1 Rate Based Reactions

No.	Reaction	A	n_g	E_g	n_e	E_e	$\Delta\varepsilon_e$	$\Delta\varepsilon_g$	Ref.
1	$e + N_2 \rightarrow e + N_2(rotation)$			EEDF			2.00×10^{-2}	-2.00×10^{-2}	[3] [1,2,3]
2	$e + N_2 \rightarrow e + N_2(vibration)$			EEDF			1.00×10^{0}	-1.00×10^{0}	[3] [4]
3	$e + N_2 \rightarrow 2e + N_2^+$			EEDF			1.56×10^{1}	0.00	[3]
4	$e + N_2 \rightarrow e + 2N$			EEDF			9.76×10^{0}	0.00	[3]
5	$e + N_2 \rightarrow e + N_2(electronic)$			EEDF			1.00×10^{0}	-3.00×10^{-1}	[3] [5]
6	$e + N_2 \rightarrow e + N_2(A)$			EEDF			6.17×10^{0}	0.00	[3]
7	$e + N_2 \rightarrow e + N_2(a)$			EEDF			1.00×10^{0}	0.00	[3] [6]
8	$e + N_2 \rightarrow e + N_2(b)$			EEDF			1.00×10^{0}	0.00	[3] [7]
9	$e + N_2 \rightarrow e + N_2(c)$			EEDF			1.10×10^{1}	0.00	[3] [8]
10	$e + He \rightarrow 2e + He^+$			EEDF			2.46×10^{1}	0.00	[6]
11	$e + He \rightarrow e + He^m$			EEDF			1.98×10^{1}	0.00	[6]
12	$e + O_2 \rightarrow 2e + O_2^+$			EEDF			1.21×10^{1}	0.00	[6]
13	$e + O_2 \rightarrow e + 2O$			EEDF			5.58×10^{0}	0.00	[6]
14	$e + O_2 \rightarrow e + O + O^m$			EEDF			8.40×10^{0}	0.00	[3]
15	$e + O_2 \rightarrow O + O^-$			EEDF			3.60×10^{0}	0.00	[3]
16	$e + O_2 \rightarrow e + O_2(rotational)$			EEDF			2.00×10^{-2}	-2.00×10^{-2}	[3]
17	$e + O_2 \rightarrow e + O_2$			EEDF			1.00×10^{0}	-3.00×10^{-1}	[3]
18	$e + O_2 \rightarrow e + O_2(h)$			EEDF			4.50×10^{0}	0.00	[3]
19	$e + O_2 \rightarrow e + O_2(a1)$			EEDF			9.80×10^{-1}	0.00	[3]
20	$e + O_2 \rightarrow e + O_2(b1)$			EEDF			1.63×10^{0}	0.00	[3]
21	$e + O_2 \rightarrow e + O_2(vibrational)$			EEDF			1.93×10^{-1}	0.00	[3]
22	$e + O_2(al) \rightarrow e + O_2(b1)$			EEDF			6.50×10^{-1}	0.00	[3]
23	$e + O_2(al) \rightarrow e + O + O^m$			EEDF			6.34×10^{0}	0.00	[3]
24	$e + O_2(al) \rightarrow O + O^-$			EEDF			2.62×10^{0}	0.00	[3]
25	$e + O_2(b1) \rightarrow O + O^-$			EEDF			1.97×10^{0}	0.00	[3]
26	$e + NO \rightarrow 2e + NO^+$			EEDF			9.26×10^{0}	0.00	[4]
27	$e + O \rightarrow e + O^m$			EEDF			6.34×10^{0}	0.00	[8]
28	$e + O^+ \rightarrow e + O^+$			EEDF			1.36×10^{1}	0.00	[8]
29	$e + He^m \rightarrow 2e + He^+$	4.66×10^{-16}	6.00×10^{-1}	5.55×10^{4}	0.00	0.00	4.78×10^{0}	0.00	[3]
30	$2He^m \rightarrow e + He + He^+$	4.50×10^{-16}	0.00	0.00	0.00	0.00	-1.50×10^{1}	0.00	[3]
31	$e + He^m \rightarrow e + He$	1.10×10^{-17}	3.10×10^{-1}	0.00	0.00	0.00	-1.98×10^{1}	0.00	[3]
32	$e + He_2{}^m \rightarrow 2e + He_2{}^+$	1.27×10^{-18}	7.10×10^{-1}	3.94×10^{4}	0.00	0.00	3.40×10^{0}	0.00	[3]

