Supporting Information
Plasma-based dry reforming of CH_4: plasma effects vs. thermal conversion

Joachim Slaets[1], Björn Loenders[1], and Annemie Bogaerts[1]

[1]Research group PLASMANT, Department of Chemistry, University of Antwerp, Universiteitsplein 1, BE-2610 Wilrijk-Antwerp, Belgium

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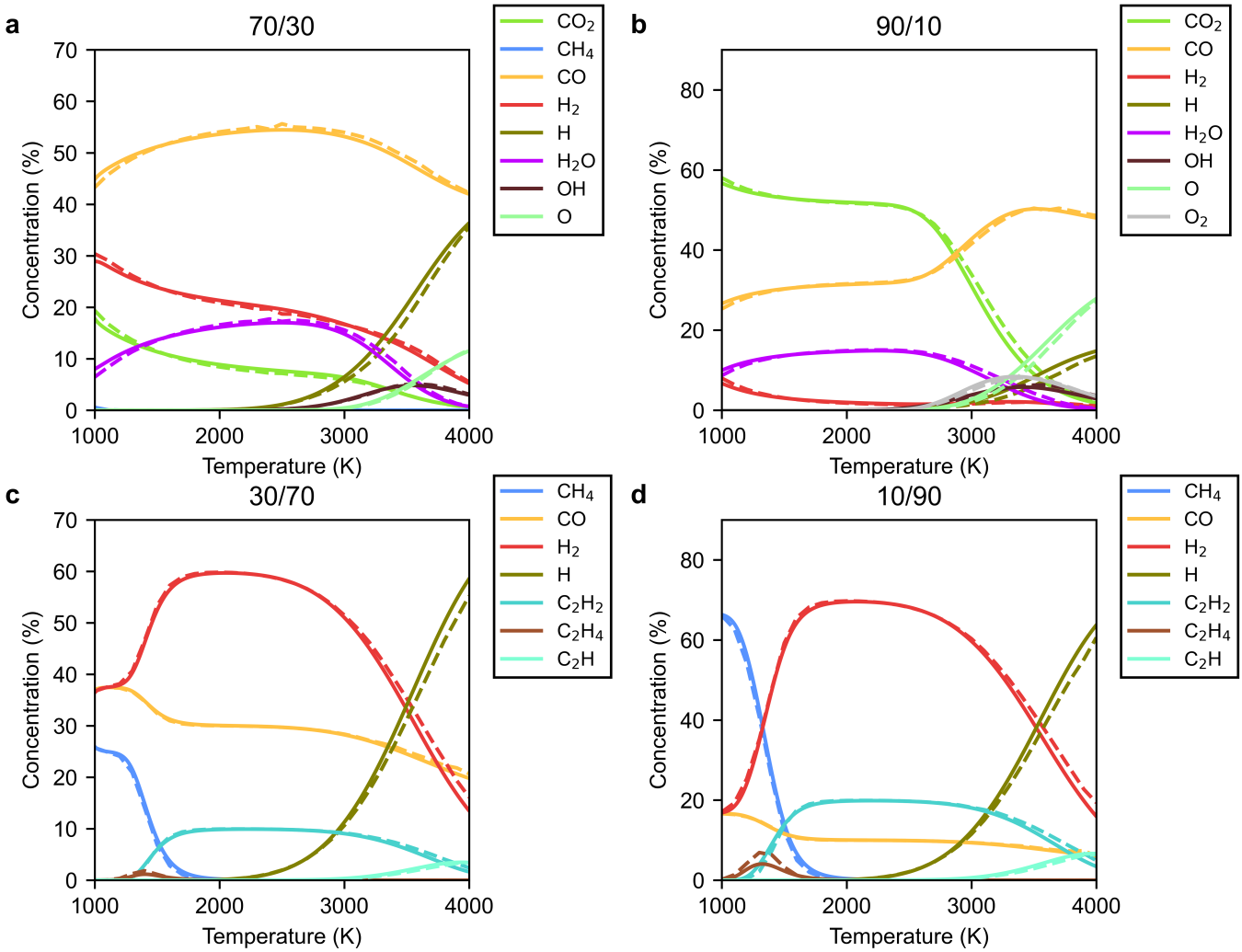

Figure S1: Calculated species concentrations of the thermal kinetics simulations (for t = 10^{10} s) (dashed) and corresponding thermodynamic equilibrium concentrations (solid), in the temperature range of 1000 to 4000 K, for four different CO_2/CH_4 ratios (70/30 (a), 90/10 (b), 30/70 (c), 10/90 (d)).

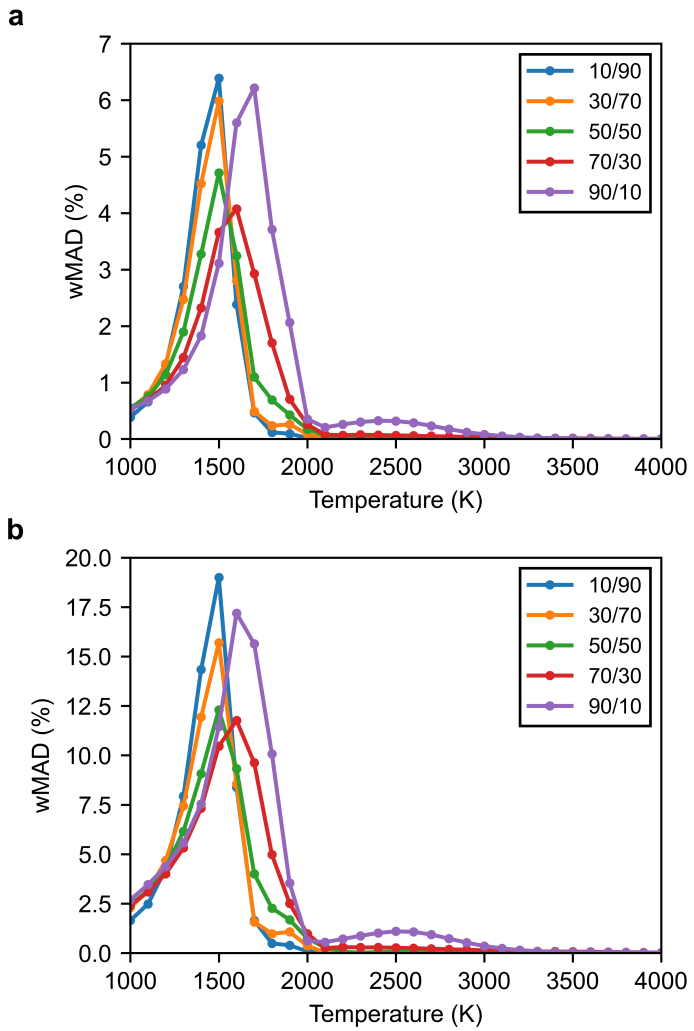

Figure S2: Weighted mean absolute deviation (wMAD) between the calculated species concentrations at thermal and plasma conditions at 500 W cm^{-3} (a) and 1500 W cm^{-3} (b), at a residence time of 10 ms, in the temperature range of 1000 to 4000 K, for five different CO_2/CH_4 ratios (90/10, 70/30, 50/50, 30/70, 10/90).

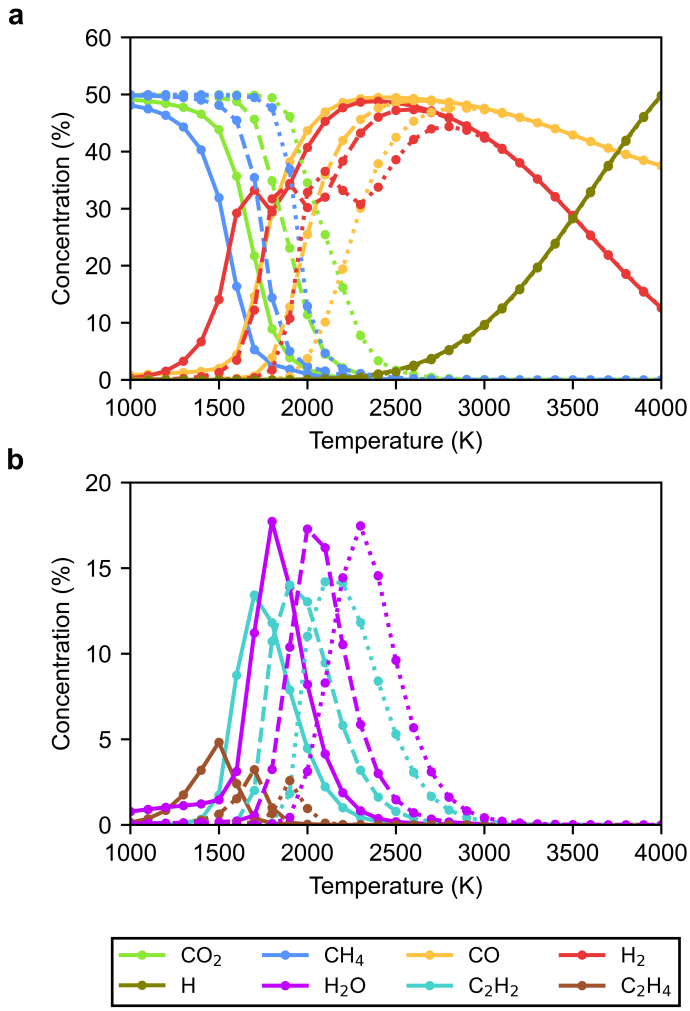

Figure S3: Calculated concentrations of the main plasma species for the temperature range of 1000 to 4000 K and a 50/50 CO_2/CH_4 ratio and 1000 W cm^{-3} plasma condition, at a residence time of 10 ms (solid lines), 1 ms (dashed lines) and 0.1 ms (dotted lines).

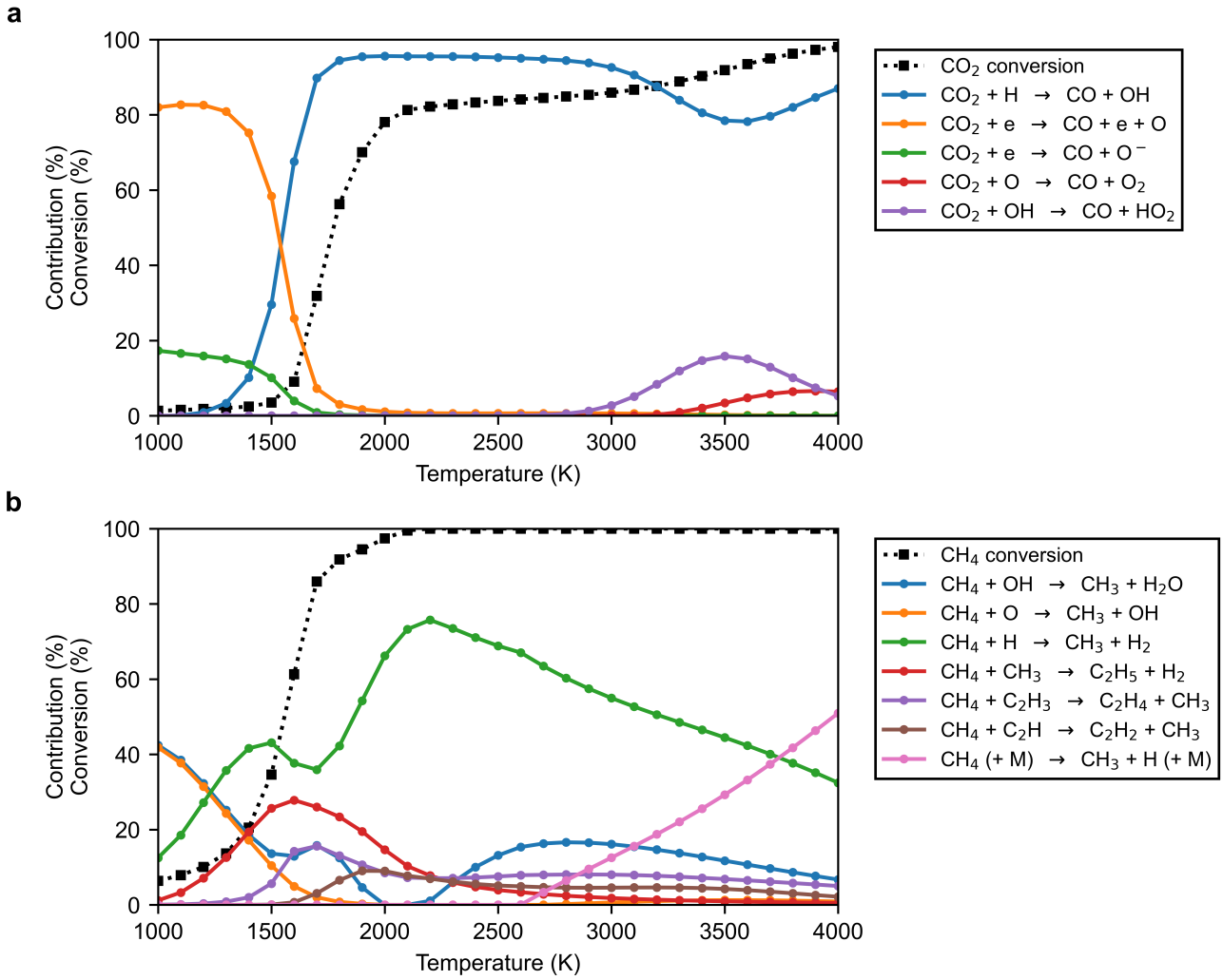

Figure S4: CO_2 (a) and CH_4 (b) conversion (dotted black lines), as well as the relative contributions of the main loss reactions (>5 %) based on the time-integrated net reaction rates (see legends), as a function of temperature, for plasma simulations with a power density of 1000 W cm^{-3} and for a 70/30 ratio of CO_2/CH_4 at a residence time of 10 ms.

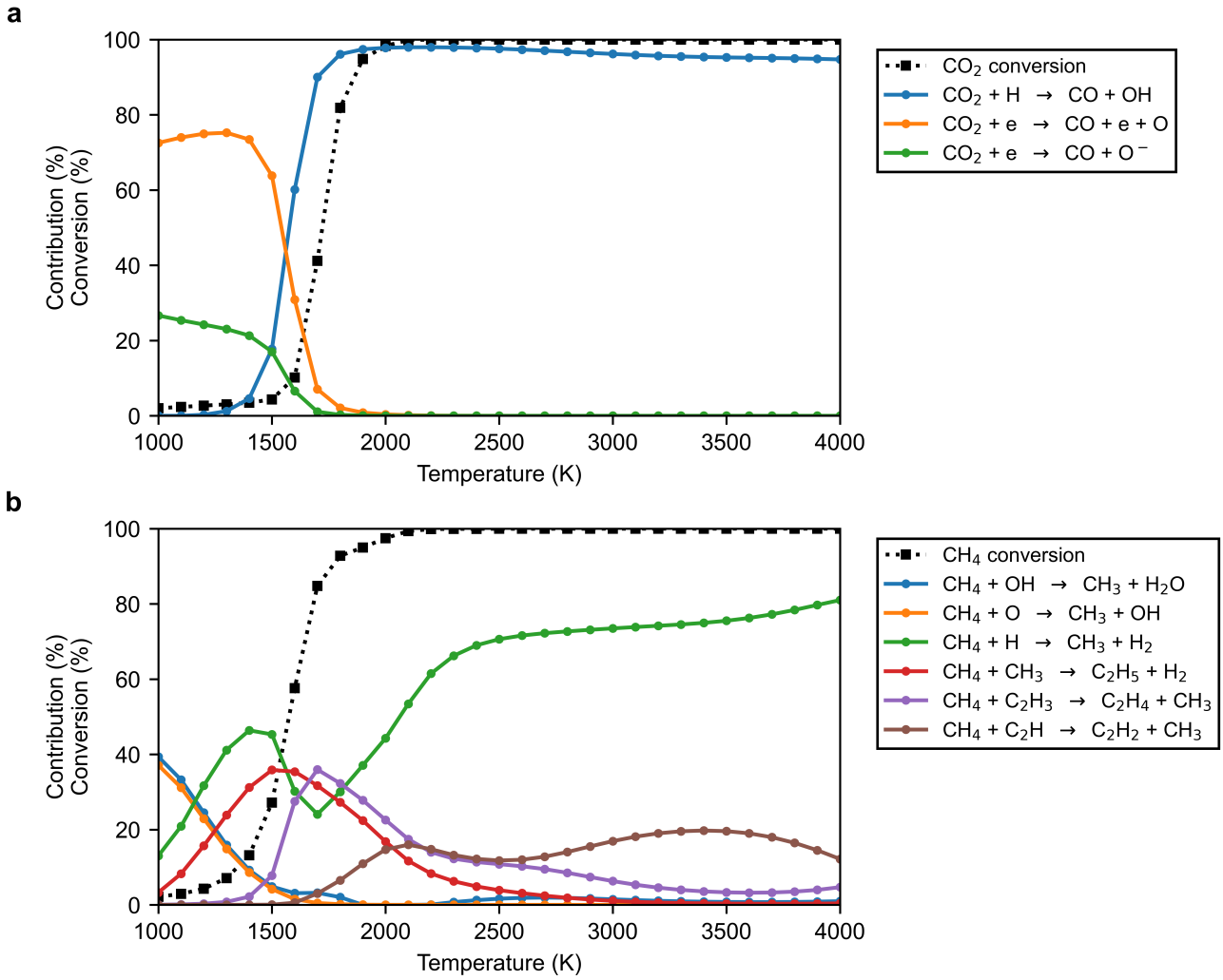

Figure S5: CO_2 (a) and CH_4 (b) conversion (dotted black lines), as well as the relative contributions of the main loss reactions (>5 %) based on the time-integrated net reaction rates (see legends), as a function of temperature, for plasma simulations with a power density of 1000 W cm^{-3} and for a 30/70 ratio of CO_2/CH_4 at a residence time of 10 ms.

Table S1: Reactions reference list with the rate coefficients (third column) expressed in $cm^3\ s^{-1}$ for two-body reactions, and in $cm^6\ s^{-1}$ for three-body reactions. In the rate equations, N_A is Avogadro's constant, k_B is the Boltzmann constant, R is the ideal gas constant, T_g is the gas temperature in K and n_M is the total number density of neutral species in cm^{-3}.

#	Reaction	Rate equation	Ref.
1	$C + H^- \rightarrow CH + e$	1×10^{-9}	[1]
2	$C + H_3^+ \rightarrow CH^+ + H_2$	2×10^{-9}	[1]
3	$C + H_2^+ \rightarrow CH^+ + H$	2.4×10^{-9}	[1]
4	$C^+ + H^- \rightarrow C + H$	$7.51 \times 10^{-8} \cdot \left(\frac{T_g}{3\times10^2}\right)^{-0.5}$	[2, 3]
5	$CH_4 + H \rightarrow CH_3 + H_2$	$6.4 \times 10^{-18} \cdot T_g^{2.11} \cdot \exp\left(\frac{-3.9\times10^3}{T_g}\right)$	[4]
6	$CH_3 + H_2 \rightarrow CH_4 + H$	$6.62 \times 10^{-20} \cdot T_g^{2.24} \cdot \exp\left(\frac{-3.22\times10^3}{T_g}\right)$	[4]
7	$CH_3 + H \rightarrow CH_2 + H_2$	$2.1 \times 10^{-8} \cdot T_g^{-0.56} \cdot \exp\left(\frac{-8.0\times10^3}{T_g}\right)$	[5]
8	$CH_3 + H \rightarrow CH_4$	$k_0 = 1.7 \times 10^{-24} \cdot T_g^{-1.8}$ $k_\infty = 3.5 \times 10^{-10}$ $F_c = 0.63 \cdot \exp\left(\frac{-T_g}{3.3150\times10^3}\right)$ $+0.37 \cdot \exp\left(\frac{-T_g}{6.10\times10^1}\right)$	[5][a]
9	$CH_2 + H_2 \rightarrow CH_3 + H$	$7.32 \times 10^{-19} \cdot T_g^{2.3} \cdot \exp\left(\frac{-3.6990\times10^3}{T_g}\right)$	[6]
10	$CH_2 + H \rightarrow CH + H_2$	2×10^{-10}	[5]
11	$CH + H_2 \rightarrow CH_2 + H$	$2.9 \times 10^{-10} \cdot \exp\left(\frac{-1.670\times10^3}{T_g}\right)$	[5]
12	$CH + H_2 \rightarrow CH_3$	$k_0 = 4.7 \times 10^{-26} \cdot T_g^{-1.6}$ $k_\infty = 8.5 \times 10^{-11} \cdot T_g^{0.15}$ $F_c = 0.48$ $+0.25 \cdot \exp\left(\frac{-T_g}{3.0\times10^2}\right)$	[5][a]
13	$CH + H \rightarrow C + H_2$	2×10^{-10}	[5]
14	$CH_4 + H^+ \rightarrow CH_4^+ + H$	1.5×10^{-9}	[1]
15	$CH_4 + H^+ \rightarrow CH_3^+ + H_2$	2.3×10^{-9}	[1]
16	$CH_3 + H^+ \rightarrow CH_3^+ + H$	3.4×10^{-9}	[1]
17	$CH_2 + H^+ \rightarrow CH_2^+ + H$	1.4×10^{-9}	[1]
18	$CH_2 + H^+ \rightarrow CH^+ + H_2$	1.4×10^{-9}	[1]
19	$CH + H^+ \rightarrow CH^+ + H$	1.9×10^{-9}	[1]
20	$CH_4 + H_2^+ \rightarrow CH_5^+ + H$	1.14×10^{-10}	[7]
21	$CH_4 + H_2^+ \rightarrow CH_4^+ + H_2$	1.406×10^{-9}	[7]
22	$CH_4 + H_2^+ \rightarrow CH_3^+ + H + H_2$	2.28×10^{-9}	[7]
23	$CH_2 + H_2^+ \rightarrow CH_3^+ + H$	1×10^{-9}	[1]
24	$CH_2 + H_2^+ \rightarrow CH_2^+ + H_2$	1×10^{-9}	[1]
25	$CH + H_2^+ \rightarrow CH_2^+ + H$	7.1×10^{-10}	[1]
26	$CH + H_2^+ \rightarrow CH^+ + H_2$	7.1×10^{-10}	[1]
27	$CH_4 + H_3^+ \rightarrow CH_5^+ + H_2$	2.4×10^{-9}	[1]
28	$CH_3 + H_3^+ \rightarrow CH_4^+ + H_2$	2.1×10^{-9}	[1]
29	$CH_2 + H_3^+ \rightarrow CH_3^+ + H_2$	1.7×10^{-9}	[1]
30	$CH + H_3^+ \rightarrow CH_2^+ + H_2$	1.2×10^{-9}	[1]
31	$CH_3 + H^- \rightarrow CH_4 + e$	1×10^{-9}	[1]
32	$CH_2 + H^- \rightarrow CH_3 + e$	1×10^{-9}	[1]

#	Reaction	Rate equation	Ref.
33	$CH + H^- \rightarrow CH_2 + e$	1×10^{-10}	[1]
34	$CH_5^+ + H \rightarrow CH_4^+ + H_2$	1.5×10^{-10}	[8]
35	$CH_4^+ + H_2 \rightarrow CH_5^+ + H$	3.3×10^{-11}	[9]
36	$CH_4^+ + H \rightarrow CH_3^+ + H_2$	2×10^{-10}	[1]
37	$CH_2^+ + H_2 \rightarrow CH_3^+ + H$	1.6×10^{-9}	[9]
38	$CH^+ + H_2 \rightarrow CH_2^+ + H$	1.2×10^{-9}	[8]
39	$CH_3^+ + H^- \rightarrow CH_3 + H$	$7.51 \times 10^{-8} \cdot \left(\frac{T_g}{3\times10^2}\right)^{-0.5}$	[2, 3]
40	$C + CH_4 \rightarrow C_2H_4$	5×10^{-15}	[10]
41	$C + CH_3 \rightarrow C_2H_2 + H$	8.3×10^{-11}	[11]
42	$C + CH_2 \rightarrow C_2H + H$	8.3×10^{-11}	[11]
43	$CH_4 + C^+ \rightarrow C_2H_3^+ + H$	1×10^{-9}	[12]
44	$CH_4 + C^+ \rightarrow C_2H_2^+ + H_2$	3.89×10^{-10}	[12]
45	$CH_3 + C^+ \rightarrow C_2H_2^+ + H$	1.3×10^{-9}	[1]
46	$CH_3 + C^+ \rightarrow C_2H^+ + H_2$	1×10^{-9}	[13]
47	$CH_2 + C^+ \rightarrow C + CH_2^+$	5.2×10^{-10}	[1]
48	$CH_2 + C^+ \rightarrow C_2H^+ + H$	5.2×10^{-10}	[1]
49	$CH + C^+ \rightarrow C + CH^+$	3.8×10^{-10}	[1]
50	$C + CH_5^+ \rightarrow CH_4 + CH^+$	1.2×10^{-9}	[1]
51	$C + CH_3^+ \rightarrow C_2H^+ + H_2$	1.2×10^{-9}	[1]
52	$C + CH_2^+ \rightarrow C_2H^+ + H$	1.2×10^{-9}	[1]
53	$CH_3 + CH_4 \rightarrow C_2H_6 + H$	$\frac{8\times10^{13}}{N_A} \cdot \exp\left(\frac{-1.6736\times10^5}{R\cdot T_g}\right)$	[14]
54	$CH_3 + CH_4 \rightarrow C_2H_5 + H_2$	$\frac{1\times10^{13}}{N_A} \cdot \exp\left(\frac{-9.6232\times10^4}{R\cdot T_g}\right)$	[14]
55	$CH_2 + CH_4 \rightarrow CH_3 + CH_3$	$7.14 \times 10^{-12} \cdot \exp\left(\frac{-4.199\times10^4}{R\cdot T_g}\right)$	[15]
56	$CH + CH_4 \rightarrow C_2H_4 + H$	$2.2 \times 10^{-8} \cdot T_g^{-0.94} \cdot \exp\left(\frac{-2.9\times10^1}{T_g}\right)$	[5]
57	$CH_3 + CH_3 \rightarrow C_2H_6$	$k_0 = 3.5 \times 10^{-7} \cdot T_g^{-7} \cdot \exp\left(\frac{-1.39\times10^3}{T_g}\right)$ $k_\infty = 6 \times 10^{-11}$ $F_c = 0.38 \cdot \exp\left(\frac{-T_g}{7.3\times10^1}\right)$ $+0.62 \cdot \exp\left(\frac{-T_g}{1.18\times10^3}\right)$	[5][a]
58	$CH_3 + CH_3 \rightarrow C_2H_5 + H$	$9 \times 10^{-11} \cdot \exp\left(\frac{-8.08\times10^3}{T_g}\right)$	[5]
59	$CH_3 + CH_3 \rightarrow CH_2 + CH_4$	$5.6 \times 10^{-17} \cdot T_g^{1.34} \cdot \exp\left(\frac{-6.791\times10^4}{R\cdot T_g}\right)$	[16]
60	$CH_2 + CH_3 \rightarrow C_2H_4 + H$	1.2×10^{-10}	[5]
61	$CH_2 + CH_2 \rightarrow C_2H_2 + H_2$	$\frac{10^{1.52\times10^1}}{N_A} \cdot \exp\left(\frac{-5\times10^4}{R\cdot T_g}\right)$	[17]
62	$CH + CH \rightarrow C_2H_2$	$\frac{1.2\times10^{14}}{N_A}$	[18]
63	$CH_2 + CH_5^+ \rightarrow CH_3^+ + CH_4$	9.6×10^{-10}	[1]
64	$CH + CH_5^+ \rightarrow CH_2^+ + CH_4$	6.9×10^{-10}	[1]
65	$CH_4 + CH_4^+ \rightarrow CH_3 + CH_5^+$	1.5×10^{-9}	[9]
66	$CH_3^+ + CH_4 \rightarrow CH_3 + CH_4^+$	1.36×10^{-10}	[19]
67	$CH_3^+ + CH_4 \rightarrow C_2H_5^+ + H_2$	1.2×10^{-9}	[20]
68	$CH_2 + CH_3^+ \rightarrow C_2H_3^+ + H_2$	9.9×10^{-10}	[1]
69	$CH + CH_3^+ \rightarrow C_2H_2^+ + H_2$	7.1×10^{-10}	[1]

