H_2-O_2 Chemistry

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1 H_2 chemistry

The reactions are in the Arrhenius form given by

$$k = AT^{B}exp(-C/T) \tag{1}$$

The rate constants are in units of cm^3s^{-1}.

Table 1: H_2 chemistry

S/N	Reaction	A	B	C	Energy (eV)	Ref.
1	$H + E \rightarrow H^+ + 2E$	6.5023E-09	0.48931	149624.36	12.89365	[1]
2	$H_2 + E \rightarrow H^+ + H + 2E$	2.9962E-08	0.44456	437818.75	37.72836	[1]
3	$H_2^+ + E \rightarrow H^+ + H + E$	1.0702E-07	0.04876	112450.85	9.69028	[1]
4	$H_2^+ + E \rightarrow H^+ + H^+ + 2E$	2.1202E-09	0.31394	270371.5	23.29885	[1]
5	$H_2^+ + H \rightarrow H_2 + H^+$	9.0E-10	0.0	0.0	0.0	[1]
6	$H_2 + H^+ \rightarrow H_2^+ + H$	1.19E-22	0.0	0.0	0.0	[1]
7	$H_2 + E \rightarrow H_2^+ + 2E$	3.1228E-08	0.17156	232987.49	20.07734	[1]
8	$H_2 + E \rightarrow 2H + E$	1.7527E-07	-1.23668	146128.85	12.59243	[1]

2 O_2 chemistry

Table 2: O_2 chemistry

S/N	Reaction	A	B	C	Energy(eV)	Ref.
1	$O_2 + E \rightarrow O_2^+ + 2E$	9.0E-10	2.0	146216.7	12.6	[2]
2	$O_2 + E \rightarrow 2O + E$	4.23E-09	0.0	64521.02	5.56	[2]
3	$O_2 + E \rightarrow O + O^-$	4.6E-11	0.0	33769.095	4.2	[2, 3]
4	$O + E \rightarrow O^+ + 2E$	9.0E-09	0.7	157821.2	13.6	[2, 3]
5	$O^- + O_2^+ \rightarrow O + O_2$	3.46E-06	-0.5	0.0	-10.61	[3]
6	$O^- + O^+ \rightarrow O + O$	4.68E-06	-0.5	0.0	-12.69	[3]
7	$O^- + E \rightarrow O + 2E$	2.10E-10	0.5	39400	0.92	[3]

References

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[2] C Lee, DB Graves, MA Lieberman, and DW Hess. Global model of plasma chemistry in a high density oxygen discharge. *Journal of the Electrochemical Society*, 141(6):1546–1555, 1994.

[3] Douglas Paul Breden. Simulations of atmospheric pressure plasma discharges. 2013.