Table 1: DNN Schematic

No.	Reaction	A	n_g	E_g	n_e	E_e	$\Delta\varepsilon_e$	$\Delta\varepsilon_g$	Ref.
33	$e + He_2^+ \rightarrow He^m + He$	5.39×10^{-13}	-5.00×10^{-1}	0.00	0.00	0.00	0.00	0.00	[3]
34	$He^m + 2He \rightarrow He_2^m + He$	1.40×10^{-45}	0.00	0.00	0.00	0.00	0.00	0.00	[3]
35	$He^+ + 2He \rightarrow He_2^+ + He$	9.95×10^{-44}	0.00	0.00	0.00	0.00	0.00	0.00	[3]
36	$e + He^+ \rightarrow He^m$	7.31×10^{-17}	-5.00×10^{-1}	0.00	0.00	0.00	0.00	-4.80×10^{0}	[7]
37	$2e + He^+ \rightarrow e + He^m$	1.04×10^{-20}	-4.50×10^{0}	0.00	0.00	0.00	0.00	-4.80×10^{0}	[7]
38	$He^m + N_2 \rightarrow e + He + N_2^+$	7.00×10^{-17}	0.00	0.00	0.00	0.00	0.00	-4.20×10^{0}	[3]
39	$He_2^m + N_2 \rightarrow e + 2He + N_2^+$	7.00×10^{-17}	0.00	0.00	0.00	0.00	0.00	0.00	[3]
40	$He^+ + N_2 \rightarrow N_2^+ + He$	5.00×10^{-16}	0.00	0.00	0.00	0.00	0.00	0.00	[3]
41	$He_2^+ + N_2 \rightarrow N_2^+ + 2He$	5.00×10^{-16}	0.00	0.00	0.00	0.00	0.00	0.00	[3]
42	$He^m + O_2 \rightarrow e + He + O_2^+$	1.47×10^{-17}	5.00×10^{-1}	0.00	0.00	0.00	0.00	-7.73×10^{0}	[7]
43	$He^m + O_3 \rightarrow e + O + He + O_2^+$	1.47×10^{-17}	5.00×10^{-1}	0.00	0.00	0.00	0.00	-2.15×10^{0}	[7]
44	$He^m + O_2(b1) \rightarrow e + He + O_2^+$	1.47×10^{-17}	5.00×10^{-1}	0.00	0.00	0.00	0.00	-9.36×10^{0}	[7]
45	$He^m + O \rightarrow e + He + O^+$	1.47×10^{-17}	5.00×10^{-1}	0.00	0.00	0.00	0.00	-6.18×10^{0}	[7]
46	$He^m + O^m \rightarrow e + He + O^+$	1.47×10^{-17}	5.00×10^{-1}	0.00	0.00	0.00	0.00	-1.25×10^{1}	[7]
47	$He^+ + O_2 \rightarrow O + He + O^+$	6.18×10^{-17}	5.00×10^{-1}	0.00	0.00	0.00	0.00	-5.40×10^{0}	[7]
48	$He^+ + O_3 \rightarrow He + O_2 + O^+$	1.47×10^{-17}	5.00×10^{-1}	0.00	0.00	0.00	0.00	-5.40×10^{0}	[7]
49	$He^+ + O_2 \rightarrow O_2^+ + He$	1.91×10^{-18}	5.00×10^{-1}	0.00	0.00	0.00	0.00	-1.25×10^{1}	[7]
50	$He^+ + O_2(a1) \rightarrow He + O + O^+$	6.18×10^{-19}	5.00×10^{-1}	0.00	0.00	0.00	0.00	-6.38×10^{0}	[7]
51	$He^+ + O_2(a1) \rightarrow He + O_2^+$	1.47×10^{-17}	5.00×10^{-1}	0.00	0.00	0.00	0.00	-1.35×10^{1}	[7]
52	$He^+ + O \rightarrow He + O^+$	2.89×10^{-18}	5.00×10^{-1}	0.00	0.00	0.00	0.00	-1.10×10^{1}	[7]
53	$He^+ + O^m \rightarrow He + O^+$	2.89×10^{-18}	5.00×10^{-1}	0.00	0.00	0.00	0.00	-1.73×10^{1}	[7]
54	$N_2^+ + N_2 + M \rightarrow N_4^+ + M$	5.00×10^{-41}	5.00×10^{-1}	0.00	0.00	0.00	0.00	0.00	[1]
55	$N_4^+ + O_2 \rightarrow O_2^+ + 2N_2$	2.50×10^{-16}	0.00	0.00	0.00	0.00	0.00	-3.51×10^{0}	[1]
56	$N_2^+ + O_2 \rightarrow O_2^+ + N_2$	1.04×10^{-15}	-5.00×10^{-1}	0.00	0.00	0.00	0.00	-3.51×10^{0}	[1]
57	$O_2^+ + 2N_2 \rightarrow O_2^+ + 2N_2$	8.10×10^{-38}	-2.00×10^{0}	0.00	0.00	0.00	0.00	-2.00×10^{0}	[1]
58	$O_2 + 2N_2 \rightarrow O_2 + 2N_2$	1.48×10^{1}	-5.30×10^{0}	2.36×10^{3}	0.00	0.00	0.00	0.00	[1]
59	$O_2 + N_2 + O_2^+ \rightarrow O_4^+ + N_2$	1.00×10^{-15}	0.00	0.00	0.00	0.00	0.00	0.00	[1]
60	$O_2^+ + O_2 + M \rightarrow O_4^+ + M$	2.03×10^{-34}	-3.20×10^{0}	0.00	0.00	0.00	0.00	0.00	[1]
61	$e + O_4^+ \rightarrow 2O_2$	2.42×10^{-11}	-5.00×10^{-1}	0.00	0.00	0.00	0.00	-1.21×10^{1}	[1]
62	$e + O_2^+ \rightarrow 2O$	6.00×10^{-11}	-1.00×10^{0}	0.00	0.00	0.00	0.00	-6.91×10^{0}	[1]
63	$e + 2O_2 \rightarrow O_2^- + O_2$	6.00×10^{-39}	-1.00×10^{0}	0.00	0.00	0.00	0.00	-4.30×10^{-1}	[1]
64	$O_2^- + O_4^+ \rightarrow 3O_2$	1.00×10^{-13}	0.00	0.00	0.00	0.00	0.00	-1.16×10^{1}	[1]