#	Reaction	Rate equation	Ref.
70	$CH_2^+ + CH_4 \rightarrow CH_3 + CH_3^+$	1.38×10^{-10}	[21]
71	$CH_2^+ + CH_4 \rightarrow C_2H_5^+ + H$	3.6×10^{-10}	[9]
72	$CH_2^+ + CH_4 \rightarrow C_2H_4^+ + H_2$	8.4×10^{-10}	[9]
73	$CH_2^+ + CH_4 \rightarrow C_2H_3^+ + H + H_2$	2.31×10^{-10}	[21]
74	$CH_2^+ + CH_4 \rightarrow C_2H_2^+ + H_2 + H_2$	3.97×10^{-10}	[21]
75	$CH_4 + CH^+ \rightarrow C_2H_4^+ + H$	6.5×10^{-11}	[9]
76	$CH_4 + CH^+ \rightarrow C_2H_3^+ + H_2$	1.09×10^{-9}	[9]
77	$CH_4 + CH^+ \rightarrow C_2H_2^+ + H + H_2$	1.43×10^{-10}	[9]
78	$CH_2 + CH^+ \rightarrow C_2H^+ + H_2$	1×10^{-9}	[1]
79	$CH_4 + e \rightarrow CH_4^+ + e + e$	$f(\sigma)$	[22, 23]
80	$CH_3 + e \rightarrow CH_3^+ + e + e$	$f(\sigma)$	[22, 23]
81	$CH_2 + e \rightarrow CH_2^+ + e + e$	$f(\sigma)$	[22, 23]
82	$CH + e \rightarrow CH^+ + e + e$	$f(\sigma)$	[22, 23]
83	$CH_4 + e \rightarrow CH_3^+ + e + e + H$	$f(\sigma)$	[22, 23]
84	$CH_4 + e \rightarrow CH_2^+ + e + e + H_2$	$f(\sigma)$	[22, 23]
85	$CH_4 + e \rightarrow CH_2^+ + e + e + H + H$	$f(\sigma)$	[22, 23]
86	$CH_4 + e \rightarrow CH^+ + e + e + H + H_2$	$f(\sigma)$	[22, 23]
87	$CH_3 + e \rightarrow CH_2^+ + e + e + H$	$f(\sigma)$	[22, 23]
88	$CH_3 + e \rightarrow CH^+ + e + e + H_2$	$f(\sigma)$	[22, 23]
89	$CH_3 + e \rightarrow CH^+ + e + e + H + H$	$f(\sigma)$	[22, 23]
90	$CH_3 + e \rightarrow C^+ + e + e + H + H_2$	$f(\sigma)$	[22, 23]
91	$CH_3 + e \rightarrow CH_2 + e + e + H^+$	$f(\sigma)$	[22, 23]
92	$CH_2 + e \rightarrow CH^+ + e + e + H$	$f(\sigma)$	[22, 23]
93	$CH_2 + e \rightarrow C^+ + e + e + H_2$	$f(\sigma)$	[22, 23]
94	$CH_2 + e \rightarrow C^+ + e + e + H + H$	$f(\sigma)$	[22, 23]
95	$CH_2 + e \rightarrow CH + e + e + H^+$	$f(\sigma)$	[22, 23]
96	$CH_2 + e \rightarrow C + e + e + H_2^+$	$f(\sigma)$	[22, 23]
97	$CH + e \rightarrow C^+ + e + e + H$	$f(\sigma)$	[22, 23]
98	$CH + e \rightarrow C + e + e + H^+$	$f(\sigma)$	[22, 23]
99	$CH_4 + e \rightarrow CH_3 + e + H$	$f(\sigma)$	[22, 23]
100	$CH_4 + e \rightarrow CH + e + H + H_2$	$f(\sigma)$	[22, 23]
101	$CH_4 + e \rightarrow C + e + H + H + H_2$	$f(\sigma)$	[22, 23]
102	$CH_4 + e \rightarrow C + e + H_2 + H_2$	$f(\sigma)$	[22, 23]
103	$CH_4 + e \rightarrow CH_2 + e + H_2$	$f(\sigma)$	[22, 23]
104	$CH_4 + e \rightarrow CH_2 + e + H + H$	$f(\sigma)$	[22, 23]
105	$CH_3 + e \rightarrow CH + e + H_2$	$f(\sigma)$	[22, 23]
106	$CH_3 + e \rightarrow C + e + H + H_2$	$f(\sigma)$	[22, 23]
107	$CH_3 + e \rightarrow CH + e + H + H$	$f(\sigma)$	[22, 23]
108	$CH_3 + e \rightarrow CH_2 + e + H$	$f(\sigma)$	[22, 23]
109	$CH_2 + e \rightarrow C + e + H_2$	$f(\sigma)$	[22, 23]

#	Reaction	Rate equation	Ref.
110	$CH_2 + e \rightarrow CH + e + H$	$f(\sigma)$	[22, 23]
111	$CH_2 + e \rightarrow C + e + H + H$	$f(\sigma)$	[22, 23]
112	$CH + e \rightarrow C + e + H$	$f(\sigma)$	[22, 23]
113	$CH_4^+ + e \rightarrow CH_3^+ + e + e + H^+$	$f(\sigma)$	[22, 23]
114	$CH_4^+ + e \rightarrow CH_3^+ + e + H$	$f(\sigma)$	[22, 23]
115	$CH_4^+ + e \rightarrow CH_2^+ + e + H_2$	$f(\sigma)$	[22, 23]
116	$CH_4^+ + e \rightarrow CH_2^+ + e + H + H$	$f(\sigma)$	[22, 23]
117	$CH_4^+ + e \rightarrow CH^+ + e + H + H_2$	$f(\sigma)$	[22, 23]
118	$CH_4^+ + e \rightarrow CH^+ + e + H + H + H$	$f(\sigma)$	[22, 23]
119	$CH_4^+ + e \rightarrow C^+ + e + H_2 + H_2$	$f(\sigma)$	[22, 23]
120	$CH_4^+ + e \rightarrow C^+ + e + H + H + H_2$	$f(\sigma)$	[22, 23]
121	$CH_4^+ + e \rightarrow C^+ + e + H + H + H + H$	$f(\sigma)$	[22, 23]
122	$CH_4^+ + e \rightarrow CH + e + H_3^+$	$f(\sigma)$	[22, 23]
123	$CH_4^+ + e \rightarrow C + e + H_2 + H_2^+$	$f(\sigma)$	[22, 23]
124	$CH_4^+ + e \rightarrow CH + e + H + H_2^+$	$f(\sigma)$	[22, 23]
125	$CH_4^+ + e \rightarrow CH_2 + e + H_2^+$	$f(\sigma)$	[22, 23]
126	$CH_4^+ + e \rightarrow C + e + H + H + H_2^+$	$f(\sigma)$	[22, 23]
127	$CH_4^+ + e \rightarrow CH_2 + e + H + H^+$	$f(\sigma)$	[22, 23]
128	$CH_4^+ + e \rightarrow CH_3 + e + H^+$	$f(\sigma)$	[22, 23]
129	$CH_4^+ + e \rightarrow CH + e + H_2 + H^+$	$f(\sigma)$	[22, 23]
130	$CH_3^+ + e \rightarrow CH_2^+ + e + H$	$f(\sigma)$	[22, 23]
131	$CH_3^+ + e \rightarrow CH^+ + e + H_2$	$f(\sigma)$	[22, 23]
132	$CH_3^+ + e \rightarrow CH^+ + e + H + H$	$f(\sigma)$	[22, 23]
133	$CH_3^+ + e \rightarrow C^+ + e + H + H_2$	$f(\sigma)$	[22, 23]
134	$CH_3^+ + e \rightarrow C^+ + e + H + H + H$	$f(\sigma)$	[22, 23]
135	$CH_3^+ + e \rightarrow C + e + H + H_2^+$	$f(\sigma)$	[22, 23]
136	$CH_3^+ + e \rightarrow CH + e + H_2^+$	$f(\sigma)$	[22, 23]
137	$CH_3^+ + e \rightarrow C + e + H_2 + H^+$	$f(\sigma)$	[22, 23]
138	$CH_3^+ + e \rightarrow CH_2 + e + H^+$	$f(\sigma)$	[22, 23]
139	$CH_3^+ + e \rightarrow CH + e + H + H^+$	$f(\sigma)$	[22, 23]
140	$CH_2^+ + e \rightarrow CH^+ + e + H$	$f(\sigma)$	[22, 23]
141	$CH_2^+ + e \rightarrow C^+ + e + H_2$	$f(\sigma)$	[22, 23]
142	$CH_2^+ + e \rightarrow C^+ + e + H + H$	$f(\sigma)$	[22, 23]
143	$CH_2^+ + e \rightarrow C + e + H_2^+$	$f(\sigma)$	[22, 23]
144	$CH_2^+ + e \rightarrow CH + e + H^+$	$f(\sigma)$	[22, 23]
145	$CH_2^+ + e \rightarrow C + e + H + H^+$	$f(\sigma)$	[22, 23]
146	$CH^+ + e \rightarrow C + e + H^+$	$f(\sigma)$	[22, 23]
147	$CH^+ + e \rightarrow C^+ + e + H$	$f(\sigma)$	[22, 23]
148	$CH_4^+ + e \rightarrow CH_3 + H$	$f(\sigma)$	[22, 23]
149	$CH_4^+ + e \rightarrow CH + H + H_2$	$f(\sigma)$	[22, 23]

#	Reaction	Rate equation	Ref.
150	$CH_4^+ + e \rightarrow C + H_2 + H_2$	$f(\sigma)$	[22, 23]
151	$CH_4^+ + e \rightarrow CH_2 + H_2$	$f(\sigma)$	[22, 23]
152	$CH_4^+ + e \rightarrow CH_2 + H + H$	$f(\sigma)$	[22, 23]
153	$CH_3^+ + e \rightarrow CH + H_2$	$f(\sigma)$	[22, 23]
154	$CH_3^+ + e \rightarrow C + H + H_2$	$f(\sigma)$	[22, 23]
155	$CH_3^+ + e \rightarrow CH + H + H$	$f(\sigma)$	[22, 23]
156	$CH_3^+ + e \rightarrow CH_2 + H$	$f(\sigma)$	[22, 23]
157	$CH_2^+ + e \rightarrow C + H_2$	$f(\sigma)$	[22, 23]
158	$CH_2^+ + e \rightarrow CH + H$	$f(\sigma)$	[22, 23]
159	$CH_2^+ + e \rightarrow C + H + H$	$f(\sigma)$	[22, 23]
160	$CH^+ + e \rightarrow C + H$	$f(\sigma)$	[22, 23]
161	$CH_4 + e \rightarrow CH_3 + H^-$	$f(\sigma)$	[24]
162	$CH_4 \rightarrow CH_3 + H$	$k_0 = 7.5 \times 10^{-7} \cdot \exp\left(\frac{-4.570\times10^4}{T_g}\right)$ $k_\infty = 2.4 \times 10^{16} \cdot \exp\left(\frac{-5.280\times10^4}{T_g}\right)$ $F_c = \exp\left(\frac{-T_g}{1.350\times10^3}\right)$ $+ \exp\left(\frac{-7.8340\times10^3}{T_g}\right)$	[5][a]
163	$CH_3 \rightarrow CH + H_2$	$1.1 \times 10^{-8} \cdot \exp\left(\frac{-4.280\times10^4}{T_g}\right) \cdot n_M$	[5]
164	$CH_3 \rightarrow CH_2 + H$	$1.7 \times 10^{-8} \cdot \exp\left(\frac{-4.560\times10^4}{T_g}\right) \cdot n_M$	[5]
165	$CH_2 \rightarrow CH + H$	$1.56 \times 10^{-8} \cdot \exp\left(\frac{-4.488\times10^4}{T_g}\right) \cdot n_M$	[5]
166	$CH_2 \rightarrow C + H_2$	$5 \times 10^{-10} \cdot \exp\left(\frac{-3.26\times10^4}{T_g}\right) \cdot n_M$	[5]
167	$CH \rightarrow C + H$	$\frac{1.9\times10^{14}}{N_A} \cdot \exp\left(\frac{-3.37\times10^4}{T_g}\right) \cdot n_M$	[11]
168	$C_2H_6 + H \rightarrow C_2H_5 + H_2$	$1.63 \times 10^{-10} \cdot \exp\left(\frac{-4.640\times10^3}{T_g}\right)$	[5]
169	$C_2H_5 + H_2 \rightarrow C_2H_6 + H$	$5.1 \times 10^{-24} \cdot T_g^{3.6} \cdot \exp\left(\frac{-4.253\times10^3}{T_g}\right)$	[5]
170	$C_2H_5 + H \rightarrow CH_3 + CH_3$	7×10^{-11}	[5]
171	$C_2H_5 + H \rightarrow C_2H_6$	$\frac{6\times10^{-11}}{1+10^{-1.915+2.69\times10^{-3}\cdot T_g-2.35\times10^{-7}\cdot T_g^2}}$	[25]
172	$C_2H_5 + H \rightarrow C_2H_4 + H_2$	3×10^{-12}	[25]
173	$C_2H_4 + H_2 \rightarrow C_2H_5 + H$	$1.7 \times 10^{-11} \cdot \exp\left(\frac{-3.43\times10^4}{T_g}\right)$	[25]
174	$C_2H_4 + H \rightarrow C_2H_3 + H_2$	$3.9 \times 10^{-22} \cdot T_g^{3.62} \cdot \exp\left(\frac{-5.67\times10^3}{T_g}\right)$	[5]
175	$C_2H_4 + H \rightarrow C_2H_5$	$k_0 = 1.3 \times 10^{-29} \cdot \exp\left(\frac{-3.8\times10^2}{T_g}\right)$ $k_\infty = 6.6 \times 10^{-15} \cdot T_g^{1.28} \cdot \exp\left(\frac{-6.5\times10^2}{T_g}\right)$ $F_c = 0.24 \cdot \exp\left(\frac{-T_g}{4\times10^1}\right)$ $+0.76 \cdot \exp\left(\frac{-T_g}{1.025\times10^3}\right)$	[5][a]
176	$C_2H_3 + H_2 \rightarrow C_2H_4 + H$	$1.57 \times 10^{-20} \cdot T_g^{2.56} \cdot \exp\left(\frac{-2.529\times10^3}{T_g}\right)$	[26]
177	$C_2H_3 + H \rightarrow C_2H_2 + H_2$	7×10^{-11}	[5]
178	$C_2H_3 + H \rightarrow C_2H_4$	$k_0 = 3.5 \times 10^{-27}$ $k_\infty = 1.6 \times 10^{-10}$ $F_c = 0.5$	[5][a]
179	$C_2H_2 + H_2 \rightarrow C_2H_3 + H$	$4 \times 10^{-12} \cdot \exp\left(\frac{-3.27\times10^4}{T_g}\right)$	[25]
180	$C_2H_2 + H_2 \rightarrow C_2H_4$	$5 \times 10^{-13} \cdot \exp\left(\frac{-1.96\times10^4}{T_g}\right)$	[25]

#	Reaction	Rate equation	Ref.
181	$C_2H_2 + H \rightarrow C_2H_3$	$k_0 = 1 \times 10^{-20} \cdot T_g^{-3.38} \cdot \exp\left(\frac{-4.26\times10^2}{T_g}\right)$ $k_\infty = 9.2 \times 10^{-16} \cdot T_g^{1.64} \cdot \exp\left(\frac{-1.055\times10^3}{T_g}\right)$ $F_c = 7.37 \times 10^{-4} \cdot T_g^{0.8}$	[5][a]
182	$C_2H_2 + H \rightarrow C_2H + H_2$	$1.67 \times 10^{-14} \cdot T_g^{1.64} \cdot \exp\left(\frac{-1.525\times10^4}{T_g}\right)$	[5]
183	$C_2H + H_2 \rightarrow C_2H_2 + H$	$3.5 \times 10^{-18} \cdot T_g^{2.32} \cdot \exp\left(\frac{-4.44\times10^2}{T_g}\right)$	[5]
184	$C_2H + H \rightarrow C_2H_2$	3×10^{-10}	[25]
185	$C_2H_6^+ + H \rightarrow C_2H_5^+ + H_2$	1×10^{-10}	[27]
186	$C_2H_5^+ + H \rightarrow C_2H_4^+ + H_2$	1×10^{-11}	[8]
187	$C_2H_4^+ + H \rightarrow C_2H_3^+ + H_2$	3×10^{-10}	[8]
188	$C_2H_3^+ + H \rightarrow C_2H_2^+ + H_2$	6.8×10^{-11}	[8]
189	$C_2H_2^+ + H_2 \rightarrow C_2H_3^+ + H$	1×10^{-11}	[8]
190	$C_2H^+ + H_2 \rightarrow C_2H_2^+ + H$	1.1×10^{-9}	[8]
191	$C_2H_6 + H^+ \rightarrow C_2H_5^+ + H_2$	1.287×10^{-9}	[28]
192	$C_2H_6 + H^+ \rightarrow C_2H_4^+ + H + H_2$	1.287×10^{-9}	[28]
193	$C_2H_6 + H^+ \rightarrow C_2H_3^+ + H_2 + H_2$	1.287×10^{-9}	[28]
194	$C_2H_4 + H^+ \rightarrow C_2H_4^+ + H$	9.8×10^{-10}	[29]
195	$C_2H_4 + H^+ \rightarrow C_2H_3^+ + H_2$	2.94×10^{-9}	[29]
196	$C_2H_4 + H^+ \rightarrow C_2H_2^+ + H + H_2$	9.8×10^{-10}	[29]
197	$C_2H_3 + H^+ \rightarrow C_2H_3^+ + H$	2×10^{-9}	[13]
198	$C_2H_3 + H^+ \rightarrow C_2H_2^+ + H_2$	2×10^{-9}	[13]
199	$C_2H_2 + H^+ \rightarrow C_2H_2^+ + H$	5.4×10^{-10}	[29]
200	$C_2H + H^+ \rightarrow C_2H^+ + H$	1.5×10^{-9}	[1]
201	$C_2H_6 + H_2^+ \rightarrow C_2H_6^+ + H_2$	2.94×10^{-10}	[7]
202	$C_2H_6 + H_2^+ \rightarrow C_2H_5^+ + H + H_2$	1.372×10^{-9}	[7]
203	$C_2H_6 + H_2^+ \rightarrow C_2H_4^+ + H_2 + H_2$	2.352×10^{-9}	[7]
204	$C_2H_6 + H_2^+ \rightarrow C_2H_3^+ + H + H_2 + H_2$	6.86×10^{-10}	[7]
205	$C_2H_6 + H_2^+ \rightarrow C_2H_2^+ + H_2 + H_2 + H_2$	1.96×10^{-10}	[7]
206	$C_2H_4 + H_2^+ \rightarrow C_2H_4^+ + H_2$	2.205×10^{-9}	[7]
207	$C_2H_4 + H_2^+ \rightarrow C_2H_3^+ + H + H_2$	1.813×10^{-9}	[7]
208	$C_2H_4 + H_2^+ \rightarrow C_2H_2^+ + H_2 + H_2$	8.82×10^{-10}	[7]
209	$C_2H_2 + H_2^+ \rightarrow C_2H_3^+ + H$	4.77×10^{-10}	[7]
210	$C_2H_2 + H_2^+ \rightarrow C_2H_2^+ + H_2$	4.823×10^{-9}	[7]
211	$C_2H + H_2^+ \rightarrow C_2H_2^+ + H$	1×10^{-9}	[1]
212	$C_2H + H_2^+ \rightarrow C_2H^+ + H_2$	1×10^{-9}	[1]
213	$C_2H_6 + H_3^+ \rightarrow C_2H_5^+ + H_2 + H_2$	3.4×10^{-9}	[30, 31]
214	$C_2H_4 + H_3^+ \rightarrow C_2H_5^+ + H_2$	1.44×10^{-9}	[30, 31]
215	$C_2H_4 + H_3^+ \rightarrow C_2H_3^+ + H_2 + H_2$	2.16×10^{-9}	[30, 31]
216	$C_2H_2 + H_3^+ \rightarrow C_2H_3^+ + H_2$	3.5×10^{-9}	[30, 31]
217	$C_2H + H_3^+ \rightarrow C_2H_2^+ + H_2$	1.7×10^{-9}	[1]
218	$C_2H + H^- \rightarrow C_2H_2 + e$	1×10^{-9}	[1]

#	Reaction	Rate equation	Ref.
219	$C_2H_2^+ + H^- \rightarrow C_2H_2 + H$	$7.51 \times 10^{-8} \cdot \left(\frac{T_g}{3\times10^2}\right)^{-0.5}$	[2, 3]
220	$C_2H_3^+ + H^- \rightarrow C_2H_3 + H$	$7.51 \times 10^{-8} \cdot \left(\frac{T_g}{3\times10^2}\right)^{-0.5}$	[2, 3]
221	$C + C_2H_4 \rightarrow C_2H_2 + CH_2$	1.239×10^{-11}	[32, 33]
222	$C_2H_6 + CH_3 \rightarrow C_2H_5 + CH_4$	$9.3 \times 10^{-14} \cdot \exp\left(\frac{-4.740\times10^3}{T_g}\right)$ $+1.4 \times 10^{-9} \cdot \exp\left(\frac{-1.120\times10^4}{T_g}\right)$	[5]
223	$C_2H_6 + CH_2 \rightarrow C_2H_5 + CH_3$	$\frac{6.5\times10^{12}}{N_A} \cdot \exp\left(\frac{-3.31\times10^4}{R\cdot T_g}\right)$	[15]
224	$C_2H_6 + CH \rightarrow C_2H_4 + CH_3$	1.3×10^{-10}	[34]
225	$C_2H_5 + CH_4 \rightarrow C_2H_6 + CH_3$	$1.43 \times 10^{-25} \cdot T_g^{4.14} \cdot \exp\left(\frac{-6.322\times10^3}{T_g}\right)$	[25]
226	$C_2H_5 + CH_3 \rightarrow C_2H_4 + CH_4$	1.5×10^{-12}	[5]
227	$C_2H_5 + CH_3 \rightarrow C_2H_6 + CH_2$	$3 \times 10^{-44} \cdot T_g^{9.0956}$	[35]
228	$C_2H_5 + CH_2 \rightarrow C_2H_4 + CH_3$	3×10^{-11}	[25]
229	$C_2H_4 + CH_3 \rightarrow C_2H_3 + CH_4$	$1 \times 10^{-16} \cdot T_g^{1.56} \cdot \exp\left(\frac{-8.37\times10^3}{T_g}\right)$	[5]
230	$C_2H_3 + CH_4 \rightarrow C_2H_4 + CH_3$	$2.4 \times 10^{-24} \cdot T_g^{4.02} \cdot \exp\left(\frac{-2.754\times10^3}{T_g}\right)$	[25]
231	$C_2H_3 + CH_3 \rightarrow C_2H_2 + CH_4$	$1.5 \times 10^{-11} \cdot \exp\left(\frac{3.850\times10^2}{T_g}\right)$	[36]
232	$C_2H_3 + CH_2 \rightarrow C_2H_2 + CH_3$	3×10^{-11}	[25]
233	$C_2H_2 + CH_3 \rightarrow C_2H + CH_4$	$3 \times 10^{-13} \cdot \exp\left(\frac{-8.7\times10^3}{T_g}\right)$	[25]
234	$C_2H + CH_4 \rightarrow C_2H_2 + CH_3$	$3.6 \times 10^{-14} \cdot T_g^{0.94} \cdot \exp\left(\frac{-3.28\times10^2}{T_g}\right)$	[5]
235	$C_2H + CH_2 \rightarrow C_2H_2 + CH$	3×10^{-11}	[25]
236	$C_2H_6 + CH_5^+ \rightarrow C_2H_5^+ + CH_4 + H_2$	2.25×10^{-10}	[28]
237	$C_2H_4 + CH_5^+ \rightarrow C_2H_5^+ + CH_4$	1.5×10^{-8}	[37]
238	$C_2H_2 + CH_5^+ \rightarrow C_2H_3^+ + CH_4$	1.56×10^{-9}	[38]
239	$C_2H + CH_5^+ \rightarrow C_2H_2^+ + CH_4$	9×10^{-10}	[1]
240	$C_2H_6 + CH_4^+ \rightarrow C_2H_4^+ + CH_4 + H_2$	1.91×10^{-9}	[39]
241	$C_2H_4 + CH_4^+ \rightarrow C_2H_4^+ + CH_4$	1.38×10^{-9}	[39]
242	$C_2H_4 + CH_4^+ \rightarrow C_2H_5^+ + CH_3$	4.232×10^{-10}	[39]
243	$C_2H_2 + CH_4^+ \rightarrow C_2H_2^+ + CH_4$	1.134×10^{-9}	[39]
244	$C_2H_2 + CH_4^+ \rightarrow C_2H_3^+ + CH_3$	1.2348×10^{-9}	[39]
245	$C_2H_6 + CH_3^+ \rightarrow C_2H_5^+ + CH_4$	1.479×10^{-9}	[39]
246	$C_2H_4 + CH_3^+ \rightarrow C_2H_3^+ + CH_4$	3.496×10^{-10}	[39]
247	$C_2H_2^+ + CH_4 \rightarrow C_2H_3^+ + CH_3$	4.1×10^{-9}	[21]
248	$C_2H^+ + CH_4 \rightarrow C_2H_2^+ + CH_3$	3.74×10^{-10}	[9]
249	$C_2H_3 + C_2H_6 \rightarrow C_2H_4 + C_2H_5$	$1 \times 10^{-21} \cdot T_g^{3.3} \cdot \exp\left(\frac{-5.285\times10^3}{T_g}\right)$	[25]
250	$C_2H + C_2H_6 \rightarrow C_2H_2 + C_2H_5$	$6.75 \times 10^{-12} \cdot T_g^{0.28} \cdot \exp\left(\frac{6.2\times10^1}{T_g}\right)$	[5]
251	$C_2H_5 + C_2H_5 \rightarrow C_2H_4 + C_2H_6$	2.3×10^{-12}	[5]
252	$C_2H_4 + C_2H_5 \rightarrow C_2H_3 + C_2H_6$	$8.1 \times 10^{-31} \cdot T_g^{5.82} \cdot \exp\left(\frac{-6\times10^3}{T_g}\right)$	[5]
253	$C_2H_3 + C_2H_5 \rightarrow C_2H_2 + C_2H_6$	2.3985×10^{-11}	[40, 41]
254	$C_2H_3 + C_2H_5 \rightarrow C_2H_4 + C_2H_4$	4.42×10^{-11}	[40, 41]
255	$C_2H_2 + C_2H_5 \rightarrow C_2H + C_2H_6$	$4.5 \times 10^{-13} \cdot \exp\left(\frac{-1.18\times10^4}{T_g}\right)$	[25]
256	$C_2H + C_2H_5 \rightarrow C_2H_2 + C_2H_4$	3×10^{-12}	[25]

