso											
	6,iso,@	8.38 (7)	12.20	22.3			2.11 (-8)	6.82 (22)				
	6,aniso	9.15 (7)	12.58	23.4	2.88 (-7)	1.090(-7)	2.30 (-8)	7.68 (22)	1.512(23)	1.27 (-16)		2.51 (-16)
	6,aniso,@	9.20 (7)	12.59	23.4	2.87 (-7)	1.096(-7)	2.30 (-8)	7.71 (22)				

@ Calculated using an exponential tail at high energies based on the SOO functions defined by Allis. See W. P. Allis, Phys. Rev. A 26, 1704 (1982). Calculated using Q_0 which was too large by 20% near 2eV

* These were calculated using quadratic equation for ${}_i$, i.e., Eq. (13) of Ref. 1. Note that the W and D_L values are not corrected for ionization. See Ref. 1 for comments.

b) STEADY-STATE, EXPONENTIAL SPATIAL GROWTH MODEL

E/n	cases+	V_d	$\langle\varepsilon\rangle$	k_i	α_A/n	α_i/n*
Td		cm/s	eV	cm^3/s	cm^2	cm^2
1500	2,iso	7.83 (7)	19.63	1.65 (-8)	1.56 (-16)	2.10 (-16)

* Calculated using k_i/V_d.

+ Here the 2 and 6 indicate the use of either 2 or 6-terms in the spherical harmonic expansion, while iso and aniso refer to the use of either the isotropic or anisotropic scattering models of reference 1.

Table IV. Electron Transport Coefficients Calculated Using Cross Sections of Table I and Two-Term Approximation**

E/n (Td=10^{-21} Vm^2)	.1	.2	.5	1	2	5	10	20	50	70
W (m/s)	2407	2865	3475	4450	6230	11120	17870	30020	62728	81653
D/μ (eV)	.0417	.0726	.1628	.291	.488	.767	.984	1.174	1.383	1.551
<ε> (eV)	.0574	.0939	.202	.368	.594	.832	.958	1.038	1.154	1.409
ν_m/n (m^3/s)	7.31E-15	1.23E-14	2.53E-14	3.95E-14	5.65E-14	7.91E-14	9.84E-14	1.17E-13	1.40E-13	1.51E-13
ν_μ/n (m^3/s)	1.51E-17	1.22E-17	1.27E-17	1.68E-17	2.69E-17	7.5E-17	1.87E-16	5.23E-16	2.31E-15	3.75E-15
(EPL-EPG) (eV-m^3/s)	2.4E-19	5.54E-19	1.2E-18	2.04E-18	3.16E-18	4.44E-18	5.24E-18	5.9E-18	7.26E-18	9.72E-18
EN. BALANCE (%) (Ref. 4)	.004	.017	.126	.224	.65	.63	.98	.96	3.3	2.6
SUM VIB QUANT (m^3/s)	2.7E-21	6.55E-20	1.84E-18	7.73E-18	2.76E-17	1.58E-16	5.53E-16	1.93E-15	9.98E-15	1.74E-14
C+E (m^3/s)									1.12E-19	3.82E-18
SUM TRIP (m^3/s)									2.65E-18	4.02E-17
α(C+E)/n (m^2)									1.78E-24	4.68E-23
α(Σtriplet)/n (m^2)									4.23E-23	4.92E-22
α_i/n (m^2)									4.29E-28	9.53E-26
GAS HEATING CALC.*										
ELA & ROT HEAT (%)	99.7	96.6	69.1	49.0	35.3	16.7	8.65	4.74	2.52	2.07
VIB. ENERGY (%)	.326	3.32	30.8	50.5	64.5	82.6	90.0	93.6	92.6	88.8
ION. ENERGY (%)									1.437E-5	.002
ELECT. EX. HEAT(%)									.769	6.77
VIB. COOLING (%)				2.872E-9	7.740E-5	.026	.161	.432	1.00	1.20
NET FAST HEAT. (%)	99.7	96.6	69.1	49.0	35.3	16.7	8.49	4.30	2.29	7.64