No.	Reaction	A	n_g	E_g	n_e	E_e	$\Delta\varepsilon_e$	$\Delta\varepsilon_g$	Ref.
65	$O_2^- + O_4^+ + M \rightarrow 3O_2 + M$	3.12×10^{-31}	-2.50×10^{0}	0.00	0.00	0.00	0.00	-1.16×10^{1}	[1]
66	$O_2^+ + O_2 + M \rightarrow O_4^+ + M$	2.03×10^{-34}	-3.20×10^{0}	0.00	0.00	0.00	0.00	0.00	[1]
67	$O_2^- + O_2^+ + M \rightarrow 2O_2 + M$	3.12×10^{-31}	-2.50×10^{0}	0.00	0.00	0.00	0.00	-1.16×10^{1}	[1]
68	$O^- + O_2^+ \rightarrow O + O_2$	3.46×10^{-12}	-5.00×10^{-1}	0.00	0.00	0.00	0.00	-1.06×10^{1}	[1]
69	$N_2(a) + O_2 \rightarrow N_2 + 2O$	1.70×10^{-18}	0.00	0.00	0.00	0.00	0.00	-1.05×10^{0}	[1] [9]
70	$N_2(a) + O_2 \rightarrow N_2 + O_2(b1)$	7.50×10^{-19}	0.00	0.00	0.00	0.00	0.00	-4.54×10^{0}	[5] [9]
71	$2N_2(a) \rightarrow N_2 + N_2(b)$	7.70×10^{-17}	0.00	0.00	0.00	0.00	0.00	-4.99×10^{0}	[5] [7,9]
72	$2N_2(a) \rightarrow N_2 + N_2(c)$	1.60×10^{-16}	0.00	0.00	0.00	0.00	0.00	-1.31×10^{0}	[5] [8,9]
73	$N_2(a) + N_2(vib) \rightarrow N_2 + N_2(b)$	1.00×10^{-16}	0.00	1.50×10^{3}	0.00	0.00	0.00	-3.20×10^{-1}	[5] [7,9]
74	$N_2(a) + O \rightarrow N_2 + O$	3.00×10^{-17}	0.00	0.00	0.00	0.00	0.00	-6.17×10^{0}	[5] [9]
75	$N_2(b) + O_2 \rightarrow N_2 + 2O$	3.00×10^{-16}	0.00	0.00	0.00	0.00	0.00	-2.23×10^{0}	[5] [10]
76	$N_2(b) + N_2 \rightarrow N_2(a) + N_2$	1.00×10^{-17}	0.00	0.00	0.00	0.00	0.00	-1.18×10^{0}	[5] [6,10]
77	$N_2(a) + O_2 \rightarrow N_2 + 2O$	2.80×10^{-17}	0.00	0.00	0.00	0.00	0.00	-3.28×10^{0}	[5] [9]
78	$N_2(a) + N_2 \rightarrow 2N_2$	2.00×10^{-19}	0.00	0.00	0.00	0.00	0.00	-8.40×10^{0}	[5] [9]
79	$N_2(c) + O_2 \rightarrow N_2 + 2O$	3.00×10^{-16}	0.00	0.00	0.00	0.00	0.00	-5.91×10^{0}	[5] [11]
80	$N_2(c) + N_2 \rightarrow N_2(a1) + N_2$	1.00×10^{-17}	0.00	0.00	0.00	0.00	0.00	-2.63×10^{0}	[5] [11]
81	$N_2(c) \rightarrow N_2(b) + h\nu$	3.00×10^{7}	0.00	0.00	0.00	0.00	0.00	0.00	[5] [7,11]
82	$O_2(h) + O_2 \rightarrow O_2(a1) + O_2$	1.86×10^{-19}	0.00	0.00	0.00	0.00	0.00	3.52×10^{0}	[5]