#	Reaction	Rate equation	Ref.
257	$C_2H_4 + C_2H_4 \rightarrow C_2H_3 + C_2H_5$	$8 \times 10^{-10} \cdot \exp\left(\frac{-3.6\times10^4}{T_g}\right)$	[25]
258	$C_2H_2 + C_2H_4 \rightarrow C_2H_3 + C_2H_3$	$4 \times 10^{-11} \cdot \exp\left(\frac{-3.44\times10^4}{T_g}\right)$	[25]
259	$C_2H + C_2H_4 \rightarrow C_2H_2 + C_2H_3$	$3.35 \times 10^{-18} \cdot T_g^{2.24}$	[42]
260	$C_2H_3 + C_2H_3 \rightarrow C_2H_2 + C_2H_4$	1.6×10^{-12}	[25]
261	$C_2H + C_2H_3 \rightarrow C_2H_2 + C_2H_2$	1.6×10^{-12}	[25]
262	$C_2H_2 + C_2H_2 \rightarrow C_2H + C_2H_3$	$1.6 \times 10^{-11} \cdot \exp\left(\frac{-4.25\times10^4}{T_g}\right)$	[25]
263	$C_2H_4 + C_2H_6^+ \rightarrow C_2H_4^+ + C_2H_6$	1.15×10^{-9}	[39]
264	$C_2H_2 + C_2H_6^+ \rightarrow C_2H_3 + C_2H_5^+$	2.223×10^{-10}	[39]
265	$C_2H_3^+ + C_2H_6 \rightarrow C_2H_4 + C_2H_5^+$	2.914×10^{-10}	[39]
266	$C_2H_3^+ + C_2H_4 \rightarrow C_2H_2 + C_2H_5^+$	9.3×10^{-10}	[39]
267	$C_2H_2^+ + C_2H_6 \rightarrow C_2H_3 + C_2H_5^+$	1.314×10^{-10}	[39]
268	$C_2H_2^+ + C_2H_6 \rightarrow C_2H_4 + C_2H_4^+$	2.628×10^{-10}	[39]
269	$C_2H_2^+ + C_2H_4 \rightarrow C_2H_2 + C_2H_4^+$	4.012×10^{-10}	[39]
270	$C_2H + e \rightarrow C_2H^+ + e + e$	$f(\sigma)$	[23, 43]
271	$C_2H_2 + e \rightarrow C_2H_2^+ + e + e$	$f(\sigma)$	[23, 43]
272	$C_2H_3 + e \rightarrow C_2H_3^+ + e + e$	$f(\sigma)$	[23, 43]
273	$C_2H_4 + e \rightarrow C_2H_4^+ + e + e$	$f(\sigma)$	[23, 43]
274	$C_2H_5 + e \rightarrow C_2H_5^+ + e + e$	$f(\sigma)$	[23, 43]
275	$C_2H_6 + e \rightarrow C_2H_6^+ + e + e$	$f(\sigma)$	[23, 43]
276	$C_2H + e \rightarrow C + CH^+ + e + e$	$f(\sigma)$	[23, 43]
277	$C_2H + e \rightarrow CH + C^+ + e + e$	$f(\sigma)$	[23, 43]
278	$C_2H_2 + e \rightarrow C_2H^+ + e + e + H$	$f(\sigma)$	[23, 43]
279	$C_2H_2 + e \rightarrow C_2H + e + e + H^+$	$f(\sigma)$	[23, 43]
280	$C_2H_3 + e \rightarrow C_2H_2^+ + e + e + H$	$f(\sigma)$	[23, 43]
281	$C_2H_3 + e \rightarrow C_2H^+ + e + e + H_2$	$f(\sigma)$	[23, 43]
282	$C_2H_3 + e \rightarrow C_2H^+ + e + e + H + H$	$f(\sigma)$	[23, 43]
283	$C_2H_3 + e \rightarrow CH + CH_2^+ + e + e$	$f(\sigma)$	[23, 43]
284	$C_2H_3 + e \rightarrow CH_2 + CH^+ + e + e$	$f(\sigma)$	[23, 43]
285	$C_2H_3 + e \rightarrow CH_3 + C^+ + e + e$	$f(\sigma)$	[23, 43]
286	$C_2H_3 + e \rightarrow C_2H_2 + e + e + H^+$	$f(\sigma)$	[23, 43]
287	$C_2H_4 + e \rightarrow C_2H_3^+ + e + e + H$	$f(\sigma)$	[23, 43]
288	$C_2H_4 + e \rightarrow C_2H_2^+ + e + e + H_2$	$f(\sigma)$	[23, 43]
289	$C_2H_4 + e \rightarrow C_2H_2^+ + e + e + H + H$	$f(\sigma)$	[23, 43]
290	$C_2H_4 + e \rightarrow C_2H^+ + e + e + H + H + H$	$f(\sigma)$	[23, 43]
291	$C_2H_4 + e \rightarrow CH + CH_3^+ + e + e$	$f(\sigma)$	[23, 43]
292	$C_2H_4 + e \rightarrow CH_2 + CH_2^+ + e + e$	$f(\sigma)$	[23, 43]
293	$C_2H_4 + e \rightarrow CH_3 + CH^+ + e + e$	$f(\sigma)$	[23, 43]
294	$C_2H_4 + e \rightarrow CH_4 + C^+ + e + e$	$f(\sigma)$	[23, 43]
295	$C_2H_5 + e \rightarrow C_2H_4^+ + e + e + H$	$f(\sigma)$	[23, 43]
296	$C_2H_5 + e \rightarrow C_2H_3^+ + e + e + H_2$	$f(\sigma)$	[23, 43]

#	Reaction	Rate equation	Ref.
297	$C_2H_5 + e \rightarrow C_2H_3^+ + e + e + H + H$	$f(\sigma)$	[23, 43]
298	$C_2H_5 + e \rightarrow C_2H_2^+ + e + e + H + H_2$	$f(\sigma)$	[23, 43]
299	$C_2H_5 + e \rightarrow C_2H^+ + e + e + H_2 + H_2$	$f(\sigma)$	[23, 43]
300	$C_2H_5 + e \rightarrow CH_2 + CH_3^+ + e + e$	$f(\sigma)$	[23, 43]
301	$C_2H_5 + e \rightarrow CH_2^+ + CH_3 + e + e$	$f(\sigma)$	[23, 43]
302	$C_2H_5 + e \rightarrow CH_4 + CH^+ + e + e$	$f(\sigma)$	[23, 43]
303	$C_2H_5 + e \rightarrow CH_4 + C^+ + e + e + H$	$f(\sigma)$	[23, 43]
304	$C_2H_5 + e \rightarrow CH_3 + C^+ + e + e + H_2$	$f(\sigma)$	[23, 43]
305	$C_2H_6 + e \rightarrow C_2H_5^+ + e + e + H$	$f(\sigma)$	[23, 43]
306	$C_2H_6 + e \rightarrow C_2H_4^+ + e + e + H_2$	$f(\sigma)$	[23, 43]
307	$C_2H_6 + e \rightarrow C_2H_3^+ + e + e + H + H_2$	$f(\sigma)$	[23, 43]
308	$C_2H_6 + e \rightarrow C_2H_2^+ + e + e + H_2 + H_2$	$f(\sigma)$	[23, 43]
309	$C_2H_6 + e \rightarrow C_2H_2^+ + e + e + H + H + H_2$	$f(\sigma)$	[23, 43]
310	$C_2H_6 + e \rightarrow CH_3 + CH_3^+ + e + e$	$f(\sigma)$	[23, 43]
311	$C_2H_6 + e \rightarrow C_2H_4 + e + e + H_2^+$	$f(\sigma)$	[23, 43]
312	$C_2H_6 + e \rightarrow C_2H_2 + e + H_2 + H_2$	$f(\sigma)$	[23, 43]
313	$C_2H_6 + e \rightarrow C_2H_5 + e + H$	$f(\sigma)$	[23, 43]
314	$C_2H_6 + e \rightarrow CH_2 + CH_4 + e$	$f(\sigma)$	[23, 43]
315	$C_2H_6 + e \rightarrow C_2H_4 + e + H_2$	$f(\sigma)$	[23, 43]
316	$C_2H_6 + e \rightarrow C_2H_3 + e + H + H_2$	$f(\sigma)$	[23, 43]
317	$C_2H_6 + e \rightarrow CH_3 + CH_3 + e$	$f(\sigma)$	[23, 43]
318	$C_2H_5 + e \rightarrow CH_2 + CH_3 + e$	$f(\sigma)$	[23, 43]
319	$C_2H_5 + e \rightarrow C_2H_3 + e + H_2$	$f(\sigma)$	[23, 43]
320	$C_2H_5 + e \rightarrow C_2H_4 + e + H$	$f(\sigma)$	[23, 43]
321	$C_2H_5 + e \rightarrow C_2H + e + H_2 + H_2$	$f(\sigma)$	[23, 43]
322	$C_2H_5 + e \rightarrow C_2H_2 + e + H + H_2$	$f(\sigma)$	[23, 43]
323	$C_2H_5 + e \rightarrow CH + CH_4 + e$	$f(\sigma)$	[23, 43]
324	$C_2H_5 + e \rightarrow C_2H_3 + e + H + H$	$f(\sigma)$	[23, 43]
325	$C_2H_4 + e \rightarrow C + CH_4 + e$	$f(\sigma)$	[23, 43]
326	$C_2H_4 + e \rightarrow C_2H_2 + e + H + H$	$f(\sigma)$	[23, 43]
327	$C_2H_4 + e \rightarrow C_2H_2 + e + H_2$	$f(\sigma)$	[23, 43]
328	$C_2H_4 + e \rightarrow C_2H + e + H + H_2$	$f(\sigma)$	[23, 43]
329	$C_2H_4 + e \rightarrow CH + CH_3 + e$	$f(\sigma)$	[23, 43]
330	$C_2H_4 + e \rightarrow CH_2 + CH_2 + e$	$f(\sigma)$	[23, 43]
331	$C_2H_4 + e \rightarrow C_2H_3 + e + H$	$f(\sigma)$	[23, 43]
332	$C_2H_3 + e \rightarrow C_2H + e + H_2$	$f(\sigma)$	[23, 43]
333	$C_2H_3 + e \rightarrow CH + CH_2 + e$	$f(\sigma)$	[23, 43]
334	$C_2H_3 + e \rightarrow C_2H_2 + e + H$	$f(\sigma)$	[23, 43]
335	$C_2H_3 + e \rightarrow C + CH_3 + e$	$f(\sigma)$	[23, 43]
336	$C_2H_3 + e \rightarrow C_2H + e + H + H$	$f(\sigma)$	[23, 43]

#	Reaction	Rate equation	Ref.
337	$C_2H_2 + e \rightarrow C + CH_2 + e$	$f(\sigma)$	[23, 43]
338	$C_2H_2 + e \rightarrow C_2H + e + H$	$f(\sigma)$	[23, 43]
339	$C_2H_2 + e \rightarrow CH + CH + e$	$f(\sigma)$	[23, 43]
340	$C_2H + e \rightarrow C + CH + e$	$f(\sigma)$	[23, 43]
341	$C_2H^+ + e \rightarrow C + CH^+ + e$	$f(\sigma)$	[23, 43]
342	$C_2H^+ + e \rightarrow CH + C^+ + e$	$f(\sigma)$	[23, 43]
343	$C_2H_2^+ + e \rightarrow C_2H^+ + e + H$	$f(\sigma)$	[23, 43]
344	$C_2H_2^+ + e \rightarrow C_2H + e + H^+$	$f(\sigma)$	[23, 43]
345	$C_2H_2^+ + e \rightarrow CH_2 + C^+ + e$	$f(\sigma)$	[23, 43]
346	$C_2H_2^+ + e \rightarrow CH + CH^+ + e$	$f(\sigma)$	[23, 43]
347	$C_2H_2^+ + e \rightarrow C + CH_2^+ + e$	$f(\sigma)$	[23, 43]
348	$C_2H_3^+ + e \rightarrow CH_2 + CH^+ + e$	$f(\sigma)$	[23, 43]
349	$C_2H_3^+ + e \rightarrow C_2H_2 + e + H^+$	$f(\sigma)$	[23, 43]
350	$C_2H_3^+ + e \rightarrow C_2H + e + H_2^+$	$f(\sigma)$	[23, 43]
351	$C_2H_3^+ + e \rightarrow C_2H^+ + e + H_2$	$f(\sigma)$	[23, 43]
352	$C_2H_3^+ + e \rightarrow C + CH_3^+ + e$	$f(\sigma)$	[23, 43]
353	$C_2H_3^+ + e \rightarrow C_2H_2^+ + e + H$	$f(\sigma)$	[23, 43]
354	$C_2H_3^+ + e \rightarrow CH + CH_2^+ + e$	$f(\sigma)$	[23, 43]
355	$C_2H_3^+ + e \rightarrow CH_3 + C^+ + e$	$f(\sigma)$	[23, 43]
356	$C_2H_4^+ + e \rightarrow CH + CH_3^+ + e$	$f(\sigma)$	[23, 43]
357	$C_2H_4^+ + e \rightarrow CH_2 + CH_2^+ + e$	$f(\sigma)$	[23, 43]
358	$C_2H_4^+ + e \rightarrow CH_3 + CH^+ + e$	$f(\sigma)$	[23, 43]
359	$C_2H_4^+ + e \rightarrow CH_4 + C^+ + e$	$f(\sigma)$	[23, 43]
360	$C_2H_4^+ + e \rightarrow C_2H_2 + e + H_2^+$	$f(\sigma)$	[23, 43]
361	$C_2H_4^+ + e \rightarrow C_2H_2^+ + e + H_2$	$f(\sigma)$	[23, 43]
362	$C_2H_4^+ + e \rightarrow C_2H_3^+ + e + H$	$f(\sigma)$	[23, 43]
363	$C_2H_5^+ + e \rightarrow C_2H_3^+ + e + H + H$	$f(\sigma)$	[23, 43]
364	$C_2H_5^+ + e \rightarrow CH_2^+ + CH_3 + e$	$f(\sigma)$	[23, 43]
365	$C_2H_5^+ + e \rightarrow C_2H_3^+ + e + H_2$	$f(\sigma)$	[23, 43]
366	$C_2H_5^+ + e \rightarrow C_2H_4^+ + e + H$	$f(\sigma)$	[23, 43]
367	$C_2H_5^+ + e \rightarrow CH_2 + CH_3^+ + e$	$f(\sigma)$	[23, 43]
368	$C_2H_6^+ + e \rightarrow CH_3 + CH_3^+ + e$	$f(\sigma)$	[23, 43]
369	$C_2H_6^+ + e \rightarrow C_2H_4^+ + e + H_2$	$f(\sigma)$	[23, 43]
370	$C_2H_6^+ + e \rightarrow C_2H_5^+ + e + H$	$f(\sigma)$	[23, 43]
371	$C_2H_6^+ + e \rightarrow C_2H_5 + H$	$f(\sigma)$	[23, 43]
372	$C_2H_6^+ + e \rightarrow CH_2 + CH_2 + H_2$	$f(\sigma)$	[23, 43]
373	$C_2H_6^+ + e \rightarrow C_2H_4 + H + H$	$f(\sigma)$	[23, 43]
374	$C_2H_6^+ + e \rightarrow CH_2 + CH_3 + H$	$f(\sigma)$	[23, 43]
375	$C_2H_6^+ + e \rightarrow CH_2 + CH_4$	$f(\sigma)$	[23, 43]
376	$C_2H_6^+ + e \rightarrow C_2H_4 + H_2$	$f(\sigma)$	[23, 43]

#	Reaction	Rate equation	Ref.
377	$C_2H_6^+ + e \rightarrow C_2H_3 + H + H_2$	$f(\sigma)$	[23, 43]
378	$C_2H_6^+ + e \rightarrow CH_3 + CH_3$	$f(\sigma)$	[23, 43]
379	$C_2H_5^+ + e \rightarrow C_2H_2 + H + H + H$	$f(\sigma)$	[23, 43]
380	$C_2H_5^+ + e \rightarrow C_2H_3 + H_2$	$f(\sigma)$	[23, 43]
381	$C_2H_5^+ + e \rightarrow CH_2 + CH_3$	$f(\sigma)$	[23, 43]
382	$C_2H_5^+ + e \rightarrow C_2H_4 + H$	$f(\sigma)$	[23, 43]
383	$C_2H_5^+ + e \rightarrow C_2H_2 + H + H_2$	$f(\sigma)$	[23, 43]
384	$C_2H_5^+ + e \rightarrow CH + CH_4$	$f(\sigma)$	[23, 43]
385	$C_2H_5^+ + e \rightarrow C_2H_3 + H + H$	$f(\sigma)$	[23, 43]
386	$C_2H_4^+ + e \rightarrow CH + CH_3$	$f(\sigma)$	[23, 43]
387	$C_2H_4^+ + e \rightarrow C_2H_2 + H + H$	$f(\sigma)$	[23, 43]
388	$C_2H_4^+ + e \rightarrow C + CH_4$	$f(\sigma)$	[23, 43]
389	$C_2H_4^+ + e \rightarrow C_2H_2 + H_2$	$f(\sigma)$	[23, 43]
390	$C_2H_4^+ + e \rightarrow C_2H + H + H_2$	$f(\sigma)$	[23, 43]
391	$C_2H_4^+ + e \rightarrow CH_2 + CH_2$	$f(\sigma)$	[23, 43]
392	$C_2H_4^+ + e \rightarrow C_2H_3 + H$	$f(\sigma)$	[23, 43]
393	$C_2H_3^+ + e \rightarrow C_2H + H_2$	$f(\sigma)$	[23, 43]
394	$C_2H_3^+ + e \rightarrow C + CH_3$	$f(\sigma)$	[23, 43]
395	$C_2H_3^+ + e \rightarrow CH + CH_2$	$f(\sigma)$	[23, 43]
396	$C_2H_3^+ + e \rightarrow C_2H_2 + H$	$f(\sigma)$	[23, 43]
397	$C_2H_3^+ + e \rightarrow C_2H + H + H$	$f(\sigma)$	[23, 43]
398	$C_2H_2^+ + e \rightarrow C_2H + H$	$f(\sigma)$	[23, 43]
399	$C_2H_2^+ + e \rightarrow CH + CH$	$f(\sigma)$	[23, 43]
400	$C_2H_2^+ + e \rightarrow C + CH_2$	$f(\sigma)$	[23, 43]
401	$C_2H^+ + e \rightarrow C + CH$	$f(\sigma)$	[23, 43]
402	$C_2H^+ + e \rightarrow C + C + H$	$f(\sigma)$	[23, 43]
403	$C_2H_6 \rightarrow CH_3 + CH_3$	$k_0 = 2.6 \times 10^{25} \cdot T_g^{-8.37} \cdot \exp\left(\frac{-4.729\times10^4}{T_g}\right)$ $k_\infty = 4.5 \times 10^{21} \cdot T_g^{-1.37} \cdot \exp\left(\frac{-4.59\times10^4}{T_g}\right)$ $F_c = 0.38 \cdot \exp\left(\frac{-T_g}{7.3\times10^1}\right)$ $+0.62 \cdot \exp\left(\frac{-T_g}{1.18\times10^3}\right)$	[5][a]
404	$C_2H_6 \rightarrow C_2H_5 + H$	$k_0 = \frac{10^{4.2839\times10^1}}{n_M} \cdot T_g^{-6.431} \cdot \exp\left(\frac{-5.3938\times10^4}{T_g}\right)$ $k_\infty = 10^{2.0947\times10^1} \cdot T_g^{-1.228} \cdot \exp\left(\frac{-5.1439\times10^4}{T_g}\right)$ $F_c = 4.761 \times 10^1 \cdot \exp\left(\frac{-1.6182\times10^4}{T_g}\right)$ $+ \exp\left(\frac{-T_g}{3.371\times10^3}\right)$	[44][a]
405	$C_2H_5 \rightarrow C_2H_4 + H$	$k_0 = 1.7 \times 10^{-6} \cdot \exp\left(\frac{-1.68\times10^4}{T_g}\right)$ $k_\infty = 8.2 \times 10^{13} \cdot \exp\left(\frac{-2.007\times10^4}{T_g}\right)$ $F_c = 0.25 \cdot \exp\left(\frac{-T_g}{9.7\times10^1}\right)$ $+0.75 \cdot \exp\left(\frac{-T_g}{1.379\times10^3}\right)$	[5][a]
406	$C_2H_4 \rightarrow C_2H_3 + H$	$10^{1.63\times10^1} \cdot \exp\left(\frac{-4.6\times10^5}{R\cdot T_g}\right)$	[45]
407	$C_2H_4 \rightarrow C_2H_2 + H_2$	$10^{1.29\times10^1} \cdot T_g^{0.44} \cdot \exp\left(\frac{-4.467\times10^4}{T_g}\right)$	[25]

#	Reaction	Rate equation	Ref.
408	$C_2H_3 \rightarrow C_2H_2 + H$	$k_0 = 4.3 \times 10^3 \cdot T_g^{-3.4} \cdot \exp\left(\frac{-1.802\times10^4}{T_g}\right)$ $k_\infty = 3.9 \times 10^8 \cdot T_g^{1.62} \cdot \exp\left(\frac{-1.865\times10^4}{T_g}\right)$ $F_c = 7.37 \times 10^{-4} \cdot T_g^{0.8}$	[5][a]
409	$C_2H_2 \rightarrow C_2H + H$	$10^{1.542\times10^1} \cdot \exp\left(\frac{-6.2445\times10^4}{T_g}\right)$	[25]
410	$e + H_2O \rightarrow e + e + H_2O^+$	$f(\sigma)$	[46, 47]
411	$e + H_2O \rightarrow H_2 + O^-$	$f(\sigma)$	[46, 48]
412	$e + H_2O \rightarrow H^- + OH$	$f(\sigma)$	[46, 48]
413	$e + H_2O \rightarrow e + H + OH$	$f(\sigma)$	[48]
414	$e + H_2O \rightarrow e + e + H^+ + OH$	$f(\sigma)$	[46, 47]
415	$e + H_2O \rightarrow e + e + H + OH^+$	$f(\sigma)$	[46, 47]
416	$e + H_2O \rightarrow e + e + H_2 + O^+$	$f(\sigma)$	[46, 47]
417	$e + H_2O \rightarrow e + e + H_2^+ + O$	$f(\sigma)$	[46, 47]
418	$e + H_2O \rightarrow H + OH^-$	$f(\sigma)$	[46, 47]
419	$e + H_2O_2 \rightarrow H_2O + O^-$	$f(\sigma)$	[49]
420	$e + H_2O_2 \rightarrow OH + OH^-$	$f(\sigma)$	[49]
421	$e + OH^- \rightarrow e + e + OH$	$f(\sigma)$	[46]
422	$e + OH \rightarrow e + H + O$	$2.55 \times 10^{-4} \cdot T_e^{-0.76} \cdot \exp\left(\frac{-8.01074\times10^4}{T_e}\right)$	[50]
423	$e + OH \rightarrow e + e + OH^+$	$1.16 \times 10^{-17} \cdot T_e^{1.78} \cdot \exp\left(\frac{-1.602671\times10^5}{T_e}\right)$	[50]
424	$M + e + OH \rightarrow M + OH^-$	3×10^{-31}	[51]
425	$e + OH^+ \rightarrow H + O$	$3.19 \times 10^4 \cdot T_e^{-2.04} \cdot \exp\left(\frac{-1.754618\times10^5}{T_e}\right)$	[50]
426	$e + H_2O^+ \rightarrow H_2 + O$	$3.9 \times 10^{-8} \cdot \left(\frac{T_e}{3.0\times10^2}\right)^{-0.5}$	[3]
427	$e + H_2O^+ \rightarrow H + H + O$	$3.05 \times 10^{-7} \cdot \left(\frac{T_e}{3.0\times10^2}\right)^{-0.5}$	[3]
428	$e + H_2O^+ \rightarrow H + OH$	$8.6 \times 10^{-8} \cdot \left(\frac{T_e}{3.0\times10^2}\right)^{-0.5}$	[3]
429	$e + H_3O^+ \rightarrow H + H + OH$	$3.05 \times 10^{-7} \cdot \left(\frac{T_e}{3.0\times10^2}\right)^{-0.5}$	[3]
430	$e + H_3O^+ \rightarrow H + H_2O$	$7.09 \times 10^{-8} \cdot \left(\frac{T_e}{3.0\times10^2}\right)^{-0.5}$	[3]
431	$e + H_3O^+ \rightarrow H + H_2 + O$	$5.6 \times 10^{-9} \cdot \left(\frac{T_e}{3.0\times10^2}\right)^{-0.5}$	[3]
432	$e + H_3O^+ \rightarrow H_2 + OH$	$5.37 \times 10^{-8} \cdot \left(\frac{T_e}{3.0\times10^2}\right)^{-0.5}$	[3]
433	$O_2^- + OH \rightarrow O_2 + OH^-$	1×10^{-10}	[51]
434	$OH + O^+ \rightarrow O + OH^+$	3.6×10^{-10}	[1]
435	$OH + O^+ \rightarrow H + O_2^+$	3.6×10^{-10}	[1]
436	$H_2^+ + OH \rightarrow H_2 + OH^+$	7.6×10^{-10}	[1]
437	$H_2^+ + OH \rightarrow H + H_2O^+$	7.6×10^{-10}	[1]
438	$H^+ + OH \rightarrow H + OH^+$	2.1×10^{-9}	[1]
439	$O + OH \rightarrow H + O_2$	$4.33 \times 10^{-11} \cdot \left(\frac{T_g}{3.0\times10^2}\right)^{-0.5} \cdot \exp\left(\frac{-3.0\times10^1}{T_g}\right)$	[25]
440	$H + OH \rightarrow H_2 + O$	$4.1 \times 10^{-12} \cdot \frac{T_g}{3.0\times10^2} \cdot \exp\left(\frac{-3.50\times10^3}{T_g}\right)$	[52]
441	$OH + OH \rightarrow H_2O + O$	$1.02 \times 10^{-12} \cdot \left(\frac{T_g}{3.0\times10^2}\right)^{1.4} \cdot \exp\left(\frac{2.0\times10^2}{T_g}\right)$	[25]
442	$OH + OH \rightarrow H + HO_2$	$2 \times 10^{-11} \cdot \exp\left(\frac{-2.020\times10^4}{T_g}\right)$	[52]
443	$OH + OH \rightarrow H_2 + O_2$	$1.82 \times 10^{-13} \cdot T_g^{0.51} \cdot \exp\left(\frac{-2.54\times10^4}{T_g}\right)$	[53]
444	$M + OH \rightarrow M + H + O$	$4.7 \times 10^{-8} \cdot \left(\frac{T_g}{3.0\times10^2}\right)^{-1.0} \cdot \exp\left(\frac{-5.0830\times10^4}{T_g}\right)$	[52]