Rate Coefficients (m^3/s) for Individual Excitation Processes

PROCESS E/n(Td)	.1	.2	.5	1	2	5	10	20	50	70
RES ROT	0	0	7.02E-20	7.09E-18	6.21E-17	2.44E-16	5.11E-16	1.13E-15	3.6E-15	5.45E-15
v=1	2.7E-21	6.55E-20	1.84E-18	7.73E-18	2.76E-17	1.50E-16	4.23E-16	9.91E-16	2.57E-15	3.52E-15
v=2				3.57E-26	2.69E-21	3.51E-18	5.04E-17	2.73E-16	1.21E-15	1.82E-15
v=3					2.9E-24	1.89E-19	9.45E-18	1.05E-16	7.52E-16	1.21E-15
v=4						2.46E-22	1.97E-19	1.31E-17	2.97E-16	6.01E-16
v=5						2.36E-24	3.42E-20	5.36E-18	1.82E-16	4.1E-16
v=6							8.97E-23	3.51E-19	7.33E-17	2.27E-16
v=7							1.62E-24	3.13E-20	2.12E-17	8.44E-17
v=8								1.38E-21	5.7E-18	2.91E-17
A3SIG									8.71E-20	1.13E-18
A3SIG									2.8E-19	3.92E-18
B3PI									1.18E-18	1.64E-17
W3DEL									6.59E-19	9.61E-18
A3SIG									1.75E-19	2.78E-18
B′3SIG									1.53E-19	2.5E-18
A′1SIG									1.13E-19	1.91E-18
A1PI									2.36E-19	4.1E-18
W1DEL									1.4E-19	2.5E-18
C3PI									1.07E-19	3.69E-18
E3SIG									4.79E-21	1.32E-19
A"1SIG									9.21E-22	4.18E-20
SUM SINGLET									3.6E-21	2.36E-19
TOTAL IONIZATION									2.69E-23	7.78E-21

E/n (Td=10^{-21} Vm^2)	100	150	200	300	500	1000	1500	2000	3000
W (m/s)	107300	148390	187380	260960	388000	643000	855000	1050000	1410000
D/μ (eV)	2.02	2.96	3.74	4.86	6.67	10.76	15	19.64	30.7
<ε> (eV)	2.24	3.81	5.03	6.73	9.41	15.72	22.4	29.8	47.1
ν_m/n (m^3/s)	1.64E-13	1.78E-13	1.88E-13	2.02E-13	2.27E-13	2.73E-13	3.08E-13	3.35E-13	3.74E-13
ν_u/n (m^3/s)	5.37E-15	7.58E-15	1.01E-14	1.62E-14	2.92E-14	5.99E-14	8.57E-14	1.07E-13	1.38E-13
(EPL-EPG) (eV-m^3/s)	1.70E-17	3.07E-17	4.2E-17	5.96E-17	9.13E-17	1.77E-16	2.75E-16	3.83E-16	6.31E-16
EN. BALANCE (%)	1.33	.59	.29	.63	.59	.156	.27	.46	.17
SUM VIB QUANT (m^3/s)	2.58E-14	2.90E-14	2.71E-14	2.21E-14	1.59E-14	9.58E-15	7.29E-15	6.70E-15	4.73E-15
C+E (m^3/s)	4.92E-17	3.13E-16	7.54E-16	1.76E-15	3.43E-15	5.12E-15	5.23E-15	4.92E-15	4.16E-15
SUM TRIP (m^3/s)	2.85E-16	1.18E-15	2.34E-15	4.63E-15	8.11E-15	1.15E-14	1.17E-14	1.10E-14	9.38E-15
α(C+E)/n (m^2)	4.58E-22	2.11E-21	4.03E-21	6.75E-21	8.85E-21	7.95E-21	6.12E-21	4.69E-21	2.95E-21
α(Σtriplet)/n (m^2)	2.65E-21	7.93E-21	1.25E-20	1.77E-20	2.09E-20	1.78E-20	1.37E-20	1.05E-20	6.66E-21
α_i/n (m^2)	3.69E-24	6.93E-23	2.86E-22	1.23E-21	4.70E-21	1.58E-20	2.54E-20	3.23E-20	3.98E-20
GAS HEATING CALC.*									
ELA & ROT HEAT (%)	1.51	.82	.479	.216	.087	.034	.024	.01	.015
VIB. ENERGY (%)	70.0	37.8	21.0	8.20	2.3	.433	.165	.092	.032
ION. ENERGY (%)	.065	.896	2.95	9.18	23.4	49.4	64.2	73.2	83.1
ELECT. EX. HEAT(%)	27.1	59.1	75.3	81.6	73.4	49.8	35.9	27.1	17.0
VIB. COOLING (%)	1.10	.654	.377	.151	.043	.007	.002	.001	5.672E-4
NET FAST HEAT. (%)	27.6	59.2	75.4	81.7	73.5	49.9	36.0	27.1	17.1