83	$O_2(h) + O_2 \rightarrow O_2(b1) + O_2$	8.10×10^{-22}	0.00	0.00	0.00	0.00	0.00	-2.87×10^{0}	[5]
84	$O_2(h) + O_2 \rightarrow 2O_2$	2.30×10^{-22}	0.00	0.00	0.00	0.00	0.00	-4.50×10^{0}	[5]
85	$O_2(h) + O \rightarrow O_2 + O$	5.00×10^{-18}	0.00	0.00	0.00	0.00	0.00	-4.50×10^{0}	[5]
86	$O_2(h) + O \rightarrow O_2(a1) + O$	2.70×10^{-18}	0.00	0.00	0.00	0.00	0.00	-3.52×10^{0}	[5]
87	$O_2(h) + O \rightarrow O_2(b1) + O$	1.35×10^{-18}	0.00	0.00	0.00	0.00	0.00	-2.87×10^{0}	[5]
88	$O^- + O_2(a1) \rightarrow e + O_3$	3.00×10^{-16}	0.00	0.00	0.00	0.00	0.00	0.00	[2]
89	$O_2^- + O \rightarrow e + O_3$	1.50×10^{-16}	0.00	0.00	0.00	0.00	0.00	0.00	[2]
90	$O^- + O_2 \rightarrow e + O_3$	5.00×10^{-21}	0.00	0.00	0.00	0.00	0.00	0.00	[2]
91	$O^- + O_2 \rightarrow e + O_3$	5.00×10^{-21}	0.00	0.00	0.00	0.00	0.00	0.00	[2]
92	$O + O_2 + N_2 \rightarrow N_2 + O_3$	1.86×10^{-41}	-2.00×10^{0}	0.00	0.00	0.00	0.00	0.00	[2]
93	$O + 2O_2 \rightarrow O_2 + O_3$	8.62×10^{-43}	-1.25×10^{0}	0.00	0.00	0.00	0.00	0.00	[2]
94	$O_4^+ + O \rightarrow O_2^+ + O_3$	3.00×10^{-16}	0.00	0.00	0.00	0.00	0.00	0.00	[2]
95	$O^- + O_2^+ + N_2 \rightarrow O_3 + N_2$	3.12×10^{-31}	-2.50×10^{0}	0.00	0.00	0.00	0.00	0.00	[2]
96	$O^- + O_2^+ + O_2 \rightarrow O_3 + O_2$	3.12×10^{-31}	-2.50×10^{0}	0.00	0.00	0.00	0.00	0.00	[2]

No.	Reaction	A	n_g	E_g	n_e	E_e	$\Delta\varepsilon_e$	$\Delta\varepsilon_g$	Ref.
97	$2O + O_2 \rightarrow O_3 + O$	3.12×10^{-31}	-2.50×10^{0}	0.00	0.00	0.00	0.00	0.00	[3]

[1]something important
[2]something else
[3]Species ‘N2(rotation)’ has been lumped into ‘N2*’
[4]Species ‘N2(vibration)’ has been lumped into ‘N2*’
[5]Species ‘N2(electronic)’ has been lumped into ‘N2*’
[6]Species ‘N2(a)’ has been lumped into ‘N2*’
[7]Species ‘N2(b)’ has been lumped into ‘N2*’
[8]Species ‘N2(c)’ has been lumped into ‘N2*’
[9]Species ‘N2(a)’ has been lumped into ‘N2*’
[10]Species ‘N2(b)’ has been lumped into ‘N2*’
[11]Species ‘N2(c)’ has been lumped into ‘N2*’

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