#	Reaction	Rate equation	Ref.
445	$H_2 + OH \rightarrow H + H_2O$	$3.6 \times 10^{-16} \cdot T_g^{1.52} \cdot \exp\left(\frac{-1.74\times10^3}{T_g}\right)$	[5]
446	$O_2 + OH \rightarrow H + O_3$	$2.7 \times 10^{-13} \cdot \left(\frac{T_g}{3.0\times10^2}\right)^{1.44} \cdot \exp\left(\frac{-3.860\times10^4}{T_g}\right)$	[52]
447	$O_2 + OH \rightarrow HO_2 + O$	$2.2 \times 10^{-11} \cdot \exp\left(\frac{-2.820\times10^4}{T_g}\right)$	[52]
448	$O_3 + OH \rightarrow HO_2 + O_2$	$1.69 \times 10^{-12} \cdot \exp\left(\frac{-9.410\times10^2}{T_g}\right)$	[54]
449	$H_2O + OH \rightarrow H + H_2O_2$	$4 \times 10^{-10} \cdot \exp\left(\frac{-4.050\times10^4}{T_g}\right)$	[52]
450	$HO_2 + OH \rightarrow H_2O + O_2$	$8.05 \times 10^{-11} \cdot \left(\frac{T_g}{3.0\times10^2}\right)^{-1.0}$	[25]
451	$HO_2 + OH \rightarrow H_2O_2 + O$	$1.5 \times 10^{-12} \cdot \left(\frac{T_g}{3.0\times10^2}\right)^{0.5} \cdot \exp\left(\frac{-1.060\times10^4}{T_g}\right)$	[52]
452	$H_2O_2 + OH \rightarrow H_2O + HO_2$	$2.9 \times 10^{-12} \cdot \exp\left(\frac{-1.60\times10^2}{T_g}\right)$	[25]
453	$O + OH^+ \rightarrow H + O_2^+$	7.1×10^{-10}	[1]
454	$O_2 + OH^+ \rightarrow O_2^+ + OH$	3.8×10^{-10}	[27]
455	$H_2O + OH^+ \rightarrow H_2O^+ + OH$	1.5895×10^{-9}	[27]
456	$H_2O + OH^+ \rightarrow H_3O^+ + O$	1.3005×10^{-9}	[27]
457	$M + OH^- \rightarrow M + e + OH$	$2 \times 10^{-10} \cdot \left(\frac{T_g}{3\times10^2}\right)^{0.5}$	c
458	$H + OH^- \rightarrow e + H_2O$	1.8×10^{-9}	[55]
459	$O + OH^- \rightarrow e + HO_2$	2×10^{-10}	[56]
460	$O_2 + OH^- \rightarrow O_2^- + OH$	$8.7 \times 10^{-10} \cdot \exp\left(\frac{-1.663\times10^4}{T_g}\right)$	[51]
461	$O_3 + OH^- \rightarrow O_3^- + OH$	9×10^{-10}	[56]
462	$O_3 + OH^- \rightarrow HO_2 + O_2^-$	1.08×10^{-11}	[57]
463	$OH^- + OH^+ \rightarrow H + H + O + O$	1×10^{-7}	[57]
464	$M + OH^- + OH^+ \rightarrow M + OH + OH$	$2 \times 10^{-25} \cdot \left(\frac{T_g}{3.0\times10^2}\right)^{-2.5}$	[57]
465	$OH^- + OH^+ \rightarrow H + O + OH$	1×10^{-7}	[57]
466	$OH^- + O^+ \rightarrow H + O + O$	1×10^{-7}	[57]
467	$OH^- + O^+ \rightarrow O + OH$	$2 \times 10^{-7} \cdot \left(\frac{T_g}{3.0\times10^2}\right)^{-0.5}$	[57]
468	$M + OH^- + O^+ \rightarrow M + HO_2$	$2 \times 10^{-25} \cdot \left(\frac{T_g}{3.0\times10^2}\right)^{-2.5}$	[57]
469	$O_2^+ + OH^- \rightarrow H + O + O_2$	1×10^{-7}	[57]
470	$O_2^+ + OH^- \rightarrow O_2 + OH$	2×10^{-7}	[57]
471	$O_2^+ + OH^- \rightarrow O + O + OH$	1×10^{-7}	[57]
472	$M + O_2^+ + OH^- \rightarrow M + O_2 + OH$	$2 \times 10^{-25} \cdot \left(\frac{T_g}{3.0\times10^2}\right)^{-2.5}$	[57]
473	$M + H_2O^+ + OH^- \rightarrow M + H_2O + OH$	$2 \times 10^{-25} \cdot \left(\frac{T_g}{3.0\times10^2}\right)^{-2.5}$	[57]
474	$H^+ + OH^- \rightarrow H + OH$	$7.51 \times 10^{-8} \cdot \left(\frac{T_g}{3\times10^2}\right)^{-0.5}$	[2, 3]
475	$H_3^+ + OH^- \rightarrow H + H_2 + OH$	$7.51 \times 10^{-8} \cdot \left(\frac{T_g}{3\times10^2}\right)^{-0.5}$	[2, 3]
476	$H_3O^+ + OH^- \rightarrow H + H_2O + OH$	$7.51 \times 10^{-8} \cdot \left(\frac{T_g}{3\times10^2}\right)^{-0.5}$	[2, 3]
477	$H + HO_2 \rightarrow H_2 + O_2$	$1.1 \times 10^{-10} \cdot \exp\left(\frac{-1.070\times10^3}{T_g}\right)$	[25]
478	$H + HO_2 \rightarrow OH + OH$	$2.8 \times 10^{-10} \cdot \exp\left(\frac{-4.40\times10^2}{T_g}\right)$	[25]
479	$H + HO_2 \rightarrow H_2O + O$	$5 \times 10^{-11} \cdot \exp\left(\frac{-8.660\times10^2}{T_g}\right)$	[58]
480	$H_2O + HO_2 \rightarrow H_2O_2 + OH$	$3 \times 10^{-11} \cdot \exp\left(\frac{-1.510\times10^4}{T_g}\right)$	[52]
481	$H_2 + HO_2 \rightarrow H_2O + OH$	$1.1 \times 10^{-12} \cdot \exp\left(\frac{-9.40\times10^3}{T_g}\right)$	[52]
482	$H_2 + HO_2 \rightarrow H + H_2O_2$	$1 \times 10^{-12} \cdot \exp\left(\frac{-9.30\times10^3}{T_g}\right)$	[52]

#	Reaction	Rate equation	Ref.
483	$HO_2 + HO_2 \rightarrow H_2O_2 + O_2$	$2.2 \times 10^{-13} \cdot \exp\left(\frac{6.0\times10^2}{T_g}\right)$	[59]
484	$HO_2 + O \rightarrow O_2 + OH$	$2.9 \times 10^{-11} \cdot \exp\left(\frac{2.0\times10^2}{T_g}\right)$	[25]
485	$HO_2 + O_2 \rightarrow O_3 + OH$	1.5×10^{-15}	[52]
486	$H + H_2O_2 \rightarrow H_2 + HO_2$	$8 \times 10^{-11} \cdot \exp\left(\frac{-4.0\times10^3}{T_g}\right)$	[25]
487	$H + H_2O_2 \rightarrow H_2O + OH$	$4 \times 10^{-11} \cdot \exp\left(\frac{-2.0\times10^3}{T_g}\right)$	[25]
488	$H_2O_2 + O \rightarrow HO_2 + OH$	$1.44 \times 10^{-12} \cdot \left(\frac{T_g}{3.0\times10^2}\right)^{2.0} \cdot \exp\left(\frac{-2.0\times10^3}{T_g}\right)$	[25]
489	$H_2O_2 \rightarrow OH + OH$	$k_0 = 3.8 \times 10^{-8} \cdot \exp\left(\frac{-2.196\times10^4}{T_g}\right)$ $k_\infty = 3 \times 10^{14} \cdot \exp\left(\frac{-2.44\times10^4}{T_g}\right)$ $F_c = 0.5$	[5][a]
490	$H_2O_2 + O_2 \rightarrow HO_2 + HO_2$	$5 \times 10^{-11} \cdot \exp\left(\frac{-2.160\times10^4}{T_g}\right)$	[52]
491	$H_2O + O^- \rightarrow OH + OH^-$	3×10^{-13}	[56]
492	$H_2O + O^- \rightarrow e + H_2O_2$	3×10^{-13}	[56]
493	$H_2O + H^- \rightarrow H_2 + OH^-$	3.7×10^{-9}	[56]
494	$H_2O + O^+ \rightarrow H_2O^+ + O$	2.2×10^{-9}	[29]
495	$H_2O + H_2O^+ \rightarrow H_3O^+ + OH$	1.67×10^{-9}	[56, 60]
496	$H_2O + H^+ \rightarrow H + H_2O^+$	6.9×10^{-9}	[29]
497	$H_2O + O \rightarrow OH + OH$	$7.6 \times 10^{-15} \cdot T_g^{1.3} \cdot \exp\left(\frac{-8.6\times10^3}{T_g}\right)$	[25]
498	$M + H_2O \rightarrow M + H + OH$	$5.9 \times 10^{-7} \cdot \left(\frac{T_g}{3.0\times10^2}\right)^{-2.2} \cdot \exp\left(\frac{-5.90\times10^4}{T_g}\right)$	[52]
499	$H + H_2O \rightarrow H_2 + OH$	$7.5 \times 10^{-16} \cdot T_g^{1.6} \cdot \exp\left(\frac{-9.03\times10^3}{T_g}\right)$	[5]
500	$H_2O + OH \rightarrow H_2 + HO_2$	$1.4 \times 10^{-13} \cdot \exp\left(\frac{-3.610\times10^4}{T_g}\right)$	[52]
501	$H_2O + O \rightarrow H + HO_2$	$2.8 \times 10^{-12} \cdot \left(\frac{T_g}{3.0\times10^2}\right)^{0.37} \cdot \exp\left(\frac{-2.87430\times10^4}{T_g}\right)$	[52]
502	$H_2O + O_2 \rightarrow H_2O_2 + O$	$9.8 \times 10^{-8} \cdot \left(\frac{T_g}{3.0\times10^2}\right)^{0.5} \cdot \exp\left(\frac{-4.480\times10^4}{T_g}\right)$	[52]
503	$H_2O + O_2 \rightarrow HO_2 + OH$	$4.3 \times 10^{-12} \cdot \left(\frac{T_g}{3.0\times10^2}\right)^{0.5} \cdot \exp\left(\frac{-3.660\times10^4}{T_g}\right)$	[52]
504	$H_2 + H_2O^+ \rightarrow H + H_3O^+$	6.4×10^{-10}	[61]
505	$H_2O^+ + O_2 \rightarrow H_2O + O_2^+$	2×10^{-10}	[56]
506	$H_2O^+ + O^- \rightarrow H_2O + O$	$2 \times 10^{-7} \cdot \left(\frac{T_g}{3.0\times10^2}\right)^{-0.5}$	[57]
507	$H_2O^+ + O_2^- \rightarrow H_2O + O_2$	$2 \times 10^{-7} \cdot \left(\frac{T_g}{3.0\times10^2}\right)^{-0.5}$	[57]
508	$H_2O^+ + O_3^- \rightarrow H_2O + O_3$	$2 \times 10^{-7} \cdot \left(\frac{T_g}{3.0\times10^2}\right)^{-0.5}$	[57]
509	$M + H_2O^+ + O^- \rightarrow M + H_2O + O$	$2 \times 10^{-25} \cdot \left(\frac{T_g}{3.0\times10^2}\right)^{-2.5}$	[57]
510	$M + H_2O^+ + O^- \rightarrow M + H_2O_2$	$2 \times 10^{-25} \cdot \left(\frac{T_g}{3.0\times10^2}\right)^{-2.5}$	[57]
511	$M + H_2O^+ + O_3^- \rightarrow M + H_2O + O_3$	$2 \times 10^{-25} \cdot \left(\frac{T_g}{3.0\times10^2}\right)^{-2.5}$	[57]
512	$H + H_3O^+ \rightarrow H_2 + H_2O^+$	$6.1 \times 10^{-10} \cdot \exp\left(\frac{-2.05\times10^4}{T_g}\right)$	[62]
513	$H_3O^+ + O^- \rightarrow H + H_2O + O$	$7.51 \times 10^{-8} \cdot \left(\frac{T_g}{3\times10^2}\right)^{-0.5}$	[2, 3]
514	$H_3O^+ + O_2^- \rightarrow H + H_2O + O_2$	$7.51 \times 10^{-8} \cdot \left(\frac{T_g}{3\times10^2}\right)^{-0.5}$	[2, 3]
515	$H_3O^+ + O_2^- \rightarrow H + H_2O + O + O$	1×10^{-7}	[57]
516	$H + O^- \rightarrow e + OH$	5×10^{-10}	[1]
517	$H + O_2^- \rightarrow e + HO_2$	7×10^{-10}	[56]
518	$H + O_2^- \rightarrow H^- + O_2$	7×10^{-10}	[56]

#	Reaction	Rate equation	Ref.
519	$H + O^+ \rightarrow H^+ + O$	7×10^{-10}	[1]
520	$M + H + O \rightarrow M + OH$	$4.33 \times 10^{-32} \cdot \left(\frac{T_g}{3\times10^2}\right)^{-1}$	[25]
521	$H + O_2 \rightarrow O + OH$	$1.62 \times 10^{-10} \cdot \exp\left(\frac{-7.4740\times10^3}{T_g}\right)$	[58]
522	$M + H + O_2 \rightarrow M + HO_2$	$3.33 \times 10^{-31} \cdot \left(\frac{T_g}{3.0\times10^2}\right)^{-1}$	[5]
523	$H + O_3 \rightarrow HO_2 + O$	7.76×10^{-13}	[63]
524	$H + O_3 \rightarrow O_2 + OH$	2.36×10^{-11}	[63]
525	$H^- + O_2 \rightarrow e + HO_2$	1.2×10^{-9}	[56]
526	$H^- + O \rightarrow e + OH$	1×10^{-9}	[1]
527	$H^- + OH \rightarrow e + H_2O$	1×10^{-10}	[1]
528	$M + H^- + O_2^+ \rightarrow M + HO_2$	$2 \times 10^{-25} \cdot \left(\frac{T_g}{3.0\times10^2}\right)^{-2.5}$	[57]
529	$H^- + O^+ \rightarrow H + O$	$7.51 \times 10^{-8} \cdot \left(\frac{T_g}{3\times10^2}\right)^{-0.5}$	[2, 3]
530	$H_3O^+ + H^- \rightarrow H + H + H_2O$	$7.51 \times 10^{-8} \cdot \left(\frac{T_g}{3\times10^2}\right)^{-0.5}$	[2, 3]
531	$H^+ + O \rightarrow H + O^+$	$6.86 \times 10^{-10} \cdot \left(\frac{T_g}{3.0\times10^2}\right)^{0.26} \cdot \exp\left(\frac{2.243\times10^2}{T_g}\right)$	[3]
532	$H^+ + O_2 \rightarrow H + O_2^+$	2×10^{-9}	[29]
533	$H^+ + O^- \rightarrow H + O$	$7.51 \times 10^{-8} \cdot \left(\frac{T_g}{3\times10^2}\right)^{-0.5}$	[2, 3]
534	$H^+ + O_2^- \rightarrow H + O_2$	$7.51 \times 10^{-8} \cdot \left(\frac{T_g}{3\times10^2}\right)^{-0.5}$	[2, 3]
535	$H_2 + O^- \rightarrow H + OH^-$	3.1×10^{-11}	[56]
536	$H_2 + O^- \rightarrow e + H_2O$	5.98×10^{-10}	[56]
537	$H_2 + O_2^- \rightarrow OH + OH^-$	5×10^{-13}	[56, 57]
538	$H_2 + O_2^- \rightarrow HO_2 + H^-$	5×10^{-13}	[56, 57]
539	$H_2 + O^+ \rightarrow H + OH^+$	1.7×10^{-9}	[56]
540	$H_2 + O_3 \rightarrow HO_2 + OH$	$1 \times 10^{-13} \cdot \exp\left(\frac{-1.0\times10^4}{T_g}\right)$	[52]
541	$H_2 + O_2 \rightarrow H + HO_2$	$3.2 \times 10^{-11} \cdot \exp\left(\frac{-2.410\times10^4}{T_g}\right)$	[52]
542	$H_2 + O \rightarrow H + OH$	$9 \times 10^{-12} \cdot \frac{T_g}{3.0\times10^2} \cdot \exp\left(\frac{-4.480\times10^3}{T_g}\right)$	[52]
543	$H_2^+ + O_2 \rightarrow H_2 + O_2^+$	7.8×10^{-10}	[7]
544	$H_2^+ + O_2 \rightarrow H + HO_2^+$	1.9×10^{-9}	[64]
545	$H_3^+ + O \rightarrow H + H_2O^+$	$8.87 \times 10^{-10} \cdot \left(\frac{T_g}{3.0\times10^2}\right)^{-0.32}$	[65]
546	$H_3^+ + O \rightarrow H_2 + OH^+$	$5.26 \times 10^{-11} \cdot \left(\frac{T_g}{3.0\times10^2}\right)^{-0.32}$	[65]
547	$H_3^+ + O^- \rightarrow H + H_2 + O$	$7.51 \times 10^{-8} \cdot \left(\frac{T_g}{3\times10^2}\right)^{-0.5}$	[2, 3]
548	$H_3^+ + O_2^- \rightarrow H + H_2 + O_2$	$7.51 \times 10^{-8} \cdot \left(\frac{T_g}{3\times10^2}\right)^{-0.5}$	[2, 3]
549	$H + O \rightarrow e + OH^+$	$\frac{1.12\times10^{13}}{N_A} \cdot \exp\left(\frac{-8.06\times10^4}{T_g}\right)$	d
550	$H + OH \rightarrow e + H_2O^+$	$\frac{1.12\times10^{13}}{N_A} \cdot \exp\left(\frac{-8.06\times10^4}{T_g}\right)$	d
551	$H_2 + O \rightarrow e + H_2O^+$	$\frac{1.12\times10^{13}}{N_A} \cdot \exp\left(\frac{-8.06\times10^4}{T_g}\right)$	d
552	$C + OH \rightarrow CO + H$	$\frac{5\times10^{13}}{N_A}$	[66]
553	$C + OH^+ \rightarrow CH^+ + O$	1.2×10^{-9}	[1]
554	$C + H_2O^+ \rightarrow CH^+ + OH$	1.1×10^{-9}	[1]
555	$C + H_3O^+ \rightarrow H_2 + HCO^+$	1×10^{-11}	[1]
556	$C + HO_2^+ \rightarrow CH^+ + O_2$	1×10^{-9}	[1]

#	Reaction	Rate equation	Ref.
557	$C + OH^- \rightarrow e + HCO$	5×10^{-10}	[1]
558	$C^+ + OH \rightarrow CO^+ + H$	7.7×10^{-10}	[1]
559	$C^+ + H_2O \rightarrow H + HCO^+$	2.7×10^{-9}	[67]
560	$C^+ + OH^- \rightarrow C + OH$	$7.51 \times 10^{-8} \cdot \left(\frac{T_g}{3\times10^2}\right)^{-0.5}$	[2, 3]
561	$CO_2 + H \rightarrow CO + OH$	$4.7 \times 10^{-10} \cdot \exp\left(\frac{-1.3915\times10^4}{T_g}\right)$	[5]
562	$CO + H \rightarrow HCO$	$2 \times 10^{-35} \cdot T_g^{0.2} \cdot n_M$	[5]
563	$CO_2 + H^+ \rightarrow HCO^+ + O$	3.5×10^{-9}	[29]
564	$CO + H_2^+ \rightarrow CO^+ + H_2$	6.44×10^{-10}	[7]
565	$CO + H_2^+ \rightarrow H + HCO^+$	2.16×10^{-9}	[7]
566	$CO + H_3^+ \rightarrow H_2 + HCO^+$	$1.36 \times 10^{-9} \cdot \left(\frac{T_g}{3\times10^2}\right)^{-0.142} \cdot \exp\left(\frac{3.41}{T_g}\right)$	[68]
567	$CO + H^- \rightarrow e + HCO$	2×10^{-11}	[69]
568	$CO_2^+ + H \rightarrow HCO^+ + O$	2.9×10^{-10}	[70]
569	$CO^+ + H \rightarrow CO + H^+$	7.5×10^{-10}	[71]
570	$CO^+ + H_2 \rightarrow H + HCO^+$	1.5×10^{-9}	[72]
571	$CO + OH \rightarrow CO_2 + H$	$\frac{3.3\times10^6}{N_A} \cdot T_g^{1.55} \cdot \exp\left(\frac{4.02\times10^2}{T_g}\right)$	[73]
572	$CO + HO_2 \rightarrow CO_2 + OH$	$\frac{5.8\times10^{13}}{N_A} \cdot \exp\left(\frac{-2.293\times10^4\cdot4.184}{R\cdot T_g}\right)$	[74]
573	$CO + H_2O_2 \rightarrow COOH + OH$	$\frac{3.6\times10^4}{N_A} \cdot T_g^{2.5} \cdot \exp\left(\frac{-1.4425\times10^4}{T_g}\right)$	[75]
574	$CO_2 + OH^+ \rightarrow HCO^+ + O_2$	5.4×10^{-10}	[1]
575	$CO + OH^+ \rightarrow HCO^+ + O$	1.05×10^{-9}	[76]
576	$CO + H_2O^+ \rightarrow HCO^+ + OH$	5×10^{-10}	[76]
577	$CO + HO_2^+ \rightarrow HCO^+ + O_2$	8.4×10^{-10}	[1]
578	$CO_2^+ + H_2O \rightarrow CO_2 + H_2O^+$	2.044×10^{-9}	[77]
579	$CO^+ + OH \rightarrow CO + OH^+$	3.1×10^{-10}	[1]
580	$CO^+ + OH \rightarrow HCO^+ + O$	3.1×10^{-10}	[1]
581	$CO^+ + H_2O \rightarrow CO + H_2O^+$	1.7×10^{-9}	[78]
582	$CO^+ + H_2O \rightarrow HCO^+ + OH$	9×10^{-10}	[78]
583	$CH_4 + O \rightarrow CH_3 + OH$	$7.3 \times 10^{-19} \cdot T_g^{2.5} \cdot \exp\left(\frac{-3.31\times10^3}{T_g}\right)$	[5]
584	$CH_4 + O_2 \rightarrow CH_3 + HO_2$	$8.1 \times 10^{-19} \cdot T_g^{2.5} \cdot \exp\left(\frac{-2.637\times10^4}{T_g}\right)$	[5]
585	$CH_4 + O_2 \rightarrow CH_3OO + H$	$\frac{4.3\times10^{13}}{N_A} \cdot \left(\frac{T_g}{1\times10^3}\right)^{1.96} \cdot \exp\left(\frac{-8.73\times10^1\cdot4.184\times10^3}{R\cdot T_g}\right)$	[79]
586	$CH_3 + O \rightarrow H + HCHO$	1.12×10^{-10}	[5]
587	$CH_3 + O_2 \rightarrow HCHO + OH$	$3.7 \times 10^{-12} \cdot \exp\left(\frac{-1.114\times10^4}{T_g}\right)$	[5]
588	$CH_3 + O_2 \rightarrow CH_3O + O$	$3.5 \times 10^{-11} \cdot \exp\left(\frac{-1.634\times10^4}{T_g}\right)$	[5]
589	$CH_3 + O_2 \rightarrow CH_3OO$	$1.3 \times 10^{-15} \cdot T_g^{1.2}$	[5]
590	$CH_2 + O \rightarrow CO + H_2$	$0.4 \cdot 3.4 \times 10^{-10} \cdot \exp\left(\frac{-2.7\times10^2}{T_g}\right)$	[5]
591	$CH_2 + O_2 \rightarrow HCHO + O$	$\frac{4\times10^{10}}{N_A}$	[80]
592	$CH_2 + O_2 \rightarrow CO + H_2O$	4.2×10^{-13}	[25]
593	$CH + O \rightarrow CO + H$	6.6×10^{-11}	[5]
594	$CH + O \rightarrow e + HCO^+$	$4.2 \times 10^{-13} \cdot \exp\left(\frac{-8.5\times10^2}{T_g}\right)$	[5]
595	$CH + O_2 \rightarrow CO_2 + H$	4.2×10^{-11}	[5]

#	Reaction	Rate equation	Ref.
596	$CH + O_2 \rightarrow CO + OH$	2.8×10^{-11}	[5]
597	$CH + O_2 \rightarrow HCO + O$	2.8×10^{-11}	[5]
598	$CH_4 + O^+ \rightarrow CH_3^+ + OH$	1.1×10^{-10}	[27]
599	$CH_4 + O^+ \rightarrow CH_4^+ + O$	8.9×10^{-10}	[27]
600	$CH_4 + O^- \rightarrow CH_3 + OH^-$	1×10^{-10}	[1]
601	$CH_2 + O^+ \rightarrow CH_2^+ + O$	9.7×10^{-10}	[1]
602	$CH_2 + O_2^+ \rightarrow CH_2^+ + O_2$	4.3×10^{-10}	[1]
603	$CH_2 + O^- \rightarrow e + HCHO$	5×10^{-10}	[1]
604	$CH + O^+ \rightarrow CH^+ + O$	3.5×10^{-10}	[1]
605	$CH + O^+ \rightarrow CO^+ + H$	3.5×10^{-10}	[1]
606	$CH + O_2^+ \rightarrow CH^+ + O_2$	3.1×10^{-10}	[1]
607	$CH + O_2^+ \rightarrow HCO^+ + O$	3.1×10^{-10}	[1]
608	$CH + O^- \rightarrow e + HCO$	5×10^{-10}	[1]
609	$CH_5^+ + O \rightarrow CH_2 + H_3O^+$	2.156×10^{-10}	[81]
610	$CH_4^+ + O_2 \rightarrow CH_4 + O_2^+$	3.9×10^{-10}	[27]
611	$CH_3^+ + O \rightarrow H_2 + HCO^+$	3.08×10^{-10}	[82]
612	$CH_3^+ + O \rightarrow CO + H_3^+$	8.8×10^{-11}	[82]
613	$CH_3^+ + O_2 \rightarrow H_2O + HCO^+$	4.3×10^{-11}	[27]
614	$CH_3^+ + O^- \rightarrow CH_3 + O$	$7.51 \times 10^{-8} \cdot \left(\frac{T_g}{3\times10^2}\right)^{-0.5}$	[2, 3]
615	$CH_3^+ + O_2^- \rightarrow CH_3 + O_2$	$7.51 \times 10^{-8} \cdot \left(\frac{T_g}{3\times10^2}\right)^{-0.5}$	[2, 3]
616	$CH_2^+ + O \rightarrow H + HCO^+$	7.5×10^{-10}	[1]
617	$CH_2^+ + O_2 \rightarrow HCO^+ + OH$	4.55×10^{-10}	[27]
618	$CH^+ + O \rightarrow CO^+ + H$	1.75×10^{-10}	[81]
619	$CH^+ + O \rightarrow CO + H^+$	1.75×10^{-10}	[81]
620	$CH^+ + O_2 \rightarrow HCO + O^+$	9.7×10^{-10}	[27]
621	$CH^+ + O_2 \rightarrow CO_2^+ + H$	4.8×10^{-10}	[1]
622	$CH_3 + CO \rightarrow CH_3CO$	$k_0 = 1.6 \times 10^{-37} \cdot T_g^{1.05} \cdot \exp\left(\frac{-1.3\times10^3}{T_g}\right)$ $k_\infty = 3.1 \times 10^{-16} \cdot T_g^{1.05} \cdot \exp\left(\frac{-2.85\times10^3}{T_g}\right)$ $F_c = 0.5$	[5][a]
623	$CH_2 + CO_2 \rightarrow CO + HCHO$	3.9×10^{-14}	[25]
624	$CH_2 + CO \rightarrow CH_2CO$	1×10^{-15}	[25]
625	$CH + CO_2 \rightarrow CO + HCO$	$0.5 \cdot 1.06 \times 10^{-16} \cdot T_g^{1.51} \cdot \exp\left(\frac{3.6\times10^2}{T_g}\right)$	[5]
626	$CH + CO \rightarrow HCCO$	$k_0 = 6.3 \times 10^{-24} \cdot T_g^{-2.5}$ $k_\infty = 1.7 \times 10^{-9} \cdot T_g^{-0.4}$ $F_c = 0.6$	[5][a]
627	$CH_4 + CO_2^+ \rightarrow CH_4^+ + CO_2$	5.5×10^{-10}	[83]
628	$CH_4 + CO^+ \rightarrow CH_4^+ + CO$	8.978×10^{-10}	[27]
629	$CH_4 + CO^+ \rightarrow CH_3 + HCO^+$	3.752×10^{-10}	[27]
630	$CH_2 + CO^+ \rightarrow CH_2^+ + CO$	4.3×10^{-10}	[1]
631	$CH_2 + CO^+ \rightarrow CH + HCO^+$	4.3×10^{-10}	[1]
632	$CH + CO^+ \rightarrow CH^+ + CO$	3.2×10^{-10}	[1]