Rate Coefficients (m^3/s) for Individual Excitation Processes

PROCESS E/n(Td)	100	150	200	300	500	1000	1500	2000	3000
RES ROT	7.25E-15	7.59E-15	6.88E-15	5.48E-15	3.9E-15	2.24E-15	1.68E-15	1.39E-15	9.55E-16
v=1	4.32E-15	4.34E-15	3.93E-15	3.28E-15	2.69E-15	1.98E-15	1.78E-15	1.45E-15	1.12E-15
v=2	2.36E-15	2.38E-15	2.12E-15	1.63E-15	1.08E-15	6.16E-16	5.36E-16	5.54E-16	3.81E-16
v=3	1.61E-15	1.63E-15	1.44E-15	1.10E-15	7.66E-16	4.37E-16	1.77E-16	2.08E-16	1.43E-16
v=4	9.25E-16	1.03E-15	9.43E-16	7.46E-16	4.92E-16	2.82E-16	2.14E-16	8.71E-17	6.E-17
v=5	6.83E-16	8.06E-16	7.61E-16	6.22E-16	4.59E-16	2.65E-16	2.38E-16	1.58E-16	1.08E-16
v=6	4.6E-16	6.13E-16	6.11E-16	5.25E-16	4.07E-16	2.36E-16	1.39E-16	2.82E-16	1.94E-16
v=7	2.02E-16	3.01E-16	3.14E-16	2.79E-16	1.91E-16	1.12E-16	8.85E-17	5.24E-17	3.6E-17
v=8	8.12E-17	1.33E-16	1.44E-16	1.32E-16	8.49E-17	5.02E-17	5.1E-17	4.06E-17	2.8E-17
A3SIG	6.79E-18	2.34E-17	4.18E-17	7.37E-17	1.20E-16	1.67E-16	1.72E-16	1.65E-16	1.43E-16
A3SIG	2.49E-17	9.03E-17	1.66E-16	3.01E-16	5.02E-16	7.09E-16	7.35E-16	7.04E-16	6.1E-16
B3PI	1.02E-16	3.5E-16	6.09E-16	1.02E-15	1.53E-15	1.95E-15	1.94E-15	1.83E-15	1.55E-15
W3DEL	6.42E-17	2.49E-16	4.78E-16	9.18E-16	1.58E-15	2.18E-15	2.18E-15	2.04E-15	1.71E-15
A3SIG	1.95E-17	7.66E-17	1.47E-16	2.8E-16	4.84E-16	7.02E-16	7.34E-16	7.06E-16	6.16E-16
B'3SIG	1.82E-17	7.44E-17	1.45E-16	2.76E-16	4.66E-16	6.49E-16	6.74E-16	6.54E-16	5.83E-16
A'1SIG	1.43E-17	5.93E-17	1.16E-16	2.2E-16	3.66E-16	5.03E-16	5.33E-16	5.39E-16	5.35E-16
A1PI	3.17E-17	1.41E-16	2.96E-16	6.4E-16	1.30E-15	2.34E-15	2.8E-15	2.97E-15	3.02E-15
W1DEL	1.91E-17	7.86E-17	1.51E-16	2.76E-16	4.39E-16	5.58E-16	5.45E-16	5.08E-16	4.3E-16
C3PI	4.79E-17	3.07E-16	7.42E-16	1.74E-15	3.39E-15	5.05E-15	5.16E-15	4.86E-15	4.11E-15
E3SIG	1.29E-18	6.03E-18	1.23E-17	2.52E-17	4.29E-17	6.5E-17	7.26E-17	6.34E-17	5.49E-17
A"1SIG	7.1E-19	6.26E-18	1.89E-17	5.85E-17	1.53E-16	3.06E-16	3.62E-16	3.79E-16	3.79E-16
SUM SINGLET	5.38E-18	6.47E-17	2.38E-16	9.83E-16	3.85E-15	1.42E-14	2.45E-14	3.31E-14	4.61E-14
TOTAL IONIZATION	3.96E-19	1.03E-17	5.36E-17	3.22E-16	1.82E-15	1.02E-14	2.17E-14	3.39E-14	5.61E-14

* See appendix B of reference 1 for definitions of these gas heating terms. The ionization energy is equal to 100[< >$+u_i$]k_i/(wE/n) as discussed in reference 3. The electronic excitation heating term includes all excitation except rotatonal and vibrational excitation. It also does not include the ionization energy term.

** (Improved Version of BACKPR Code of Ref. 5. See Yoshida et al., Ref. 3 for changes from Ref. 4)
CALCULATIONS OF 84/04/07-11

Table V. Electron Transport Coefficient Calculated Using Cross Sections of Table II and Multiterm Code in Two-Term Approximation

E/n (Td)	100*	200	300	500	1000	1500
W (m/s)	1.074(5)	2.10(5)	2.64(5)	3.91(5)	6.48(5)	8.58(5)
D/μ (eV)	2.03	3.90	5.06	6.91	11.46	16.47
$\langle\epsilon\rangle$ (eV)	2.26	5.43	6.83	9.45	15.72	22.2
$D_T n$ ($m^{-1}s^{-1}$)	2.18(24)		4.42(24)	5.33(24)	7.03(24)	8.65(24)
ν_i/n (m^3/s)	4.04(-19)	7.02(-17)	3.10(-16)	1.75(-15)	9.76(-15)	2.09(-14)

* Calculated using two-term code (improved BACKPR)