#	Reaction	Rate equation	Ref.
633	$CH + CO^+ \rightarrow C + HCO^+$	3.2×10^{-10}	[1]
634	$CH_5^+ + CO \rightarrow CH_4 + HCO^+$	9.9×10^{-10}	[27]
635	$CH_4^+ + CO \rightarrow CH_3 + HCO^+$	1.0368×10^{-9}	[27]
636	$CH^+ + CO_2 \rightarrow CO + HCO^+$	1.6×10^{-9}	[27]
637	$CH^+ + CO \rightarrow C + HCO^+$	7×10^{-12}	[27]
638	$CH_4 + OH \rightarrow CH_3 + H_2O$	$1.66 \times 10^{-18} \cdot T_g^{2.182} \cdot \exp\left(\frac{-1.231\times10^3}{T_g}\right)$	[84]
639	$CH_4 + HO_2 \rightarrow CH_3 + H_2O_2$	$7.8 \times 10^{-20} \cdot T_g^{2.5} \cdot \exp\left(\frac{-1.057\times10^4}{T_g}\right)$	[5]
640	$CH_3 + OH \rightarrow CH_3OH$	$k_0 = 1.06 \times 10^{-10} \cdot T_g^{-6.21} \cdot \exp\left(\frac{-6.71\times10^2}{T_g}\right)$ $k_\infty = 7.2 \times 10^{-9} \cdot T_g^{-0.79}$ $F_c = 0.75 \cdot \exp\left(\frac{-T_g}{2.1\times10^2}\right)$ $+0.25 \cdot \exp\left(\frac{-T_g}{1.434\times10^3}\right)$	[5][a]
641	$CH_3 + OH \rightarrow CH_2 + H_2O$	$\frac{k}{n_M}$ $k_0 = 1.8 \times 10^{-8} \cdot T_g^{-0.91} \cdot \exp\left(\frac{-2.75\times10^2}{T_g}\right)$ $k_\infty = 6.4 \times 10^{-8} \cdot T_g^{5.8} \cdot \exp\left(\frac{4.85\times10^2}{T_g}\right)$ $F_c = 0.664 \cdot \exp\left(\frac{-T_g}{3.569\times10^3}\right)$ $+0.336 \cdot \exp\left(\frac{-T_g}{1.08\times10^2}\right)$ $+ \exp\left(\frac{-3.24\times10^3}{T_g}\right)$	[5][a]
642	$CH_3 + OH \rightarrow CH_2OH + H$	$1.2 \times 10^{-12} \cdot \exp\left(\frac{-2.76\times10^3}{T_g}\right)$	[5]
643	$CH_3 + OH \rightarrow CH_3O + H$	$2 \times 10^{-14} \cdot \exp\left(\frac{-6.99\times10^3}{T_g}\right)$	[5]
644	$CH_3 + OH \rightarrow H_2 + HCHO$	$5.3 \times 10^{-15} \cdot \exp\left(\frac{-2.53\times10^3}{T_g}\right)$	[5]
645	$CH_3 + OH \rightarrow CH_4 + O$	$1.16 \times 10^{-19} \cdot T_g^{2.2} \cdot \exp\left(\frac{-2.24\times10^3}{T_g}\right)$	[85]
646	$CH_3 + H_2O \rightarrow CH_4 + OH$	$8 \times 10^{-22} \cdot T_g^{2.9} \cdot \exp\left(\frac{-7.48\times10^3}{T_g}\right)$	[86]
647	$CH_3 + HO_2 \rightarrow CH_3O + OH$	3×10^{-11}	[5]
648	$CH_3 + HO_2 \rightarrow CH_4 + O_2$	6×10^{-12}	[25]
649	$CH_3 + H_2O_2 \rightarrow CH_4 + HO_2$	$2 \times 10^{-14} \cdot \exp\left(\frac{3.0\times10^2}{T_g}\right)$	[25]
650	$CH_2 + OH \rightarrow H + HCHO$	5×10^{-11}	[25]
651	$CH_2 + H_2O \rightarrow CH_3 + OH$	1×10^{-16}	[25]
652	$CH_2 + HO_2 \rightarrow HCHO + OH$	3×10^{-11}	[25]
653	$CH_2 + H_2O_2 \rightarrow CH_3 + HO_2$	1×10^{-14}	[25]
654	$CH + OH \rightarrow C + H_2O$	$\frac{4\times10^7}{N_A} \cdot T_g^2 \cdot \exp\left(\frac{-3\times10^3\cdot4.184}{R\cdot T_g}\right)$	[74]
655	$CH + OH \rightarrow H + HCO$	$\frac{3\times10^{13}}{N_A}$	[74]
656	$CH + H_2O \rightarrow H + HCHO$	$\frac{8.5\times10^8}{N_A} \cdot T_g^{1.144} \cdot \exp\left(\frac{2.051\times10^3\cdot4.184}{R\cdot T_g}\right)$	[66]
657	$CH_4 + OH^+ \rightarrow CH_5^+ + O$	1.885×10^{-10}	[27]
658	$CH_4 + OH^+ \rightarrow CH_2 + H_3O^+$	1.2615×10^{-9}	[27]
659	$CH_4 + H_2O^+ \rightarrow CH_3 + H_3O^+$	1.12×10^{-9}	[27]
660	$CH_4 + HO_2^+ \rightarrow CH_3^+ + H_2 + O_2$	8×10^{-11}	[27]
661	$CH_4 + HO_2^+ \rightarrow CH_5^+ + O_2$	9.2×10^{-10}	[27]
662	$CH_3 + OH^- \rightarrow CH_3OH + e$	1×10^{-9}	[1]
663	$CH_2 + OH^+ \rightarrow CH_2^+ + OH$	4.8×10^{-10}	[1]
664	$CH_2 + OH^+ \rightarrow CH_3^+ + O$	4.8×10^{-10}	[1]

#	Reaction	Rate equation	Ref.
665	$CH_2 + H_2O^+ \rightarrow CH_2^+ + H_2O$	4.7×10^{-10}	[1]
666	$CH_2 + H_2O^+ \rightarrow CH_3^+ + OH$	4.7×10^{-10}	[1]
667	$CH_2 + H_3O^+ \rightarrow CH_3^+ + H_2O$	9.4×10^{-10}	[1]
668	$CH_2 + HO_2^+ \rightarrow CH_3^+ + O_2$	8.5×10^{-10}	[1]
669	$CH + OH^+ \rightarrow CH^+ + OH$	3.5×10^{-10}	[1]
670	$CH + OH^+ \rightarrow CH_2^+ + O$	3.5×10^{-10}	[1]
671	$CH + H_2O^+ \rightarrow CH^+ + H_2O$	3.4×10^{-10}	[1]
672	$CH + H_2O^+ \rightarrow CH_2^+ + OH$	3.4×10^{-10}	[1]
673	$CH + H_3O^+ \rightarrow CH_2^+ + H_2O$	6.8×10^{-10}	[1]
674	$CH + HO_2^+ \rightarrow CH_2^+ + O_2$	6.2×10^{-10}	[1]
675	$CH + OH^- \rightarrow e + HCHO$	5×10^{-10}	[1]
676	$CH_5^+ + OH \rightarrow CH_4 + H_2O^+$	7×10^{-10}	[1]
677	$CH_5^+ + H_2O \rightarrow CH_4 + H_3O^+$	3.7×10^{-9}	[27]
678	$CH_4^+ + H_2O \rightarrow CH_3 + H_3O^+$	2.5×10^{-9}	[27]
679	$CH_3^+ + OH^- \rightarrow CH_3 + OH$	$7.51 \times 10^{-8} \cdot \left(\frac{T_g}{3\times10^2}\right)^{-0.5}$	[2, 3]
680	$CH^+ + OH \rightarrow CO^+ + H_2$	7.5×10^{-10}	[1]
681	$CH^+ + H_2O \rightarrow C + H_3O^+$	1.45×10^{-9}	[27]
682	$C^+ + HCO \rightarrow C + HCO^+$	4.8×10^{-10}	[1]
683	$C^+ + HCO \rightarrow CH^+ + CO$	4.8×10^{-10}	[1]
684	$C^+ + HCHO \rightarrow CH_2^+ + CO$	2.112×10^{-9}	[87]
685	$C^+ + HCHO \rightarrow CH + HCO^+$	9.24×10^{-10}	[87]
686	$CH_3OH + C^+ \rightarrow CH_3 + HCO^+$	3.28×10^{-10}	[87]
687	$CH_3OH + C^+ \rightarrow CH_3^+ + HCO$	1.189×10^{-9}	[87]
688	$C + HCO^+ \rightarrow CH^+ + CO$	1.1×10^{-9}	[1]
689	$CO + COOH \rightarrow CO_2 + HCO$	1×10^{-14}	[88]
690	$CH_3O + CO \rightarrow CH_3 + CO_2$	$2.6 \times 10^{-11} \cdot \exp\left(\frac{-5.94\times10^3}{T_g}\right)$	[25]
691	$CH_3O + CO \rightarrow HCHO + HCO$	5.23×10^{-15}	[89]
692	$CH_3OO + CO \rightarrow CH_3O + CO_2$	7×10^{-18}	[90]
693	$CO^+ + HCO \rightarrow CO + HCO^+$	7.4×10^{-10}	[1]
694	$CO^+ + HCHO \rightarrow HCO + HCO^+$	1.65×10^{-9}	[91]
695	$H + HCO \rightarrow CO + H_2$	1.5×10^{-10}	[5]
696	$H + HCO \rightarrow CH_2 + O$	$\frac{3.98107171\times10^{13}}{N_A} \cdot \exp\left(\frac{-4.29\times10^5}{R\cdot T_g}\right)$	[92]
697	$H + HCHO \rightarrow H_2 + HCO$	$3.34 \times 10^{-23} \cdot T_g^{-3.81} \cdot \exp\left(\frac{-2.02\times10^2}{T_g}\right)$	[5]
698	$H + HCHO \rightarrow CH_3O$	$\frac{2.4\times10^{13}}{N_A} \cdot \exp\left(\frac{-4.11\times10^3\cdot4.184}{T_g}\right)$	[93]
699	$CH_3O + H \rightarrow H_2 + HCHO$	3.3×10^{-11}	[25]
700	$CH_3O + H \rightarrow CH_3OH$	$3.4 \times 10^{-10} \cdot \left(\frac{T_g}{3\times10^2}\right)^{0.33}$	[94]
701	$CH_3O + H_2 \rightarrow CH_3OH + H$	$1.7 \times 10^{-15} \cdot \left(\frac{T_g}{3\times10^2}\right)^{4} \cdot \exp\left(\frac{-2.47\times10^3}{T_g}\right)$	[95]
702	$CH_2OH + H \rightarrow H_2 + HCHO$	1×10^{-11}	[96]
703	$CH_2OH + H \rightarrow CH_3 + OH$	1.6×10^{-10}	[96]

#	Reaction	Rate equation	Ref.
704	$CH_2OH + H_2 \rightarrow CH_3OH + H$	$1.12 \times 10^{-18} \cdot T_g^2 \cdot \exp\left(\frac{-6.722\times10^3}{T_g}\right)$	[96]
705	$CH_3OH + H \rightarrow CH_2OH + H_2$	$5.7 \times 10^{-15} \cdot T_g^{1.24} \cdot \exp\left(\frac{-2.26\times10^3}{T_g}\right)$	[5]
706	$CH_3OH + H \rightarrow CH_3 + H_2O$	$\frac{2\times10^{12}}{N_A} \cdot \exp\left(\frac{-5.3\cdot4.184\times10^3}{R\cdot T_g}\right)$	[97]
707	$CH_3OO + H \rightarrow CH_4 + O_2$	$\frac{4.02\times10^{13}}{N_A} \cdot \left(\frac{T_g}{1\times10^3}\right)^{1.02} \cdot \exp\left(\frac{-1.66\times10^1\cdot4.184\times10^3}{R\cdot T_g}\right)$	[79]
708	$CH_3OO + H \rightarrow CH_3O + OH$	1.6×10^{-10}	[25]
709	$CH_3OO + H_2 \rightarrow CH_3OOH + H$	$5 \times 10^{-11} \cdot \exp\left(\frac{-1.31\times10^4}{T_g}\right)$	[25]
710	$HCO + H^+ \rightarrow H + HCO^+$	9.4×10^{-10}	[1]
711	$HCO + H^+ \rightarrow CO^+ + H_2$	9.4×10^{-10}	[1]
712	$HCO + H^+ \rightarrow CO + H_2^+$	9.4×10^{-10}	[1]
713	$H_2^+ + HCO \rightarrow H_2 + HCO^+$	1×10^{-9}	[1]
714	$H_2^+ + HCO \rightarrow CO + H_3^+$	1×10^{-9}	[1]
715	$HCO + H^- \rightarrow e + HCHO$	1×10^{-9}	[1]
716	$HCHO + H^+ \rightarrow CO^+ + H + H_2$	1.064×10^{-9}	[98]
717	$HCHO + H^+ \rightarrow H_2 + HCO^+$	3.572×10^{-9}	[98]
718	$H_2^+ + HCHO \rightarrow H + H_2 + HCO^+$	1.4×10^{-9}	[1]
719	$H_3^+ + HCOOH \rightarrow CO + H_2 + H_3O^+$	1.83×10^{-9}	[99]
720	$H_3^+ + HCOOH \rightarrow H_2 + H_2O + HCO^+$	4.27×10^{-9}	[99]
721	$CH_3OH + H^+ \rightarrow CH_3^+ + H_2O$	7.4×10^{-10}	[29]
722	$CH_3OH + H^+ \rightarrow H_2 + H_2 + HCO^+$	1.11×10^{-9}	[29]
723	$CH_3OH + H_3^+ \rightarrow CH_3^+ + H_2 + H_2O$	3.71×10^{-9}	[100]
724	$CH_3OH + H_3^+ \rightarrow H_2 + H_2 + H_2 + HCO^+$	1.26×10^{-9}	[100]
725	$HCO^+ + H^- \rightarrow CO + H + H$	$3.76 \times 10^{-8} \cdot \left(\frac{T_g}{3\times10^2}\right)^{-0.5}$	[2, 3]
726	$HCO^+ + H^- \rightarrow H + HCO$	$3.76 \times 10^{-8} \cdot \left(\frac{T_g}{3\times10^2}\right)^{-0.5}$	[2, 3]
727	$HCO^+ + H^- \rightarrow CO + H_2$	$2.3 \times 10^{-7} \cdot \left(\frac{T_g}{3\times10^2}\right)^{-0.5}$	[1]
728	$HCO + OH \rightarrow CO + H_2O$	1.8×10^{-10}	[5]
729	$H_2O + HCO \rightarrow HCHO + OH$	$3.9 \times 10^{-16} \cdot T_g^{1.35} \cdot \exp\left(\frac{-1.3146\times10^4}{T_g}\right)$	[25]
730	$H_2O_2 + HCO \rightarrow HCHO + HO_2$	$1.7 \times 10^{-13} \cdot \exp\left(\frac{-3.486\times10^3}{T_g}\right)$	[25]
731	$HCHO + OH \rightarrow H_2O + HCO$	$2.31 \times 10^{-11} \cdot \exp\left(\frac{-3.04\times10^2}{T_g}\right)$	[5]
732	$HCHO + OH \rightarrow H + HCOOH$	2×10^{-13}	[101]
733	$HCHO + HO_2 \rightarrow H_2O_2 + HCO$	$6.8 \times 10^{-20} \cdot T_g^{2.5} \cdot \exp\left(\frac{-5.14\times10^3}{T_g}\right)$	[5]
734	$HCHO + HO_2 \rightarrow CH_2OH + O_2$	$\frac{3.38844156\times10^{12}}{N_A} \cdot \exp\left(\frac{-8\times10^4}{R\cdot T_g}\right)$	[92]
735	$HCOOH + OH \rightarrow COOH + H_2O$	$\frac{5.93\times10^8\cdot1\times10^3}{N_A} \cdot \exp\left(\frac{-1.036\times10^3}{T_g}\right)$	[102]
736	$CH_3O + OH \rightarrow H_2O + HCHO$	3×10^{-11}	[25]
737	$CH_3O + HO_2 \rightarrow H_2O_2 + HCHO$	5×10^{-13}	[25]
738	$CH_3O + HO_2 \rightarrow CH_3OH + O_2$	4.7×10^{-11}	[103]
739	$CH_2OH + OH \rightarrow H_2O + HCHO$	4×10^{-11}	[96]
740	$CH_2OH + H_2O \rightarrow CH_3OH + OH$	$\frac{1.54881662\times10^{14}}{N_A} \cdot \exp\left(\frac{-1.1\times10^5}{R\cdot T_g}\right)$	[92]
741	$CH_2OH + HO_2 \rightarrow H_2O_2 + HCHO$	$\frac{1.3\times10^6\cdot1\times10^3}{N_A} \cdot \left(\frac{T_g}{2.98\times10^2}\right)^{5.31} \cdot \exp\left(\frac{-6.01\times10^4}{R\cdot T_g}\right)$	[104]

#	Reaction	Rate equation	Ref.
742	$CH_2OH + HO_2 \rightarrow CH_3OH + O_2$	$\frac{5.7\times10^4\cdot1\times10^3}{N_A} \cdot \left(\frac{T_g}{2.98\times10^2}\right)^{3.2} \cdot \exp\left(\frac{-6.8\times10^3}{R\cdot T_g}\right)$	[104]
743	$CH_2OH + HO_2 \rightarrow H_2O + HCOOH$	$\frac{3.6\times10^9\cdot1\times10^3}{N_A} \cdot T_g^{0.12} \cdot \exp\left(\frac{-1.9\times10^3}{R\cdot T_g}\right)$	[104]
744	$CH_2OH + H_2O_2 \rightarrow CH_3OH + HO_2$	$5 \times 10^{-15} \cdot \exp\left(\frac{-1.3\times10^3}{T_g}\right)$	[96]
745	$CH_3OH + HO_2 \rightarrow CH_2OH + H_2O_2$	$5.41 \times 10^{-11} \cdot \exp\left(\frac{-9.2\times10^3}{T_g}\right)$	[105]
746	$CH_3OH + HO_2 \rightarrow CH_3O + H_2O_2$	$2.02 \times 10^{-12} \cdot \exp\left(\frac{-1.01\times10^4}{T_g}\right)$	[105]
747	$CH_3OOH + OH \rightarrow CH_3OO + H_2O$	$1.8 \times 10^{-12} \cdot \exp\left(\frac{2.2\times10^2}{T_g}\right)$	[5]
748	$CH_3OO + OH \rightarrow CH_3OH + O_2$	1×10^{-10}	[25]
749	$CH_3OO + HO_2 \rightarrow CH_3OOH + O_2$	$0.9 \cdot 4.2 \times 10^{-13} \cdot \exp\left(\frac{7.5\times10^2}{T_g}\right)$	[5]
750	$CH_3OO + H_2O_2 \rightarrow CH_3OOH + HO_2$	$4 \times 10^{-12} \cdot \exp\left(\frac{-5\times10^3}{T_g}\right)$	[25]
751	$HCO + OH^+ \rightarrow HCO^+ + OH$	2.8×10^{-10}	[1]
752	$HCO + OH^+ \rightarrow CO + H_2O^+$	2.8×10^{-10}	[1]
753	$H_2O^+ + HCO \rightarrow H_2O + HCO^+$	2.8×10^{-10}	[1]
754	$H_2O^+ + HCO \rightarrow CO + H_3O^+$	2.8×10^{-10}	[1]
755	$HCO^+ + OH \rightarrow CO + H_2O^+$	6.2×10^{-10}	[1]
756	$H_2O + HCO^+ \rightarrow CO + H_3O^+$	2.5×10^{-9}	[91]
757	$HCO^+ + OH^- \rightarrow CO + H + OH$	$3.76 \times 10^{-8} \cdot \left(\frac{T_g}{3\times10^2}\right)^{-0.5}$	[2, 3]
758	$HCO^+ + OH^- \rightarrow HCO + OH$	$3.76 \times 10^{-8} \cdot \left(\frac{T_g}{3\times10^2}\right)^{-0.5}$	[2, 3]
759	$HCO + O \rightarrow CO + OH$	5×10^{-11}	[25]
760	$HCO + O \rightarrow CO_2 + H$	5×10^{-11}	[25]
761	$HCO + O_2 \rightarrow CO + HO_2$	$4.5 \times 10^{-14} \cdot T_g^{0.68} \cdot \exp\left(\frac{2.36\times10^2}{T_g}\right)$	[5]
762	$HCHO + O \rightarrow HCO + OH$	$6.9 \times 10^{-13} \cdot T_g^{0.57} \cdot \exp\left(\frac{-1.39\times10^3}{T_g}\right)$	[5]
763	$HCHO + O_2 \rightarrow HCO + HO_2$	$4.05 \times 10^{-19} \cdot T_g^{2.5} \cdot \exp\left(\frac{-1.835\times10^4}{T_g}\right)$	[5]
764	$CH_3O + O \rightarrow CH_3 + O_2$	1.875×10^{-11}	[5]
765	$CH_3O + O \rightarrow HCHO + OH$	6.25×10^{-12}	[5]
766	$CH_3O + O_2 \rightarrow HCHO + HO_2$	$3.6 \times 10^{-14} \cdot \exp\left(\frac{-8.8\times10^2}{T_g}\right)$	[5]
767	$CH_2OH + O_2 \rightarrow HCHO + HO_2$	$4.8 \times 10^{-8} \cdot T_g^{-1.5}$ $+1.2 \times 10^{-10} \cdot \exp\left(\frac{-1.88\times10^3}{T_g}\right)$	[5]
768	$CH_3OH + O \rightarrow CH_2OH + OH$	$4.1 \times 10^{-11} \cdot \exp\left(\frac{-2.67\times10^3}{T_g}\right)$	[5]
769	$CH_3OH + O_2 \rightarrow CH_2OH + HO_2$	$3.4 \times 10^{-11} \cdot \exp\left(\frac{-2.26\times10^4}{T_g}\right)$	[96]
770	$CH_3OO + O \rightarrow CH_3O + O_2$	6×10^{-11}	[25]
771	$HCO + O^+ \rightarrow HCO^+ + O$	4.3×10^{-10}	[1]
772	$HCO + O^+ \rightarrow CO + OH^+$	4.3×10^{-10}	[1]
773	$HCO + O_2^+ \rightarrow HCO^+ + O_2$	3.6×10^{-10}	[1]
774	$HCO + O_2^+ \rightarrow CO + HO_2^+$	3.6×10^{-10}	[1]
775	$HCHO + O^+ \rightarrow CO + H_2O^+$	4×10^{-10}	[1]
776	$HCO^+ + O^- \rightarrow CO + H + O$	$3.76 \times 10^{-8} \cdot \left(\frac{T_g}{3\times10^2}\right)^{-0.5}$	[2, 3]
777	$HCO^+ + O^- \rightarrow HCO + O$	$3.76 \times 10^{-8} \cdot \left(\frac{T_g}{3\times10^2}\right)^{-0.5}$	[2, 3]
778	$HCO^+ + O_2^- \rightarrow CO + H + O_2$	$3.76 \times 10^{-8} \cdot \left(\frac{T_g}{3\times10^2}\right)^{-0.5}$	[2, 3]
779	$HCO^+ + O_2^- \rightarrow HCO + O_2$	$3.76 \times 10^{-8} \cdot \left(\frac{T_g}{3\times10^2}\right)^{-0.5}$	[2, 3]

#	Reaction	Rate equation	Ref.
780	$CH_4 + HCO \rightarrow CH_3 + HCHO$	$1.21 \times 10^{-20} \cdot T_g^{2.85} \cdot \exp\left(\frac{-1.133\times10^4}{T_g}\right)$	[25]
781	$CH_3 + HCO \rightarrow CH_4 + CO$	2×10^{-10}	[25]
782	$CH_3 + HCO \rightarrow CH_3CHO$	3×10^{-11}	[25]
783	$CH_2 + HCO \rightarrow CH_3 + CO$	3×10^{-11}	[25]
784	$CH_3 + COOH \rightarrow CH_2CO + H_2O$	$\left(1.52 + 1.95 \times 10^{-4} \cdot T_g\right) \cdot 3.24 \times 10^{-11} \cdot T_g^{0.1024}$	[106]
785	$CH_3 + COOH \rightarrow CH_4 + CO_2$	$3.24 \times 10^{-11} \cdot T_g^{0.1024}$	[106]
786	$CH_3 + HCHO \rightarrow CH_3CH_2O$	$\frac{3\times10^{11}}{N_A} \cdot \exp\left(\frac{-6.336\times10^3\cdot4.186}{R\cdot T_g}\right)$	[93]
787	$CH_3 + HCHO \rightarrow CH_4 + HCO$	$5.3 \times 10^{-23} \cdot T_g^{3.36} \cdot \exp\left(\frac{-2.17\times10^3}{T_g}\right)$	[5]
788	$CH_2 + HCHO \rightarrow CH_3 + HCO$	1×10^{-14}	[25]
789	$CH + HCHO \rightarrow CH_2CO + H$	$7.62 \times 10^{-10} \cdot T_g^{-0.32} \cdot \exp\left(\frac{3.86\times10^2}{T_g}\right)$	[107]
790	$CH_3O + CH_4 \rightarrow CH_3 + CH_3OH$	$2.6 \times 10^{-13} \cdot \exp\left(\frac{-4.45\times10^3}{T_g}\right)$	[25]
791	$CH_3 + CH_3O \rightarrow CH_4 + HCHO$	4×10^{-11}	[25]
792	$CH_2 + CH_3O \rightarrow CH_3 + HCHO$	3×10^{-11}	[25]
793	$CH_2OH + CH_4 \rightarrow CH_3 + CH_3OH$	$3.6 \times 10^{-23} \cdot T_g^{3.1} \cdot \exp\left(\frac{-8.166\times10^3}{T_g}\right)$	[96]
794	$CH_2OH + CH_3 \rightarrow CH_3CH_2OH$	2×10^{-11}	[96]
795	$CH_2OH + CH_3 \rightarrow CH_4 + HCHO$	4×10^{-12}	[96]
796	$CH_2 + CH_2OH \rightarrow C_2H_4 + OH$	4×10^{-11}	[96]
797	$CH_2 + CH_2OH \rightarrow CH_3 + HCHO$	2×10^{-12}	[96]
798	$CH_3 + CH_3OH \rightarrow CH_2OH + CH_4$	$0.33 \cdot 5 \times 10^{-23} \cdot T_g^{3.45} \cdot \exp\left(\frac{-4.02\times10^3}{T_g}\right)$	[5]
799	$CH_3 + CH_3OH \rightarrow CH_3O + CH_4$	$0.67 \cdot 5 \times 10^{-23} \cdot T_g^{3.45} \cdot \exp\left(\frac{-4.02\times10^3}{T_g}\right)$	[5]
800	$CH_2 + CH_3OH \rightarrow CH_2OH + CH_3$	$5.3 \times 10^{-23} \cdot T_g^{3.2} \cdot \exp\left(\frac{-3.609\times10^3}{T_g}\right)$	[96]
801	$CH_2 + CH_3OH \rightarrow CH_3 + CH_3O$	$2.4 \times 10^{-23} \cdot T_g^{3.1} \cdot \exp\left(\frac{-3.49\times10^3}{T_g}\right)$	[96]
802	$CH_3OO + CH_4 \rightarrow CH_3 + CH_3OOH$	$3 \times 10^{-13} \cdot \exp\left(\frac{-9.3\times10^3}{T_g}\right)$	[25]
803	$CH_3 + CH_3OO \rightarrow CH_3O + CH_3O$	4×10^{-11}	[25]
804	$CH_2 + CH_3OO \rightarrow CH_3O + HCHO$	3×10^{-11}	[25]
805	$CH_2 + CH_3OO \rightarrow C_2H_5 + O_2$	3×10^{-11}	[25]
806	$CH_3^+ + HCO \rightarrow CH_3 + HCO^+$	4.4×10^{-10}	[1]
807	$CH_3^+ + HCO \rightarrow CH_4^+ + CO$	4.4×10^{-10}	[1]
808	$CH_2^+ + HCO \rightarrow CH_3^+ + CO$	4.5×10^{-10}	[1]
809	$CH^+ + HCO \rightarrow CH + HCO^+$	4.6×10^{-10}	[1]
810	$CH^+ + HCO \rightarrow CH_2^+ + CO$	4.6×10^{-10}	[1]
811	$CH_3^+ + HCHO \rightarrow CH_4 + HCO^+$	1.6×10^{-9}	[20]
812	$CH_2 + HCO^+ \rightarrow CH_3^+ + CO$	8.6×10^{-10}	[1]
813	$CH + HCO^+ \rightarrow CH_2^+ + CO$	6.3×10^{-10}	[1]
814	$HCO + HCO \rightarrow CO + HCHO$	4.265×10^{-11}	[5]
815	$CH_3O + HCO \rightarrow CH_3OH + CO$	1.5×10^{-10}	[25]
816	$CH_2OH + HCO \rightarrow CH_3OH + CO$	2×10^{-10}	[96]
817	$CH_2OH + HCO \rightarrow HCHO + HCHO$	3×10^{-10}	[96]
818	$CH_3OH + HCO \rightarrow CH_2OH + HCHO$	$1.6 \times 10^{-20} \cdot T_g^{2.9} \cdot \exp\left(\frac{-6.596\times10^3}{T_g}\right)$	[96]

#	Reaction	Rate equation	Ref.
819	$CH_3OH + HCO \rightarrow CH_3O + HCHO$	$1.6 \times 10^{-22} \cdot T_g^{2.9} \cdot \exp\left(\frac{-6.596\times10^3}{T_g}\right)$	[96]
820	$CH_3O + HCHO \rightarrow CH_3OH + HCO$	$1.7 \times 10^{-13} \cdot \exp\left(\frac{-1.5\times10^3}{T_g}\right)$	[25]
821	$CH_2OH + HCHO \rightarrow CH_3OH + HCO$	$9.1 \times 10^{-21} \cdot T_g^{2.8} \cdot \exp\left(\frac{-2.95\times10^3}{T_g}\right)$	[96]
822	$CH_3O + CH_3O \rightarrow CH_3OH + HCHO$	1×10^{-10}	[25]
823	$CH_2OH + CH_3O \rightarrow CH_3OH + HCHO$	4×10^{-11}	[96]
824	$CH_3O + CH_3OH \rightarrow CH_2OH + CH_3OH$	$5 \times 10^{-13} \cdot \exp\left(\frac{-2.05\times10^3}{T_g}\right)$	[96]
825	$CH_2OH + CH_2OH \rightarrow CH_3OH + HCHO$	8×10^{-12}	[96]
826	$CH_2OH + CH_3OH \rightarrow CH_3O + CH_3OH$	$1.3 \times 10^{-14} \cdot \exp\left(\frac{-6.07\times10^3}{T_g}\right)$	[96]
827	$CH_3O + CH_3OO \rightarrow CH_3OOH + HCHO$	5×10^{-13}	[25]
828	$CH_3OH + CH_3OO \rightarrow CH_2OH + CH_3OOH$	$3.421 \times 10^{-33} \cdot T_g^{6.2} \cdot \exp\left(\frac{-2.9826\times10^4}{R\cdot T_g}\right)$	[108]
829	$CH_3OH + CH_3OO \rightarrow CH_3O + CH_3OOH$	$1.318 \times 10^{-27} \cdot T_g^{4.71} \cdot \exp\left(\frac{-5.6739\times10^4}{R\cdot T_g}\right)$	[108]
830	$CH_2OH + CH_3OO \rightarrow CH_3OOH + HCHO$	$1.047 \times 10^{-24} \cdot T_g^{2.69} \cdot \exp\left(\frac{1.4344\times10^4}{R\cdot T_g}\right)$	[108]
831	$CH_2OH + CH_3OO \rightarrow CH_3OH + HCOOH$	$3.89 \times 10^{-24} \cdot T_g^{2.74} \cdot \exp\left(\frac{1.4922\times10^4}{R\cdot T_g}\right)$	[108]
832	$CH_3OO + HCHO \rightarrow CH_3OOH + HCO$	$3.3 \times 10^{-12} \cdot \exp\left(\frac{-5.87\times10^3}{T_g}\right)$	[25]
833	$C_2H_6 + OH \rightarrow C_2H_5 + H_2O$	$1.52 \times 10^{-17} \cdot T_g^{2} \cdot \exp\left(\frac{-5\times10^2}{T_g}\right)$	[5]
834	$C_2H_6 + HO_2 \rightarrow C_2H_5 + H_2O_2$	$1.83 \times 10^{-19} \cdot T_g^{2.5} \cdot \exp\left(\frac{-8.48\times10^3}{T_g}\right)$	[5]
835	$C_2H_5 + OH \rightarrow C_2H_6 + O$	$1.7 \times 10^{-40} \cdot T_g^{8.8} \cdot \exp\left(\frac{-2.5\times10^2}{T_g}\right)$	[85]
836	$C_2H_5 + OH \rightarrow C_2H_4 + H_2O$	4×10^{-11}	[25]
837	$C_2H_5 + H_2O \rightarrow C_2H_6 + OH$	$5.6 \times 10^{-18} \cdot T_g^{1.44} \cdot \exp\left(\frac{-1.015\times10^4}{T_g}\right)$	[25]
838	$C_2H_5 + HO_2 \rightarrow C_2H_6 + O_2$	5×10^{-13}	[25]
839	$C_2H_5 + HO_2 \rightarrow C_2H_4 + H_2O_2$	5×10^{-13}	[25]
840	$C_2H_5 + H_2O_2 \rightarrow C_2H_6 + HO_2$	$1.45 \times 10^{-14} \cdot \exp\left(\frac{-4.9\times10^2}{T_g}\right)$	[25]
841	$C_2H_4 + OH \rightarrow CH_3 + HCHO$	$\frac{1}{3} \cdot 3.4 \times 10^{-11} \cdot \exp\left(\frac{-2.99\times10^3}{T_g}\right)$	[5]
842	$C_2H_4 + OH \rightarrow CH_3CHO + H$	$\frac{1}{3} \cdot 3.4 \times 10^{-11} \cdot \exp\left(\frac{-2.99\times10^3}{T_g}\right)$	[5]
843	$C_2H_4 + HO_2 \rightarrow C_2H_5 + O_2$	$1 \times 10^{-13} \cdot T_g^{0.07} \cdot \exp\left(\frac{-6.58\times10^3}{T_g}\right)$	[5]
844	$C_2H_3 + OH \rightarrow CH_3 + HCO$	$1.09 \times 10^{-5} \cdot T_g^{-1.85} \cdot \exp\left(\frac{-5.01\times10^2}{T_g}\right)$	[109]
845	$C_2H_3 + OH \rightarrow CH_3CO + H$	$9.42 \times 10^{-9} \cdot T_g^{-1.014} \cdot \exp\left(\frac{-1.95\times10^2}{T_g}\right)$	[109]
846	$C_2H_3 + OH \rightarrow C_2H_2 + H_2O$	$3.96 \times 10^{-13} \cdot T_g^{0.081} \cdot \exp\left(\frac{1.91\times10^2}{T_g}\right)$	[109]
847	$C_2H_3 + OH \rightarrow CH_2CO + H_2$	$1.26 \times 10^{-8} \cdot T_g^{-1.517} \cdot \exp\left(\frac{-3.63\times10^2}{T_g}\right)$	[109]
848	$C_2H_3 + OH \rightarrow CH_4 + CO$	$1.32 \times 10^{-8} \cdot T_g^{-1.328} \cdot \exp\left(\frac{-2.98\times10^2}{T_g}\right)$	[109]
849	$C_2H_3 + H_2O \rightarrow C_2H_4 + OH$	$8 \times 10^{-22} \cdot T_g^{2.9} \cdot \exp\left(\frac{-7.48\times10^3}{T_g}\right)$	[25]
850	$C_2H_3 + H_2O_2 \rightarrow C_2H_4 + HO_2$	$2 \times 10^{-14} \cdot \exp\left(\frac{3\times10^2}{T_g}\right)$	[25]
851	$C_2H_2 + OH \rightarrow CH_2CO + H$	$0.5 \cdot 1.3 \times 10^{-10} \cdot \exp\left(\frac{-6.8\times10^3}{T_g}\right)$	[5]
852	$C_2H_2 + OH \rightarrow C_2H + H_2O$	$0.5 \cdot 1.3 \times 10^{-10} \cdot \exp\left(\frac{-6.8\times10^3}{T_g}\right)$	[5]
853	$C_2H_2 + HO_2 \rightarrow C_2H_3 + O_2$	$5.18 \times 10^{-18} \cdot T_g^{1.61} \cdot \exp\left(\frac{-7.1309\times10^3}{T_g}\right)$	[110]
854	$C_2H + OH \rightarrow C_2H_2 + O$	3×10^{-11}	[25]
855	$C_2H + OH \rightarrow CH_2 + CO$	3×10^{-11}	[25]
856	$C_2H + H_2O \rightarrow C_2H_2 + OH$	$2.2 \times 10^{-21} \cdot T_g^{3.05} \cdot \exp\left(\frac{-3.76\times10^2}{T_g}\right)$	[111]

#	Reaction	Rate equation	Ref.
857	$C_2H + HO_2 \rightarrow C_2H_2 + O_2$	3×10^{-11}	[25]
858	$C_2H + HO_2 \rightarrow HCCO + OH$	3×10^{-11}	[25]
859	$C_2H_6 + OH^+ \rightarrow C_2H_4^+ + H_2 + OH$	1.04×10^{-9}	[28]
860	$C_2H_6 + OH^+ \rightarrow C_2H_5^+ + H_2 + O$	3.2×10^{-10}	[28]
861	$C_2H_6 + OH^+ \rightarrow C_2H_4 + H_3O^+$	1.6×10^{-10}	[28]
862	$C_2H_6 + OH^+ \rightarrow C_2H_6^+ + OH$	4.8×10^{-11}	[28]
863	$C_2H_6 + H_2O^+ \rightarrow C_2H_5 + H_3O^+$	1.328×10^{-9}	[28]
864	$C_2H_6 + H_2O^+ \rightarrow C_2H_4^+ + H_2 + H_2O$	1.92×10^{-10}	[28]
865	$C_2H_6 + H_2O^+ \rightarrow C_2H_6^+ + H_2O$	6.4×10^{-11}	[28]
866	$C_2H_6 + H_2O^+ \rightarrow C_2H_5^+ + H + H_2O$	1.6×10^{-11}	[28]
867	$C_2H_4 + H_2O^+ \rightarrow C_2H_4^+ + H_2O$	1.5×10^{-9}	[61]
868	$C_2H_2 + H_2O^+ \rightarrow C_2H_2^+ + H_2O$	1.9×10^{-9}	[61]
869	$C_2H + OH^+ \rightarrow C_2H^+ + OH$	4.5×10^{-10}	[1]
870	$C_2H + OH^+ \rightarrow C_2H_2^+ + O$	4.5×10^{-10}	[1]
871	$C_2H + H_2O^+ \rightarrow C_2H^+ + H_2O$	4.4×10^{-10}	[1]
872	$C_2H + H_2O^+ \rightarrow C_2H_2^+ + OH$	4.4×10^{-10}	[1]
873	$C_2H + HO_2^+ \rightarrow C_2H_2^+ + O_2$	7.6×10^{-10}	[1]
874	$C_2H_6^+ + H_2O \rightarrow C_2H_5 + H_3O^+$	2.95×10^{-9}	[87]
875	$C_2H_5^+ + H_2O \rightarrow C_2H_4 + H_3O^+$	1.4×10^{-9}	[112]
876	$C_2H_3^+ + H_2O \rightarrow C_2H_2 + H_3O^+$	8.5×10^{-10}	[1]
877	$C_2H_3^+ + OH^- \rightarrow C_2H_3 + OH$	$7.51 \times 10^{-8} \cdot \left(\frac{T_g}{3\times10^2}\right)^{-0.5}$	[2, 3]
878	$C_2H_2^+ + H_2O \rightarrow C_2H + H_3O^+$	2.2×10^{-10}	[1]
879	$C_2H_2^+ + OH^- \rightarrow C_2H_2 + OH$	$7.51 \times 10^{-8} \cdot \left(\frac{T_g}{3\times10^2}\right)^{-0.5}$	[2, 3]
880	$C_2H_4^+ + OH^- \rightarrow C_2H_3 + H + OH$	$7.51 \times 10^{-8} \cdot \left(\frac{T_g}{3\times10^2}\right)^{-0.5}$	[2, 3]
881	$C_2H_6 + O \rightarrow C_2H_5 + OH$	$3 \times 10^{-19} \cdot T_g^{2.8} \cdot \exp\left(\frac{-2.92\times10^3}{T_g}\right)$	[5]
882	$C_2H_6 + O_2 \rightarrow C_2H_5 + HO_2$	$1.21 \times 10^{-18} \cdot T_g^{2.5} \cdot \exp\left(\frac{-2.474\times10^4}{T_g}\right)$	[5]
883	$C_2H_5 + O \rightarrow CH_3CHO + H$	8.8×10^{-11}	[5]
884	$C_2H_5 + O \rightarrow CH_3 + HCHO$	6.6×10^{-11}	[5]
885	$C_2H_5 + O \rightarrow C_2H_4 + OH$	4.4×10^{-11}	[5]
886	$C_2H_5 + O_2 \rightarrow C_2H_4 + HO_2$	1×10^{-13}	[5]
887	$C_2H_4 + O \rightarrow CH_3 + HCO$	$0.6 \cdot 2.25 \times 10^{-17} \cdot T_g^{1.88} \cdot \exp\left(\frac{-9.2\times10^1}{T_g}\right)$	[5]
888	$C_2H_4 + O \rightarrow CH_2CO + H_2$	$0.05 \cdot 2.25 \times 10^{-17} \cdot T_g^{1.88} \cdot \exp\left(\frac{-9.2\times10^1}{T_g}\right)$	[5]
889	$C_2H_4 + O_2 \rightarrow C_2H_3 + HO_2$	$7 \times 10^{-11} \cdot \exp\left(\frac{-2.9\times10^4}{T_g}\right)$	[25]
890	$C_2H_3 + O \rightarrow C_2H_2 + OH$	$1.6666667 \times 10^{-11}$	[5]
891	$C_2H_3 + O \rightarrow CH_3 + CO$	$1.6666667 \times 10^{-11}$	[5]
892	$C_2H_3 + O \rightarrow CH_2 + HCO$	$1.6666667 \times 10^{-11}$	[5]
893	$C_2H_3 + O_2 \rightarrow C_2H_2 + HO_2$	$\frac{6.6\times10^{21}}{N_A} \cdot T_g^{-3.3} \cdot \exp\left(\frac{-5.41\times10^3\cdot4.184}{R\cdot T_g}\right)$	[113]
894	$C_2H_3 + O_2 \rightarrow HCHO + HCO$	$\frac{4\times10^{21}}{N_A} \cdot T_g^{-3} \cdot \exp\left(\frac{-2.4\times10^3\cdot4.184}{R\cdot T_g}\right)$	[113]
895	$C_2H_2 + O \rightarrow CH_2 + CO$	$0.2 \cdot 1.95 \times 10^{-15} \cdot T_g^{1.4} \cdot \exp\left(\frac{-1.11\times10^3}{T_g}\right)$	[5]

#	Reaction	Rate equation	Ref.
896	$C_2H_2 + O \rightarrow H + HCCO$	$0.8 \cdot 1.95 \times 10^{-15} \cdot T_g^{1.4} \cdot \exp\left(\frac{-1.11\times10^3}{T_g}\right)$	[5]
897	$C_2H_2 + O_2 \rightarrow HCO + HCO$	$\frac{6.1\times10^{12}}{N_A} \cdot \exp\left(\frac{-5.325\times10^4\cdot4.184}{R\cdot T_g}\right)$	[114]
898	$C_2H + O \rightarrow CH + CO$	9.9×10^{-11}	[5]
899	$C_2H + O_2 \rightarrow CO + HCO$	$0.45 \cdot 2.7 \times 10^{-10} \cdot T_g^{-0.35}$	[5]
900	$C_2H + O_2 \rightarrow CH + CO_2$	$0.1 \cdot 2.7 \times 10^{-10} \cdot T_g^{-0.35}$	[5]
901	$C_2H_6 + O^+ \rightarrow C_2H_4^+ + H_2O$	1.33×10^{-9}	[28]
902	$C_2H_6 + O^+ \rightarrow C_2H_5^+ + OH$	5.7×10^{-10}	[28]
903	$C_2H_4 + O^+ \rightarrow C_2H_4^+ + O$	7×10^{-11}	[29]
904	$C_2H_4 + O^+ \rightarrow C_2H_2^+ + H_2O$	1.12×10^{-9}	[29]
905	$C_2H_4 + O^+ \rightarrow C_2H_3^+ + OH$	2.1×10^{-10}	[29]
906	$C_2H_4 + O_2^+ \rightarrow C_2H_4^+ + O_2$	6.8×10^{-10}	[115]
907	$C_2H_2 + O^+ \rightarrow C_2H_2^+ + O$	3.9×10^{-11}	[29]
908	$C_2H_2 + O_2^+ \rightarrow C_2H_2^+ + O_2$	1.105×10^{-9}	[116]
909	$C_2H_2 + O_2^+ \rightarrow CO + H + HCO^+$	6.5×10^{-11}	[116]
910	$C_2H + O^+ \rightarrow C_2H^+ + O$	4.6×10^{-10}	[1]
911	$C_2H + O^+ \rightarrow CH + CO^+$	4.6×10^{-10}	[1]
912	$C_2H_4^+ + O \rightarrow CH_3^+ + HCO$	1.08×10^{-10}	[117]
913	$C_2H_4^+ + O \rightarrow CH_3 + HCO^+$	8.4×10^{-11}	[117]
914	$C_2H_4^+ + O^- \rightarrow C_2H_3 + H + O$	$7.51 \times 10^{-8} \cdot \left(\frac{T_g}{3\times10^2}\right)^{-0.5}$	[2, 3]
915	$C_2H_3^+ + O \rightarrow CH_3^+ + CO$	5×10^{-12}	[117]
916	$C_2H_3^+ + O^- \rightarrow C_2H_3 + O$	$7.51 \times 10^{-8} \cdot \left(\frac{T_g}{3\times10^2}\right)^{-0.5}$	[2, 3]
917	$C_2H_3^+ + O^- \rightarrow C_2H + H_2 + O$	$7.51 \times 10^{-8} \cdot \left(\frac{T_g}{3\times10^2}\right)^{-0.5}$	[2, 3]
918	$C_2H_3^+ + O_2^- \rightarrow C_2H_3 + O_2$	$7.51 \times 10^{-8} \cdot \left(\frac{T_g}{3\times10^2}\right)^{-0.5}$	[2, 3]
919	$C_2H_2^+ + O \rightarrow CH + HCO^+$	8.5×10^{-11}	[81]
920	$C_2H_2^+ + O^- \rightarrow C_2H_2 + O$	$7.51 \times 10^{-8} \cdot \left(\frac{T_g}{3\times10^2}\right)^{-0.5}$	[2, 3]
921	$C_2H_2^+ + O_2^- \rightarrow C_2H_2 + O_2$	$7.51 \times 10^{-8} \cdot \left(\frac{T_g}{3\times10^2}\right)^{-0.5}$	[2, 3]
922	$C_2H^+ + O \rightarrow C + HCO^+$	1×10^{-11}	[1]
923	$C_2H_4 + CO \rightarrow C_2H_3 + HCO$	$2.5 \times 10^{-10} \cdot \exp\left(\frac{-4.56\times10^4}{T_g}\right)$	[25]
924	$C_2H_2 + CO \rightarrow C_2H + HCO$	$8 \times 10^{-10} \cdot \exp\left(\frac{-5.37\times10^4}{T_g}\right)$	[25]
925	$C_2H_4 + CO_2^+ \rightarrow C_2H_4^+ + CO_2$	8.775×10^{-10}	[61]
926	$C_2H_2 + CO_2^+ \rightarrow C_2H_2^+ + CO_2$	7.3×10^{-10}	[61]
927	$C_2H + CO^+ \rightarrow C_2H^+ + CO$	3.9×10^{-10}	[1]
928	$C_2H_6 + HCO \rightarrow C_2H_5 + HCHO$	$7.8 \times 10^{-20} \cdot T_g^{2.72} \cdot \exp\left(\frac{-9.176\times10^3}{T_g}\right)$	[25]
929	$C_2H_6 + CH_3O \rightarrow C_2H_5 + CH_3OH$	$4 \times 10^{-13} \cdot \exp\left(\frac{-3.57\times10^3}{T_g}\right)$	[25]
930	$C_2H_6 + CH_2OH \rightarrow C_2H_5 + CH_3OH$	$3.3 \times 10^{-22} \cdot T_g^{2.95} \cdot \exp\left(\frac{-7.033\times10^3}{T_g}\right)$	[96]
931	$C_2H_6 + CH_3OO \rightarrow C_2H_5 + CH_3OOH$	$4.9 \times 10^{-13} \cdot \exp\left(\frac{-7.52\times10^3}{T_g}\right)$	[25]
932	$C_2H_5 + HCO \rightarrow C_2H_6 + CO$	2×10^{-10}	[25]
933	$C_2H_5 + HCHO \rightarrow C_2H_6 + HCO$	$9.2 \times 10^{-21} \cdot T_g^{2.81} \cdot \exp\left(\frac{-2.95\times10^3}{T_g}\right)$	[25]
934	$C_2H_5 + CH_3O \rightarrow C_2H_6 + HCHO$	4×10^{-11}	[25]

#	Reaction	Rate equation	Ref.
935	$C_2H_5 + CH_2OH \rightarrow C_2H_4 + CH_3OH$	4×10^{-12}	[96]
936	$C_2H_5 + CH_2OH \rightarrow C_2H_6 + HCHO$	4×10^{-12}	[96]
937	$C_2H_5 + CH_3OH \rightarrow C_2H_6 + CH_2OH$	$5.3 \times 10^{-23} \cdot T_g^{3.2} \cdot \exp\left(\frac{-4.61\times10^3}{T_g}\right)$	[96]
938	$C_2H_5 + CH_3OH \rightarrow C_2H_6 + CH_3O$	$2.4 \times 10^{-23} \cdot T_g^{3.1} \cdot \exp\left(\frac{-4.5\times10^3}{T_g}\right)$	[96]
939	$C_2H_5 + CH_3OO \rightarrow CH_3CH_2O + CH_3O$	4×10^{-11}	[25]
940	$C_2H_4 + COOH \rightarrow C_2H_5 + CO_2$	1×10^{-14}	[88]
941	$C_2H_4 + CH_2OH \rightarrow C_2H_5 + HCHO$	$\frac{8\times10^{-14}\cdot\exp\left(\frac{-3.5\times10^3}{T_g}\right)\cdot\exp\left(\frac{-2\times10^3}{T_g}\right)}{1.0+\exp\left(\frac{-2\times10^3}{T_g}\right)}$	[96]
942	$C_2H_3 + HCO \rightarrow C_2H_4 + CO$	1.5×10^{-10}	[25]
943	$C_2H_3 + HCHO \rightarrow C_2H_4 + HCO$	$9 \times 10^{-21} \cdot T_g^{2.81} \cdot \exp\left(\frac{-2.95\times10^3}{T_g}\right)$	[25]
944	$C_2H_3 + CH_3O \rightarrow C_2H_4 + HCHO$	4×10^{-11}	[25]
945	$C_2H_3 + CH_2OH \rightarrow C_2H_4 + HCHO$	5×10^{-11}	[96]
946	$C_2H_3 + CH_3OH \rightarrow C_2H_4 + CH_2OH$	$5.3 \times 10^{-23} \cdot T_g^{3.2} \cdot \exp\left(\frac{-3.609\times10^3}{T_g}\right)$	[96]
947	$C_2H_3 + CH_3OH \rightarrow C_2H_4 + CH_3O$	$2.4 \times 10^{-23} \cdot T_g^{3.1} \cdot \exp\left(\frac{-3.49\times10^3}{T_g}\right)$	[96]
948	$C_2H_2 + COOH \rightarrow C_2H_3 + CO_2$	3×10^{-14}	[88]
949	$C_2H_2 + CH_2OH \rightarrow C_2H_3 + HCHO$	$1.2 \times 10^{-12} \cdot \exp\left(\frac{-4.531\times10^3}{T_g}\right)$	[96]
950	$C_2H + HCO \rightarrow C_2H_2 + CO$	1×10^{-10}	[25]
951	$C_2H + CH_3O \rightarrow C_2H_2 + HCHO$	4×10^{-11}	[25]
952	$C_2H + CH_2OH \rightarrow C_2H_2 + HCHO$	6×10^{-11}	[96]
953	$C_2H + CH_3OH \rightarrow C_2H_2 + CH_2OH$	1×10^{-11}	[96]
954	$C_2H + CH_3OH \rightarrow C_2H_2 + CH_3O$	2×10^{-12}	[96]
955	$C_2H + CH_3OO \rightarrow CH_3O + HCCO$	4×10^{-11}	[25]
956	$C_2H_4 + HCO^+ \rightarrow C_2H_5^+ + CO$	1.4×10^{-9}	[13]
957	$C_2H_3 + HCO^+ \rightarrow C_2H_4^+ + CO$	1.4×10^{-9}	[13]
958	$C_2H_2 + HCO^+ \rightarrow C_2H_3^+ + CO$	1.4×10^{-9}	[38]
959	$C_2H + HCO^+ \rightarrow C_2H_2^+ + CO$	7.8×10^{-10}	[1]
960	$C_2H_2^+ + HCO \rightarrow C_2H_2 + HCO^+$	5×10^{-10}	[1]
961	$C_2H_2^+ + HCO \rightarrow C_2H_3^+ + CO$	3.7×10^{-10}	[1]
962	$C_2H_2^+ + HCHO \rightarrow C_2H_3 + HCO^+$	5.375×10^{-10}	[87]
963	$C_2H_2^+ + HCHO \rightarrow C_2H_4^+ + CO$	2.795×10^{-10}	[87]
964	$C_2H^+ + HCO \rightarrow C_2H_2^+ + CO$	7.6×10^{-10}	[1]
965	$H + HCCO \rightarrow CH_2 + CO$	$9.92 \times 10^{-13} \cdot T_g^{0.76} \cdot \exp\left(\frac{4.38\times10^2}{T_g}\right)$	[118]
966	$CH_2CO + H \rightarrow CH_3 + CO$	$\frac{1.11\times10^7}{N_A} \cdot T_g^2 \cdot \exp\left(\frac{-2\times10^3\cdot4.184}{R\cdot T_g}\right)$	[119]
967	$CH_2CO + H \rightarrow H_2 + HCCO$	$\frac{1.8\times10^{14}}{N_A} \cdot \exp\left(\frac{-8.6\times10^3\cdot4.184}{R\cdot T_g}\right)$	[119]
968	$CH_2CO + H \rightarrow CH_3CO$	$\frac{1.63\times10^9}{N_A} \cdot T_g^{1.3766} \cdot \exp\left(\frac{-1.664\times10^3\cdot4.184}{R\cdot T_g}\right)$	[120]
969	$CH_3CO + H \rightarrow CH_3 + HCO$	$\frac{0.65\cdot2\times10^{13}}{N_A}$	[121, 122]
970	$CH_3CO + H \rightarrow CH_2CO + H_2$	$\frac{0.35\cdot2\times10^{13}}{N_A}$	[121, 122]
971	$CH_3CO + H \rightarrow CH_3CHO$	$6.02 \times 10^{-11} \cdot T_g^{0.16}$	[109]
972	$CH_3CO + H_2 \rightarrow CH_3CHO + H$	$6.8 \times 10^{-18} \cdot T_g^{1.82} \cdot \exp\left(\frac{-8.862\times10^3}{T_g}\right)$	[25]

#	Reaction	Rate equation	Ref.
973	$CH_3CHO + H \rightarrow CH_3CO + H_2$	$2.18 \times 10^{-19} \cdot T_g^{2.58} \cdot \exp\left(\frac{-6.14\times10^2}{T_g}\right)$	[123]
974	$CH_3CHO + H \rightarrow CH_3CH_2O$	$7.66 \times 10^{-17} \cdot T_g^{1.71} \cdot \exp\left(\frac{-3.57\times10^3}{T_g}\right)$	[123]
975	$CH_3CHO + H \rightarrow CH_3CHOH$	$2.89 \times 10^{-18} \cdot T_g^{2.2} \cdot \exp\left(\frac{-3.78\times10^3}{T_g}\right)$	[123]
976	$CH_3CH_2O + H \rightarrow CH_2OH + CH_3$	$2.26 \times 10^{-12} \cdot T_g^{0.701} \cdot \exp\left(\frac{-1.74\times10^2}{T_g}\right)$	[124]
977	$CH_3CH_2O + H \rightarrow CH_3CH_2OH$	$5.11 \times 10^{-13} \cdot T_g^{0.894} \cdot \exp\left(\frac{-6.5}{T_g}\right)$	[124]
978	$CH_3CH_2O + H \rightarrow C_2H_5 + OH$	$9.04 \times 10^{-16} \cdot T_g^{1.27} \cdot \exp\left(\frac{-1.57\times10^2}{T_g}\right)$	[124]
979	$CH_3CH_2O + H \rightarrow CH_3CHOH + H$	$1.33 \times 10^{-22} \cdot T_g^{3.1} \cdot \exp\left(\frac{-1.42\times10^2}{T_g}\right)$	[124]
980	$CH_3CH_2O + H \rightarrow C_2H_4 + H_2O$	$9.95 \times 10^{-10} \cdot T_g^{-0.813} \cdot \exp\left(\frac{-3.59\times10^2}{T_g}\right)$	[124]
981	$CH_3CH_2O + H \rightarrow CH_3CHO + H_2$	$1.25 \times 10^{-20} \cdot T_g^{1.78} \cdot \exp\left(\frac{-4.07\times10^1}{T_g}\right)$ $+1.24 \times 10^{-14} \cdot T_g^{1.15} \cdot \exp\left(\frac{-3.39\times10^2}{T_g}\right)$	[124]
982	$CH_3CH_2O + H \rightarrow CH_4 + HCHO$	$1.32 \times 10^{-21} \cdot T_g^{2.21} \cdot \exp\left(\frac{9.05\times10^1}{T_g}\right)$	[124]
983	$CH_3CHOH + H \rightarrow CH_3CH_2OH$	$5.99 \times 10^{-11} \cdot T_g^{0.06} \cdot \exp\left(\frac{-2.2\times10^2}{T_g}\right)$	[124]
984	$CH_3CHOH + H \rightarrow CH_2OH + CH_3$	$1.44 \times 10^{-7} \cdot T_g^{-0.891} \cdot \exp\left(\frac{-1.461\times10^3}{T_g}\right)$	[124]
985	$CH_3CHOH + H \rightarrow C_2H_5 + OH$	$4.02 \times 10^{-9} \cdot T_g^{-0.83} \cdot \exp\left(\frac{-2.414\times10^3}{T_g}\right)$	[124]
986	$CH_3CHOH + H \rightarrow CH_3CH_2O + H$	$4.95 \times 10^{-23} \cdot T_g^{2.94} \cdot \exp\left(\frac{-4.266\times10^3}{T_g}\right)$	[124]
987	$CH_3CHOH + H \rightarrow C_2H_4 + H_2O$	$7.81 \times 10^{-3} \cdot T_g^{-3.02} \cdot \exp\left(\frac{-1.432\times10^3}{T_g}\right)$	[124]
988	$CH_3CHOH + H \rightarrow CH_3CHO + H_2$	$7.42 \times 10^{-21} \cdot T_g^{1.62} \cdot \exp\left(\frac{5.4}{T_g}\right)$ $+2.26 \times 10^{-15} \cdot T_g^{1.29} \cdot \exp\left(\frac{-1.421\times10^3}{T_g}\right)$	[124]
989	$CH_3CHOH + H \rightarrow CH_4 + HCHO$	$5.56 \times 10^{-22} \cdot T_g^{2.1} \cdot \exp\left(\frac{-1.07\times10^2}{T_g}\right)$	[124]
990	$CH_3CH_2OH + H \rightarrow C_2H_5 + H_2O$	$\frac{5.9\times10^{11}}{N_A} \cdot \exp\left(\frac{-3.45\times10^3\cdot4.184}{R\cdot T_g}\right)$	[125]
991	$CH_3CH_2OH + H \rightarrow CH_3CHOH + H_2$	$1.46 \times 10^{-19} \cdot T_g^{2.68} \cdot \exp\left(\frac{-1.467\times10^3}{T_g}\right)$	[126]
992	$CH_3CH_2OH + H \rightarrow CH_2CH_2OH + H_2$	$8.82 \times 10^{-20} \cdot T_g^{2.81} \cdot \exp\left(\frac{-3.772\times10^3}{T_g}\right)$	[126]
993	$CH_3CH_2OH + H \rightarrow CH_3CH_2O + H_2$	$1.57 \times 10^{-21} \cdot T_g^{3.14} \cdot \exp\left(\frac{-4.379\times10^3}{T_g}\right)$	[126]
994	$CH_3CHO + H_3^+ \rightarrow C_2H_3^+ + H_2 + H_2O$	8.97×10^{-10}	[100]
995	$CH_3CHO + H_3^+ \rightarrow C_2H_5^+ + H_2O$	7.59×10^{-10}	[100]
996	$CH_3CHO + H_3^+ \rightarrow CH_3OH + CH_3^+$	1.449×10^{-9}	[100]
997	$CH_3CHO + H_3^+ \rightarrow CH_5^+ + CO + H_2$	8.28×10^{-10}	[100]
998	$CH_3CHO + H_3^+ \rightarrow C_2H_4 + H_3O^+$	1.035×10^{-9}	[100]
999	$CH_3CH_2OH + H_3^+ \rightarrow CH_3^+ + CH_4 + H_2O$	1.5×10^{-9}	[100]
1000	$CH_3CH_2OH + H_3^+ \rightarrow C_2H_3^+ + H_2 + H_2 + H_2O$	4×10^{-10}	[100]
1001	$CH_3CH_2OH + H_3^+ \rightarrow CH_4 + H_2 + H_2 + HCO^+$	1.1×10^{-9}	[100]
1002	$CH_3CH_2OH + H_3^+ \rightarrow C_2H_5^+ + H_2 + H_2O$	1.1×10^{-9}	[100]
1003	$HCCO + OH \rightarrow CH_2CO + O$	$2.1 \times 10^{-18} \cdot T_g^{1.99} \cdot \exp\left(\frac{-1.128\times10^4\cdot4.184}{R\cdot T_g}\right)$	[127]
1004	$CH_2CO + OH \rightarrow CH_2OH + CO$	$0.6 \cdot 2.8 \times 10^{-12} \cdot \exp\left(\frac{5.1\times10^2}{T_g}\right)$	[5]
1005	$CH_2CO + OH \rightarrow H_2O + HCCO$	$0.01 \cdot 2.8 \times 10^{-12} \cdot \exp\left(\frac{5.1\times10^2}{T_g}\right)$	[5]
1006	$CH_2CO + OH \rightarrow HCHO + HCO$	$0.02 \cdot 2.8 \times 10^{-12} \cdot \exp\left(\frac{5.1\times10^2}{T_g}\right)$	[5]
1007	$CH_2CO + OH \rightarrow CH_3 + CO_2$	$0.37 \cdot 2.8 \times 10^{-12} \cdot \exp\left(\frac{5.1\times10^2}{T_g}\right)$	[5]
1008	$CH_3CO + OH \rightarrow CH_2CO + H_2O$	2×10^{-11}	[25]

#	Reaction	Rate equation	Ref.
1009	$CH_3CO + H_2O_2 \rightarrow CH_3CHO + HO_2$	$3 \times 10^{-13} \cdot \exp\left(\frac{-4.14\times10^3}{T_g}\right)$	[25]
1010	$CH_3CHO + OH \rightarrow CH_3CO + H_2O$	$0.93 \cdot 4.8 \times 10^{-16} \cdot T_g^{1.35} \cdot \exp\left(\frac{7.92\times10^2}{T_g}\right)$	[5]
1011	$CH_3CHO + OH \rightarrow CH_3 + HCOOH$	$0.03 \cdot 4.8 \times 10^{-16} \cdot T_g^{1.35} \cdot \exp\left(\frac{7.92\times10^2}{T_g}\right)$	[5, 128]
1012	$CH_3CHO + OH \rightarrow CH_3COOH + H$	$0.02 \cdot 4.8 \times 10^{-16} \cdot T_g^{1.35} \cdot \exp\left(\frac{7.92\times10^2}{T_g}\right)$	[5, 128]
1013	$CH_3CHO + HO_2 \rightarrow CH_3CO + H_2O_2$	$6.8 \times 10^{-20} \cdot T_g^{2.5} \cdot \exp\left(\frac{-5.135\times10^3}{T_g}\right)$	[5]
1014	$CH_3CH_2OH + OH \rightarrow CH_2CH_2OH + H_2O$	$\frac{1.74\times10^{11}}{N_A} \cdot T_g^{0.27} \cdot \exp\left(\frac{-6\times10^2\cdot4.184}{R\cdot T_g}\right)$	[129]
1015	$CH_3CH_2OH + OH \rightarrow CH_3CHOH + H_2O$	$\frac{4.64\times10^{11}}{N_A} \cdot T_g^{0.15}$	[129]
1016	$CH_3CH_2OH + OH \rightarrow CH_3CH_2O + H_2O$	$\frac{7.46\times10^{11}}{N_A} \cdot T_g^{0.3} \cdot \exp\left(\frac{-1.634\times10^3\cdot4.184}{R\cdot T_g}\right)$	[129]
1017	$CH_3CH_2OH + HO_2 \rightarrow CH_3CHOH + H_2O_2$	$\frac{5.544\times10^{18}}{N_A} \cdot T_g^{-1.808} \cdot \exp\left(\frac{-8.29197\times10^3}{T_g}\right)$	[130]
1018	$HCCO + O \rightarrow CH + CO_2$	$4.9 \times 10^{-11} \cdot \exp\left(\frac{-5.6\times10^2}{T_g}\right)$	[5]
1019	$CH_2CO + O \rightarrow HCCO + OH$	$3.11 \times 10^{-10} \cdot \exp\left(\frac{-1.669\times10^4\cdot4.184}{R\cdot T_g}\right)$	[127]
1020	$CH_2CO + O \rightarrow CO + HCHO$	$0.2 \cdot 3 \times 10^{-12} \cdot \exp\left(\frac{-6.8\times10^2}{T_g}\right)$	[5]
1021	$CH_2CO + O \rightarrow HCO + HCO$	$0.1 \cdot 3 \times 10^{-12} \cdot \exp\left(\frac{-6.8\times10^2}{T_g}\right)$	[5]
1022	$CH_2CO + O \rightarrow CH_2 + CO_2$	$0.6 \cdot 3 \times 10^{-12} \cdot \exp\left(\frac{-6.8\times10^2}{T_g}\right)$	[5]
1023	$CH_3CO + O \rightarrow CH_2CO + OH$	8.75×10^{-11}	[5]
1024	$CH_3CO + O \rightarrow CH_3 + CO_2$	2.625×10^{-10}	[5]
1025	$CH_3CHO + O \rightarrow CH_3CO + OH$	$\frac{5\times10^{12}}{N_A} \cdot \exp\left(\frac{-7.5\times10^3}{R\cdot T_g}\right)$	[122]
1026	$CH_3CHO + O_2 \rightarrow CH_3CO + HO_2$	$2 \times 10^{-19} \cdot T_g^{2.5} \cdot \exp\left(\frac{-1.89\times10^4}{T_g}\right)$	[5]
1027	$CH_3CH_2O + O_2 \rightarrow CH_3CHO + HO_2$	$3.8 \times 10^{-14} \cdot \exp\left(\frac{-4.4\times10^2}{T_g}\right)$	[5]
1028	$CH_3CHOH + O \rightarrow CH_3 + HCOOH$	$3.9 \times 10^{-10} \cdot \left(\frac{T_g}{3\times10^2}\right)^{0.18} \cdot \exp\left(\frac{-0.49}{T_g}\right)$	[131]
1029	$CH_3CHOH + O \rightarrow CH_3CHO + OH$	$4.8 \times 10^{-11} \cdot \left(\frac{T_g}{3\times10^2}\right)^{0.19} \cdot \exp\left(\frac{-0.39}{T_g}\right)$	[131]
1030	$CH_3CHOH + O \rightarrow CH_3COOH + H$	$2.2 \times 10^{-10} \cdot \left(\frac{T_g}{3\times10^2}\right)^{0.16} \cdot \exp\left(\frac{-0.59}{T_g}\right)$	[131]
1031	$CH_3CHOH + O_2 \rightarrow CH_3CHO + HO_2$	$\frac{5.28\times10^{17}}{N_A} \cdot T_g^{-1.638} \cdot \exp\left(\frac{-0.839\cdot4.184\times10^3}{R\cdot T_g}\right)$	[132]
1032	$CH_2CH_2OH + O \rightarrow CH_2OH + HCHO$	$4.6 \times 10^{-10} \cdot \left(\frac{T_g}{3\times10^2}\right)^{0.17} \cdot \exp\left(\frac{-0.51}{T_g}\right)$	[131]
1033	$CH_3CH_2OH + O \rightarrow CH_3CHOH + OH$	$0.99 \cdot 1 \times 10^{-18} \cdot T_g^{2.5} \cdot \exp\left(\frac{-9.3\times10^2}{T_g}\right)$	[5]
1034	$CH_3CH_2OH + O \rightarrow CH_2CH_2OH + OH$	$0.005 \cdot 1 \times 10^{-18} \cdot T_g^{2.5} \cdot \exp\left(\frac{-9.3\times10^2}{T_g}\right)$	[5]
1035	$CH_3CH_2OH + O \rightarrow CH_3CH_2O + OH$	$0.005 \cdot 1 \times 10^{-18} \cdot T_g^{2.5} \cdot \exp\left(\frac{-9.3\times10^2}{T_g}\right)$	[5]
1036	$CH_3CH_2OH + O_2 \rightarrow CH_3CHOH + HO_2$	$4 \times 10^{-19} \cdot T_g^{2.5} \cdot \exp\left(\frac{-2.217\times10^4}{T_g}\right)$	[5]
1037	$CH_3CH_2OH + O_2 \rightarrow CH_2CH_2OH + HO_2$	$6 \times 10^{-19} \cdot T_g^{2.5} \cdot \exp\left(\frac{-2.403\times10^4}{T_g}\right)$	[5]
1038	$CH_3CH_2OH + O_2 \rightarrow CH_3CH_2O + HO_2$	$2 \times 10^{-19} \cdot T_g^{2.5} \cdot \exp\left(\frac{-2.653\times10^4}{T_g}\right)$	[5]
1039	$CH_2CO + CH_3 \rightarrow C_2H_5 + CO$	$\frac{1.24\times10^5}{N_A} \cdot T_g^{2.29} \cdot \exp\left(\frac{-1.0642\times10^4\cdot4.184}{R\cdot T_g}\right)$	[133]
1040	$CH_2CO + CH_3 \rightarrow CH_4 + HCCO$	$\frac{1.55\times10^2}{N_A} \cdot T_g^{3.38} \cdot \exp\left(\frac{-1.0512\times10^4\cdot4.184}{R\cdot T_g}\right)$	[133]
1041	$CH_2 + CH_2CO \rightarrow C_2H_4 + CO$	$\frac{1\times10^{12}}{N_A}$	[134]
1042	$CH_2 + CH_2CO \rightarrow CH_3 + HCCO$	$\frac{3.6\times10^{13}}{N_A} \cdot \exp\left(\frac{-1.1\times10^4\cdot4.184}{R\cdot T_g}\right)$	[119]
1043	$CH_3CO + CH_4 \rightarrow CH_3 + CH_3CHO$	$3.6 \times 10^{-21} \cdot T_g^{2.88} \cdot \exp\left(\frac{-1.08\times10^4}{T_g}\right)$	[25]
1044	$CH_3 + CH_3CO \rightarrow CH_2CO + CH_4$	$\frac{6.1\times10^9\cdot1\times10^3}{N_A}$	[135]
1045	$CH_2 + CH_3CO \rightarrow CH_2CO + CH_3$	3×10^{-11}	[25]
1046	$CH_3 + CH_3CHO \rightarrow CH_3CO + CH_4$	$0.993 \cdot 5.8 \times 10^{-32} \cdot T_g^{6.21} \cdot \exp\left(\frac{-8.2\times10^2}{T_g}\right)$	[5]

#	Reaction	Rate equation	Ref.
1047	$CH_3 + CH_3CH_2OH \rightarrow CH_3CHOH + CH_4$	$\frac{2.476\times10^1}{N_A} \cdot T_g^{3.368} \cdot \exp\left(\frac{-3.95579\times10^3}{T_g}\right)$	[130]
1048	$CH_3 + CH_3CH_2OH \rightarrow CH_2CH_2OH + CH_4$	$\frac{1.861\times10^2}{N_A} \cdot T_g^{3.45} \cdot \exp\left(\frac{-5.54285\times10^3}{T_g}\right)$	[130]
1049	$CH_3 + CH_3CH_2OH \rightarrow CH_3CH_2O + CH_4$	$\frac{0.09533}{N_A} \cdot T_g^{4.159} \cdot \exp\left(\frac{-4.119\times10^3}{T_g}\right)$	[130]
1050	$C_2H_6 + CH_3CO \rightarrow C_2H_5 + CH_3CHO$	$3 \times 10^{-20} \cdot T_g^{2.75} \cdot \exp\left(\frac{-8.82\times10^3}{T_g}\right)$	[25]
1051	$C_2H_5 + CH_3CHO \rightarrow C_2H_6 + CH_3CO$	$\frac{1.25892541\times10^{12}}{N_A} \cdot \exp\left(\frac{-8.5\cdot4.184\times10^3}{R\cdot T_g}\right)$	[136]
1052	$CH_3CO + HCO \rightarrow CH_3CHO + CO$	1.5×10^{-11}	[25]
1053	$CH_3CO + HCHO \rightarrow CH_3CHO + HCO$	$3 \times 10^{-13} \cdot \exp\left(\frac{-6.5\times10^3}{T_g}\right)$	[25]
1054	$CH_3CO + CH_3O \rightarrow CH_2CO + CH_3OH$	1×10^{-11}	[25]
1055	$CH_3CO + CH_3O \rightarrow CH_3CHO + HCHO$	1×10^{-11}	[25]
1056	$CH_3CO + CH_3OH \rightarrow CH_2OH + CH_3CHO$	$8.06 \times 10^{-21} \cdot T_g^{2.99} \cdot \exp\left(\frac{-6.21\times10^3}{T_g}\right)$	[96]
1057	$CH_3CHO + CH_3O \rightarrow CH_3CO + CH_3OH$	$\frac{1.69\times10^5}{N_A} \cdot T_g^{2.04} \cdot \exp\left(\frac{-2.353\times10^3\cdot4.184}{R\cdot T_g}\right)$ $+\frac{9.62\times10^3}{N_A} \cdot T_g^{2.5} \cdot \exp\left(\frac{-1.59\times10^2\cdot4.184}{R\cdot T_g}\right)$	[137]
1058	$CH_3CHO + CH_3OO \rightarrow CH_3CO + CH_3OOH$	$\frac{0.322}{N_A} \cdot T_g^{3.94} \cdot \exp\left(\frac{-9.503\times10^3\cdot4.184}{R\cdot T_g}\right)$ $+\frac{4.99\times10^{-6}}{N_A} \cdot T_g^{4.98} \cdot \exp\left(\frac{-5.2682\times10^3\cdot4.184}{R\cdot T_g}\right)$	[137]
1059	$CH_3CO + CH_3CO \rightarrow CH_2CO + CH_3CHO$	$\frac{9\times10^9\cdot1\times10^3}{N_A}$	[135]
1060	$COOH \rightarrow CO + OH$	$k_0 = \frac{10^{2.5137\times10^1}}{N_A} \cdot T_g^{-2.396} \cdot \exp\left(\frac{-1.8862\times10^4}{T_g}\right)$ $k_\infty = 10^{1.4074\times10^1} \cdot T_g^{0.132} \cdot \exp\left(\frac{-1.8349\times10^4}{T_g}\right)$ $F_c = 0.729 \cdot \exp\left(\frac{-5.13\times10^2}{T_g}\right)$ $+\exp\left(\frac{-T_g}{5.4\times10^2}\right)$	[138][a]
1061	$COOH \rightarrow CO_2 + H$	$k_0 = \frac{10^{2.6775\times10^1}}{N_A} \cdot T_g^{-3.148} \cdot \exp\left(\frac{-1.8629\times10^4}{T_g}\right)$ $k_\infty = 10^{1.1915\times10^1} \cdot T_g^{0.413} \cdot \exp\left(\frac{-1.7783\times10^4}{T_g}\right)$ $F_c = 1.049 \cdot \exp\left(\frac{-2.407\times10^3}{T_g}\right)$ $+\exp\left(\frac{-T_g}{8.23\times10^2}\right)$	[138][a]
1062	$HCHO \rightarrow H + HCO$	$8.09 \times 10^{-9} \cdot \exp\left(\frac{-3.805\times10^4}{T_g}\right) \cdot n_M$	[5]
1063	$CH_2OH \rightarrow H + HCHO$	$k_0 = \frac{6.01\times10^{33}}{N_A} \cdot T_g^{-5.39} \cdot \exp\left(\frac{-3.62\times10^4\cdot4.184}{R\cdot T_g}\right)$ $k_\infty = 2.8 \times 10^{14} \cdot T_g^{-0.73} \cdot \exp\left(\frac{-3.282\times10^4\cdot4.184}{R\cdot T_g}\right)$ $F_c = (1 - 0.96) \cdot \exp\left(\frac{-T_g}{6.76\times10^1}\right)$ $+0.96 \cdot \exp\left(\frac{-T_g}{1.855\times10^3}\right)$ $+\exp\left(\frac{-7.543\times10^3}{T_g}\right)$	[139][a]
1064	$CH_3OH \rightarrow CH_3 + OH$	$0.8 \cdot k$ $k_0 = 1.1 \times 10^{-7} \cdot \exp\left(\frac{-3.308\times10^4}{T_g}\right)$ $k_\infty = 2.5 \times 10^{19} \cdot T_g^{-0.94} \cdot \exp\left(\frac{-4.703\times10^4}{T_g}\right)$ $F_c = 0.18 \cdot \exp\left(\frac{-T_g}{2\times10^2}\right)$ $+0.82 \cdot \exp\left(\frac{-T_g}{1.438\times10^3}\right)$	[5, 140][a]
1065	$CH_3OH \rightarrow CH_2 + H_2O$	$0.15 \cdot k$ $k_0 = 1.1 \times 10^{-7} \cdot \exp\left(\frac{-3.308\times10^4}{T_g}\right)$ $k_\infty = 2.5 \times 10^{19} \cdot T_g^{-0.94} \cdot \exp\left(\frac{-4.703\times10^4}{T_g}\right)$ $F_c = 0.18 \cdot \exp\left(\frac{-T_g}{2\times10^2}\right)$ $+0.82 \cdot \exp\left(\frac{-T_g}{1.438\times10^3}\right)$	[5, 140][a]

#	Reaction	Rate equation	Ref.
1066	$CH_3OH \rightarrow CH_2OH + H$	$0.05 \cdot k$ $k_0 = 1.1 \times 10^{-7} \cdot \exp\left(\frac{-3.308\times10^4}{T_g}\right)$ $k_\infty = 2.5 \times 10^{19} \cdot T_g^{-0.94} \cdot \exp\left(\frac{-4.703\times10^4}{T_g}\right)$ $F_c = 0.18 \cdot \exp\left(\frac{-T_g}{2\times10^2}\right)$ $+0.82 \cdot \exp\left(\frac{-T_g}{1.438\times10^3}\right)$	[5, 140][a]
1067	$CH_3OOH \rightarrow CH_3O + OH$	$6 \times 10^{14} \cdot \exp\left(\frac{-2.13\times10^4}{T_g}\right)$	[5]
1068	$HCCO \rightarrow CH + CO$	$\frac{6\times10^{15}}{N_A} \cdot \exp\left(\frac{-2.96\times10^4}{T_g}\right) \cdot n_M$	[141]
1069	$CH_2CO \rightarrow CH_2 + CO$	$\frac{2.3\times10^{15}}{N_A} \cdot \exp\left(\frac{-2.899\times10^4}{T_g}\right) \cdot n_M$	[134]
1070	$CH_3CO \rightarrow CH_3 + CO$	$k_0 = 1 \times 10^{-8} \cdot \exp\left(\frac{-7.08\times10^3}{T_g}\right)$ $k_\infty = 2 \times 10^{13} \cdot \exp\left(\frac{-8.63\times10^3}{T_g}\right)$ $F_c = 0.5$	[5][a]
1071	$CH_3CO \rightarrow CH_2CO + H$	$1.36 \times 10^8 \cdot T_g^{1.9433} \cdot \exp\left(\frac{-4.6005\times10^4\cdot4.184}{R\cdot T_g}\right)$	[120]
1072	$CH_3CHO \rightarrow CH_3CO + H$	$5 \times 10^{14} \cdot \exp\left(\frac{-8.79\times10^4\cdot4.184}{R\cdot T_g}\right)$	[142]
1073	$CH_3CHO \rightarrow CH_3 + HCO$	$2.1 \times 10^{16} \cdot \exp\left(\frac{-4.1135\times10^4}{T_g}\right)$	[5]
1074	$CH_3COOH \rightarrow CH_3 + COOH$	$10^{5.7\times10^1} \cdot T_g^{-1.204\times10^1} \cdot \exp\left(\frac{-1.1313\times10^5\cdot4.182}{R\cdot T_g}\right)$	[143]
1075	$CH_3CH_2O \rightarrow CH_3CHO + H$	$\frac{5.43\times10^{15}}{N_A} \cdot T_g^{-0.69} \cdot \exp\left(\frac{-2.223\times10^4\cdot4.184}{R\cdot T_g}\right)$	[93]
1076	$CH_3CH_2O \rightarrow CH_3 + HCHO$	$k_0 = \frac{4.7\times10^{25}}{N_A} \cdot T_g^{-3} \cdot \exp\left(\frac{-8.32\times10^3}{T_g}\right)$ $k_\infty = 6.31 \times 10^{10} \cdot T_g^{0.93} \cdot \exp\left(\frac{-8.605\times10^3}{T_g}\right)$ $F_c = (1 - 0.426) \cdot \exp\left(\frac{-T_g}{0.3}\right)$ $+0.426 \cdot \exp\left(\frac{-T_g}{2.278\times10^3}\right)$ $+ \exp\left(\frac{-1\times10^5}{T_g}\right)$	[144][a]
1077	$CH_3CHOH \rightarrow CH_3CHO + H$	$k_0 = \frac{1.77\times10^{16}}{N_A} \cdot \exp\left(\frac{-1.0458\times10^4}{T_g}\right)$ $k_\infty = 6.17 \times 10^9 \cdot T_g^{1.31} \cdot \exp\left(\frac{-1.6998\times10^4}{T_g}\right)$ $F_c = (1 - 0.187) \cdot \exp\left(\frac{-T_g}{6.52\times10^1}\right)$ $+0.187 \cdot \exp\left(\frac{-T_g}{2.568\times10^3}\right)$ $+ \exp\left(\frac{-4.1226\times10^4}{T_g}\right)$	[144][a]
1078	$CH_3CHOH \rightarrow CH_3 + HCHO$	$k_0 = \frac{5.86\times10^{15}}{N_A} \cdot \exp\left(\frac{-1.0735\times10^4}{T_g}\right)$ $k_\infty = 2.22 \times 10^9 \cdot T_g^{1.18} \cdot \exp\left(\frac{-1.7103\times10^4}{T_g}\right)$ $F_c = (1 - 0.124) \cdot \exp\left(\frac{-T_g}{1}\right)$ $+0.124 \cdot \exp\left(\frac{-T_g}{1.729\times10^3}\right)$ $+ \exp\left(\frac{-5\times10^4}{T_g}\right)$	[144][a]
1079	$CH_2CH_2OH \rightarrow C_2H_4 + OH$	$3.52 \times 10^{-34} \cdot T_g^{1.184\times10^1} \cdot \exp\left(\frac{9.429\times10^3}{T_g}\right)$	[145]
1080	$CH_3CH_2OH \rightarrow CH_2OH + CH_3$	$k_0 = \frac{2.88\times10^{85}}{N_A} \cdot T_g^{-1.89\times10^1} \cdot \exp\left(\frac{-5.5317\times10^4}{T_g}\right)$ $k_\infty = 5.94 \times 10^{23} \cdot T_g^{-1.68} \cdot \exp\left(\frac{-4.588\times10^4}{T_g}\right)$ $F_c = 0.5 \cdot \exp\left(\frac{-T_g}{2\times10^2}\right)$ $+0.5 \cdot \exp\left(\frac{-T_g}{8.9\times10^2}\right)$ $+ \exp\left(\frac{-4.6\times10^3}{T_g}\right)$	[129][a]
1081	$e + HCO^+ \rightarrow CO + H$	$0.88 \cdot 2.4 \times 10^{-7} \cdot \left(\frac{T_e}{3\times10^2}\right)^{-0.69}$	[146, 147]
1082	$e + HCO^+ \rightarrow C + OH$	$0.06 \cdot 2.4 \times 10^{-7} \cdot \left(\frac{T_e}{3\times10^2}\right)^{-0.69}$	[146, 147]
1083	$e + HCO^+ \rightarrow CH + O$	$0.06 \cdot 2.4 \times 10^{-7} \cdot \left(\frac{T_e}{3\times10^2}\right)^{-0.69}$	[146, 147]

#	Reaction	Rate equation	Ref.
1084	$C + OH \rightarrow e + HCO^+$	$\frac{1.12\times10^{13}}{N_A} \cdot \exp\left(\frac{-8.06\times10^4}{T_g}\right)$	d
1085	$CO + H \rightarrow e + HCO^+$	$\frac{1.12\times10^{13}}{N_A} \cdot \exp\left(\frac{-8.06\times10^4}{T_g}\right)$	d
1086	$e + O \rightarrow e + e + O^+$	$f(\sigma)$	[24]
1087	$e + O^- \rightarrow e + e + O$	$f(\sigma)$	[148]
1088	$e + O_2 \rightarrow e + e + O_2^+$	$f(\sigma)$	[24]
1089	$e + O_2 \rightarrow e + e + O + O^+$	$f(\sigma)$	[149]
1090	$e + O_2 \rightarrow e + O + O$	$f(\sigma)$	[24]
1091	$e + O_2 \rightarrow e + O + O$	$f(\sigma)$	[24]
1092	$e + O_2 \rightarrow O + O^-$	$f(\sigma)$	[24]
1093	$e + O_3 \rightarrow O + O_2^-$	$f(\sigma)$	[148]
1094	$e + O_3 \rightarrow O_2 + O^-$	$f(\sigma)$	[148]
1095	$M + e + O \rightarrow M + O^-$	1×10^{-31}	[52, 150]
1096	$M + e + O_2 \rightarrow M + O_2^-$	1×10^{-31}	[52, 150]
1097	$M + e + O_3 \rightarrow M + O_3^-$	1×10^{-31}	[52, 150]
1098	$e + e + O^+ \rightarrow e + O$	$7 \times 10^{-20} \cdot \left(\frac{3.0\times10^2}{T_e}\right)^{4.5}$	[52]
1099	$M + e + O^+ \rightarrow M + O$	$6 \times 10^{-27} \cdot \left(\frac{3.0\times10^2}{T_e}\right)^{1.5}$	[52, 150]
1100	$e + e + O_2^+ \rightarrow e + O_2$	$1 \times 10^{-19} \cdot \left(\frac{3.0\times10^2}{T_e}\right)^{4.5}$	[150]
1101	$M + e + O_2^+ \rightarrow M + O_2$	$6 \times 10^{-27} \cdot \left(\frac{3.0\times10^2}{T_e}\right)^{1.5}$	[52, 150]
1102	$e + O_2^+ \rightarrow O + O$	$2.7 \times 10^{-7} \cdot \left(\frac{3.0\times10^2}{T_e}\right)^{0.7}$	[52]
1103	$M + O + O \rightarrow M + O_2$	$5.2 \times 10^{-35} \cdot \exp\left(\frac{9\times10^2}{T_g}\right)$	[25]
1104	$O + O \rightarrow e + O_2^+$	$\frac{1.12\times10^{13}}{N_A} \cdot \exp\left(\frac{-8.06\times10^4}{T_g}\right)$	[151]
1105	$O + O^- \rightarrow e + O_2$	2.3×10^{-10}	[152]
1106	$M + O + O^+ \rightarrow M + O_2^+$	1×10^{-29}	[52, 150]
1107	$O + O_2^- \rightarrow O_2 + O^-$	3.3×10^{-10}	[52, 150]
1108	$O + O_2^- \rightarrow e + O_3$	1.5×10^{-10}	[52, 150]
1109	$O + O_3^- \rightarrow e + O_2 + O_2$	1×10^{-13}	[153]
1110	$O + O_3^- \rightarrow O_2 + O_2^-$	2.5×10^{-10}	[154]
1111	$O + O_3 \rightarrow O_2 + O_2$	$8 \times 10^{-12} \cdot \exp\left(\frac{-2.060\times10^3}{T_g}\right)$	[54]
1112	$M + O + O_2 \rightarrow M + O_3$	$5.4 \times 10^{-34} \cdot \left(\frac{3\times10^2}{T_g}\right)^{1.9}$	[52]
1113	$O_2 + O^+ \rightarrow O + O_2^+$	$2 \times 10^{-11} \cdot \left(\frac{T_g}{3.0\times10^2}\right)^{-0.5}$	[52]
1114	$O_3 + O^+ \rightarrow O_2 + O_2^+$	1×10^{-10}	[52, 150]
1115	$O^- + O^+ \rightarrow O + O$	$2 \times 10^{-7} \cdot \left(\frac{3.0\times10^2}{T_g}\right)^{0.5}$	[150]
1116	$O_2^- + O^+ \rightarrow O + O_2$	$2 \times 10^{-7} \cdot \left(\frac{3.0\times10^2}{T_g}\right)^{0.5}$	[150]
1117	$O_3^- + O^+ \rightarrow O + O_3$	$2 \times 10^{-7} \cdot \left(\frac{3.0\times10^2}{T_g}\right)^{0.5}$	[150]
1118	$M + O_2^- + O^+ \rightarrow M + O + O_2$	$2 \times 10^{-25} \cdot \left(\frac{3.0\times10^2}{T_g}\right)^{2.5}$	[150]
1119	$M + O^- + O^+ \rightarrow M + O + O$	$2 \times 10^{-25} \cdot \left(\frac{3.0\times10^2}{T_g}\right)^{2.5}$	[150]
1120	$M + O_2^- + O^+ \rightarrow M + O_3$	$2 \times 10^{-25} \cdot \left(\frac{3.0\times10^2}{T_g}\right)^{2.5}$	[150]
1121	$M + O^- + O^+ \rightarrow M + O_2$	$2 \times 10^{-25} \cdot \left(\frac{3.0\times10^2}{T_g}\right)^{2.5}$	[150]

#	Reaction	Rate equation	Ref.
1122	$M + O_3^- + O^+ \rightarrow M + O + O_3$	$2 \times 10^{-25} \cdot \left(\frac{3.0\times10^2}{T_g}\right)^{2.5}$	[155]
1123	$O_2^+ + O^- \rightarrow O + O + O$	1×10^{-7}	[150]
1124	$O_2^+ + O^- \rightarrow O + O_2$	$2 \times 10^{-7} \cdot \left(\frac{3.0\times10^2}{T_g}\right)^{0.5}$	[150]
1125	$O_2 + O^- \rightarrow e + O_3$	5×10^{-15}	[52, 150]
1126	$M + O_2 + O^- \rightarrow M + O_3^-$	$1.1 \times 10^{-30} \cdot \left(\frac{T_g}{3.0\times10^2}\right)^{-1}$	[52, 150, 156]
1127	$O_3 + O^- \rightarrow e + O_2 + O_2$	3×10^{-10}	[52, 157]
1128	$O_3 + O^- \rightarrow O + O_3^-$	8×10^{-10}	[52]
1129	$M + O^- \rightarrow M + e + O$	$6.9 \times 10^{-10} \cdot \left(\frac{T_g}{3\times10^2}\right)^{0.5}$	[158]
1130	$M + O_2^+ + O^- \rightarrow M + O + O_2$	$2 \times 10^{-25} \cdot \left(\frac{3.0\times10^2}{T_g}\right)^{2.5}$	[150]
1131	$M + O_2^+ + O^- \rightarrow M + O_3$	$2 \times 10^{-25} \cdot \left(\frac{3.0\times10^2}{T_g}\right)^{2.5}$	[150]
1132	$O_2 + O_2 \rightarrow O + O_3$	$2 \times 10^{-11} \cdot \exp\left(\frac{-4.980\times10^4}{T_g}\right)$	[52]
1133	$M + O_2 \rightarrow M + O + O$	$3 \times 10^{-6} \cdot T_g^{-1} \cdot \exp\left(\frac{-5.938\times10^4}{T_g}\right)$	[25]
1134	$M + O_2^+ + O_3^- \rightarrow M + O_2 + O_3$	$2 \times 10^{-25} \cdot \left(\frac{3.0\times10^2}{T_g}\right)^{2.5}$	[155]
1135	$O_2^+ + O_3^- \rightarrow O + O + O_3$	1×10^{-7}	[150]
1136	$O_2^+ + O_3^- \rightarrow O_2 + O_3$	$2 \times 10^{-7} \cdot \left(\frac{3.0\times10^2}{T_g}\right)^{0.5}$	[150]
1137	$M + O_2^- + O_2^+ \rightarrow M + O_2 + O_2$	$2 \times 10^{-25} \cdot \left(\frac{3.0\times10^2}{T_g}\right)^{2.5}$	[150]
1138	$O_2^- + O_2^+ \rightarrow O + O + O_2$	1×10^{-7}	[150]
1139	$O_2^- + O_2^+ \rightarrow O_2 + O_2$	$2 \times 10^{-7} \cdot \left(\frac{3.0\times10^2}{T_g}\right)^{0.5}$	[150, 159]
1140	$M + O_2^- \rightarrow M + e + O_2$	$2 \times 10^{-10} \cdot \left(\frac{T_g}{3\times10^2}\right)^{0.5}$	[158]
1141	$O_2^- + O_3 \rightarrow O_2 + O_3^-$	3.5×10^{-10}	[52]
1142	$O_3 + O_3^- \rightarrow e + O_2 + O_2 + O_2$	3×10^{-10}	[154]
1143	$M + O_3 \rightarrow M + O + O_2$	$6.6 \times 10^{-10} \cdot \exp\left(\frac{-1.160\times10^4}{T_g}\right)$	[52]
1144	$O_2 + O_3^- \rightarrow e + O_2 + O_3$	2.3×10^{-11}	[160]
1145	$CO_2 + e \rightarrow CO_2^+ + e + e$	$f(\sigma)$	[24]
1146	$CO_2 + e \rightarrow CO + e + O$	$f(\sigma)$	[161]
1147	$CO_2 + e \rightarrow CO + e + O$	$f(\sigma)$	[161]
1148	$CO_2 + e \rightarrow CO + O^-$	$f(\sigma)$	[162]
1149	$CO + e \rightarrow CO^+ + e + e$	$f(\sigma)$	[24]
1150	$CO + e \rightarrow C + O^-$	$f(\sigma)$	[24]
1151	$CO + e \rightarrow C + e + O$	$f(\sigma)$	[24]
1152	$CO^+ + e \rightarrow C + O$	$6.8 \times 10^{-7} \cdot \left(\frac{T_e}{3\times10^2}\right)^{-0.4}$	[160]
1153	$CO_2^+ + e \rightarrow CO + O$	$0.5 \cdot 3.4 \times 10^{-6} \cdot \left(\frac{T_e}{3\times10^2}\right)^{-0.4}$	[160]
1154	$CO_2^+ + e \rightarrow C + O_2$	$0.5 \cdot 3.4 \times 10^{-6} \cdot \left(\frac{T_e}{3\times10^2}\right)^{-0.4}$	[160]
1155	$CO + O \rightarrow CO_2^+ + e$	$\frac{1.12\times10^{13}}{N_A} \cdot \exp\left(\frac{-8.06\times10^4}{T_g}\right)$	d
1156	$C + O_2 \rightarrow CO_2^+ + e$	$\frac{1.12\times10^{13}}{N_A} \cdot \exp\left(\frac{-8.06\times10^4}{T_g}\right)$	d
1157	$C + O \rightarrow CO^+ + e$	$\frac{5.28\times10^{12}}{N_A} \cdot \exp\left(\frac{-3.2\times10^4}{T_g}\right)$	[151, 163]
1158	$CO^+ + e + e \rightarrow CO + e$	$1 \times 10^{-19} \cdot \left(\frac{3\times10^2}{T_e}\right)^{4.5}$	e
1159	$M + CO^+ + e \rightarrow M + CO$	$6 \times 10^{-27} \cdot \left(\frac{3\times10^2}{T_e}\right)^{1.5}$	f

#	Reaction	Rate equation	Ref.
1160	$CO_2^+ + e + e \rightarrow CO_2 + e$	$1 \times 10^{-19} \cdot \left(\frac{3\times10^2}{T_e}\right)^{4.5}$	e
1161	$M + CO_2^+ + e \rightarrow M + CO_2$	$6 \times 10^{-27} \cdot \left(\frac{3\times10^2}{T_e}\right)^{1.5}$	f
1162	$M + C + O \rightarrow M + CO$	$9.1 \times 10^{-22} \cdot T_g^{-3.08} \cdot \exp\left(\frac{-2.114\times10^3}{T_g}\right)$	[160]
1163	$C + O_2 \rightarrow CO + O$	$\frac{1.2\times10^{14}}{N_A} \cdot \exp\left(\frac{-2.01\times10^3}{T_g}\right)$	[164]
1164	$M + C + O^+ \rightarrow M + CO^+$	$1 \times 10^{-19} \cdot T_g^{-3.08} \cdot \exp\left(\frac{-2.114\times10^3}{T_g}\right)$	[165]
1165	$C + O_2^+ \rightarrow CO^+ + O$	5.2×10^{-11}	[1]
1166	$C + O_2^+ \rightarrow C^+ + O_2$	5.2×10^{-11}	[1]
1167	$C + O^- \rightarrow CO + e$	5×10^{-10}	[1]
1168	$M + C^+ + O \rightarrow M + CO^+$	$1 \times 10^{-19} \cdot T_g^{-3.08} \cdot \exp\left(\frac{-2.114\times10^3}{T_g}\right)$	[165]
1169	$C^+ + O_2 \rightarrow CO + O^+$	6.138×10^{-10}	[56]
1170	$C^+ + O_2 \rightarrow CO^+ + O$	3.762×10^{-10}	[56]
1171	$CO_2 + O \rightarrow CO + O_2$	$\frac{1.7\times10^{13}}{N_A} \cdot \exp\left(\frac{-2.65\times10^4}{T_g}\right)$	[160]
1172	$CO_2 + O^+ \rightarrow CO_2^+ + O$	4.5×10^{-10}	[56]
1173	$CO_2 + O^+ \rightarrow CO + O_2^+$	4.5×10^{-10}	[56]
1174	$M + CO + O \rightarrow M + CO_2$	$8.3 \times 10^{-34} \cdot \exp\left(\frac{-1.51\times10^3}{T_g}\right)$	[25]
1175	$CO + O_2 \rightarrow CO_2 + O$	$4.2 \times 10^{-12} \cdot \exp\left(\frac{-2.4\times10^4}{T_g}\right)$	[25]
1176	$CO + O_3 \rightarrow CO_2 + O_2$	4×10^{-25}	[166]
1177	$CO + O^+ \rightarrow CO^+ + O$	$2 \times 10^{-11} \cdot \left(\frac{T_g}{5\times10^3}\right)^{0.5} \cdot \exp\left(\frac{-4.58\times10^3}{T_g}\right)$	[165]
1178	$CO + O^- \rightarrow CO_2 + e$	$6 \times 10^{-10} \cdot \left(\frac{T_g}{3\times10^2}\right)^{-0.39}$	[167]
1179	$CO_2^+ + O \rightarrow CO_2 + O^+$	9.62×10^{-11}	[56]
1180	$CO_2^+ + O \rightarrow CO + O_2^+$	1.638×10^{-10}	[56]
1181	$CO_2^+ + O_2 \rightarrow CO_2 + O_2^+$	5.3×10^{-11}	[83]
1182	$CO^+ + O \rightarrow CO + O^+$	1.4×10^{-10}	[168]
1183	$CO^+ + O_2 \rightarrow CO + O_2^+$	1.2×10^{-10}	[91]
1184	$C + CO_2 \rightarrow CO + CO$	1×10^{-15}	[169]
1185	$CO_2 + C^+ \rightarrow CO + CO^+$	1.1×10^{-9}	[170]
1186	$C + CO^+ \rightarrow CO + C^+$	1.1×10^{-10}	[1]
1187	$M + CO_2 \rightarrow M + CO + O$	$\frac{3.65\times10^{14}}{N_A} \cdot \exp\left(\frac{-5.2525\times10^4}{T_g}\right)$	[171]
1188	$CO_2 + CO^+ \rightarrow CO + CO_2^+$	1×10^{-9}	[91]
1189	$M + CO \rightarrow M + C + O$	$1.46 \times 10^6 \cdot T_g^{-3.52} \cdot \exp\left(\frac{-1.287\times10^5}{T_g}\right)$	[160]
1190	$e + H \rightarrow e + e + H^+$	$f(\sigma)$	[24]
1191	$e + H_2 \rightarrow e + e + H_2^+$	$f(\sigma)$	[24]
1192	$e + H_2 \rightarrow e + H + H$	$f(\sigma)$	[149]
1193	$e + H_2 \rightarrow e + e + H + H^+$	$f(\sigma)$	[149]
1194	$e + H_2 \rightarrow H + H^-$	$f(\sigma)$	[149]
1195	$e + H_2^+ \rightarrow H + H$	$7.51 \times 10^{-09} - 1.12 \times 10^{-09} \cdot \frac{T_e}{1.16045052e4}$ $+1.03 \times 10^{-10} \cdot \left(\frac{T_e}{1.16045052e4}\right)^{2.0}$ $-4.15 \times 10^{-12} \cdot \left(\frac{T_e}{1.16045052e4}\right)^{3.0}$ $+5.86 \times 10^{-14} \cdot \left(\frac{T_e}{1.16045052e4}\right)^{4.0}$	[172]

#	Reaction	Rate equation	Ref.
1196	$e + H_3^+ \rightarrow H + H + H$	$5 \times 10^{-01} \cdot \left(8.39 \times 10^{-09} + 3.02 \times 10^{-09} \cdot \frac{T_e}{1.16045052e4}\right)$ $+5 \times 10^{-01} \cdot \left(-3.8 \times 10^{-10} \cdot \left(\frac{T_e}{1.16045052e4}\right)^{2.0}\right)$ $+5 \times 10^{-01} \cdot \left(1.31 \times 10^{-11} \cdot \left(\frac{T_e}{1.16045052e4}\right)^{3.0}\right)$ $+5 \times 10^{-01} \cdot \left(2.42 \times 10^{-13} \cdot \left(\frac{T_e}{1.16045052e4}\right)^{4.0}\right)$ $+5 \times 10^{-01} \cdot \left(-2.3 \times 10^{-14} \cdot \left(\frac{T_e}{1.16045052e4}\right)^{5.0}\right)$ $+5 \times 10^{-01} \cdot \left(3.55 \times 10^{-16} \cdot \left(\frac{T_e}{1.16045052e4}\right)^{6.0}\right)$	[172]
1197	$e + H_3^+ \rightarrow H + H_2$	$5 \times 10^{-01} \cdot \left(8.39 \times 10^{-09} + 3.02 \times 10^{-09} \cdot \frac{T_e}{1.16045052e4}\right)$ $+5 \times 10^{-01} \cdot \left(-3.8 \times 10^{-10} \cdot \left(\frac{T_e}{1.16045052e4}\right)^{2.0}\right)$ $+5 \times 10^{-01} \cdot \left(1.31 \times 10^{-11} \cdot \left(\frac{T_e}{1.16045052e4}\right)^{3.0}\right)$ $+5 \times 10^{-01} \cdot \left(2.42 \times 10^{-13} \cdot \left(\frac{T_e}{1.16045052e4}\right)^{4.0}\right)$ $+5 \times 10^{-01} \cdot \left(-2.3 \times 10^{-14} \cdot \left(\frac{T_e}{1.16045052e4}\right)^{5.0}\right)$ $+5 \times 10^{-01} \cdot \left(3.55 \times 10^{-16} \cdot \left(\frac{T_e}{1.16045052e4}\right)^{6.0}\right)$	[172]
1198	$H + H_2^+ \rightarrow H_2 + H^+$	6.4×10^{-10}	[27]
1199	$M + H + H \rightarrow M + H_2$	$\frac{1.5\times10^{-29}}{N_A} \cdot T_g^{-1.3}$	[25]
1200	$H + H \rightarrow e + H_2^+$	$\frac{1.12\times10^{13}}{N_A} \cdot \exp\left(\frac{-8.06\times10^4}{T_g}\right)$	d
1201	$M + H^- \rightarrow M + e + H$	$8 \times 10^{-12} \cdot \left(\frac{T_g}{3\times10^2}\right)^{0.5}$	[173]
1202	$H_2^+ + H^- \rightarrow H + H + H$	$2 \times 10^{-7} \cdot \frac{3.0\times10^2}{T_g}$	[174]
1203	$H_3^+ + H^- \rightarrow H + H + H_2$	$2 \times 10^{-7} \cdot \frac{3.0\times10^2}{T_g}$	[174]
1204	$H^- + H^+ \rightarrow H + H$	$7.51 \times 10^{-8} \cdot \left(\frac{T_g}{3\times10^2}\right)^{-0.5}$	[2, 3]
1205	$H_2 + H_2^+ \rightarrow H + H_3^+$	2×10^{-9}	[27]
1206	$M + H_2 \rightarrow M + H + H$	$\frac{7.6\times10^{-5}}{N_A} \cdot T_g^{-1.4} \cdot \exp\left(\frac{-5.253\times10^4}{T_g}\right)$	[25]
1207	$C + e \rightarrow C^+ + e + e$	$f(\sigma)$	[148]
1208	$C + H_2 \rightarrow CH + H$	$k_{rev} \cdot K_{eq}$	b
1209	$C_2H_4 \rightarrow C + CH_4$	$k_{rev} \cdot K_{eq}$	b
1210	$C_2H_2 + H \rightarrow C + CH_3$	$k_{rev} \cdot K_{eq}$	b
1211	$C_2H + H \rightarrow C + CH_2$	$k_{rev} \cdot K_{eq}$	b
1212	$C_2H_6 + H \rightarrow CH_3 + CH_4$	$k_{rev} \cdot K_{eq}$	b
1213	$C_2H_5 + H_2 \rightarrow CH_3 + CH_4$	$k_{rev} \cdot K_{eq}$	b
1214	$C_2H_4 + H \rightarrow CH + CH_4$	$k_{rev} \cdot K_{eq}$	b
1215	$C_2H_4 + H \rightarrow CH_2 + CH_3$	$k_{rev} \cdot K_{eq}$	b
1216	$C_2H_2 + H_2 \rightarrow CH_2 + CH_2$	$k_{rev} \cdot K_{eq}$	b
1217	$C_2H_2 \rightarrow CH + CH$	$k_{rev} \cdot K_{eq}$	b
1218	$CH_2 + H \rightarrow CH_3$	$k_{rev} \cdot K_{eq}$	b
1219	$CH + H \rightarrow CH_2$	$k_{rev} \cdot K_{eq}$	b
1220	$C + H_2 \rightarrow CH_2$	$k_{rev} \cdot K_{eq}$	b
1221	$C + H \rightarrow CH$	$k_{rev} \cdot K_{eq}$	b
1222	$C_2H_2 + CH_2 \rightarrow C + C_2H_4$	$k_{rev} \cdot K_{eq}$	b
1223	$C_2H_4 + CH_3 \rightarrow C_2H_6 + CH$	$k_{rev} \cdot K_{eq}$	b
1224	$C_2H_4 + CH_4 \rightarrow C_2H_5 + CH_3$	$k_{rev} \cdot K_{eq}$	b
1225	$C_2H_4 + CH_3 \rightarrow C_2H_5 + CH_2$	$k_{rev} \cdot K_{eq}$	b

#	Reaction	Rate equation	Ref.
1226	$C_2H_2 + CH_4 \rightarrow C_2H_3 + CH_3$	$k_{rev} \cdot K_{eq}$	b
1227	$C_2H_2 + CH_3 \rightarrow C_2H_3 + CH_2$	$k_{rev} \cdot K_{eq}$	b
1228	$C_2H_2 + CH \rightarrow C_2H + CH_2$	$k_{rev} \cdot K_{eq}$	b
1229	$C_2H_4 + C_2H_6 \rightarrow C_2H_5 + C_2H_5$	$k_{rev} \cdot K_{eq}$	b
1230	$C_2H_2 + C_2H_6 \rightarrow C_2H_3 + C_2H_5$	$k_{rev} \cdot K_{eq}$	b
1231	$C_2H_2 + C_2H_4 \rightarrow C_2H + C_2H_5$	$k_{rev} \cdot K_{eq}$	b
1232	$C_2H_2 + C_2H_3 \rightarrow C_2H + C_2H_4$	$k_{rev} \cdot K_{eq}$	b
1233	$H_2 + O_2 \rightarrow OH + OH$	$k_{rev} \cdot K_{eq}$	b
1234	$OH + OH \rightarrow H_2O_2$	$k_{rev} \cdot K_{eq}$	b
1235	$M + H + OH \rightarrow M + H_2O$	$k_{rev} \cdot K_{eq}$	b
1236	$H_2O_2 + O \rightarrow H_2O + O_2$	$k_{rev} \cdot K_{eq}$	b
1237	$M + HO_2 \rightarrow M + H + O_2$	$k_{rev} \cdot K_{eq}$	b
1238	$HO_2 + O \rightarrow H + O_3$	$k_{rev} \cdot K_{eq}$	b
1239	$HO_2 + OH \rightarrow H_2 + O_3$	$k_{rev} \cdot K_{eq}$	b
1240	$CO + H \rightarrow C + OH$	$k_{rev} \cdot K_{eq}$	b
1241	$HCO \rightarrow CO + H$	$k_{rev} \cdot K_{eq}$	b
1242	$CO_2 + OH \rightarrow CO + HO_2$	$k_{rev} \cdot K_{eq}$	b
1243	$COOH + OH \rightarrow CO + H_2O_2$	$k_{rev} \cdot K_{eq}$	b
1244	$H + HCHO \rightarrow CH_3 + O$	$k_{rev} \cdot K_{eq}$	b
1245	$HCHO + OH \rightarrow CH_3 + O_2$	$k_{rev} \cdot K_{eq}$	b
1246	$CH_3OO \rightarrow CH_3 + O_2$	$k_{rev} \cdot K_{eq}$	b
1247	$CO + H_2 \rightarrow CH_2 + O$	$k_{rev} \cdot K_{eq}$	b
1248	$HCHO + O \rightarrow CH_2 + O_2$	$k_{rev} \cdot K_{eq}$	b
1249	$CO + H_2O \rightarrow CH_2 + O_2$	$k_{rev} \cdot K_{eq}$	b
1250	$CO + H \rightarrow CH + O$	$k_{rev} \cdot K_{eq}$	b
1251	$CO_2 + H \rightarrow CH + O_2$	$k_{rev} \cdot K_{eq}$	b
1252	$CO + OH \rightarrow CH + O_2$	$k_{rev} \cdot K_{eq}$	b
1253	$HCO + O \rightarrow CH + O_2$	$k_{rev} \cdot K_{eq}$	b
1254	$CO + HCHO \rightarrow CH_2 + CO_2$	$k_{rev} \cdot K_{eq}$	b
1255	$CO + HCO \rightarrow CH + CO_2$	$k_{rev} \cdot K_{eq}$	b
1256	$CH_3O + H \rightarrow CH_3 + OH$	$k_{rev} \cdot K_{eq}$	b
1257	$H_2 + HCHO \rightarrow CH_3 + OH$	$k_{rev} \cdot K_{eq}$	b
1258	$CH_3O + OH \rightarrow CH_3 + HO_2$	$k_{rev} \cdot K_{eq}$	b
1259	$H + HCHO \rightarrow CH_2 + OH$	$k_{rev} \cdot K_{eq}$	b
1260	$HCHO + OH \rightarrow CH_2 + HO_2$	$k_{rev} \cdot K_{eq}$	b
1261	$CH_3 + HO_2 \rightarrow CH_2 + H_2O_2$	$k_{rev} \cdot K_{eq}$	b
1262	$C + H_2O \rightarrow CH + OH$	$k_{rev} \cdot K_{eq}$	b
1263	$H + HCO \rightarrow CH + OH$	$k_{rev} \cdot K_{eq}$	b
1264	$H + HCHO \rightarrow CH + H_2O$	$k_{rev} \cdot K_{eq}$	b
1265	$CO_2 + HCO \rightarrow CO + COOH$	$k_{rev} \cdot K_{eq}$	b

#	Reaction	Rate equation	Ref.
1266	$CH_3 + CO_2 \rightarrow CH_3O + CO$	$k_{rev} \cdot K_{eq}$	b
1267	$HCHO + HCO \rightarrow CH_3O + CO$	$k_{rev} \cdot K_{eq}$	b
1268	$CH_3O + CO_2 \rightarrow CH_3OO + CO$	$k_{rev} \cdot K_{eq}$	b
1269	$CO + H_2 \rightarrow H + HCO$	$k_{rev} \cdot K_{eq}$	b
1270	$CH_2 + O \rightarrow H + HCO$	$k_{rev} \cdot K_{eq}$	b
1271	$H_2 + HCO \rightarrow H + HCHO$	$k_{rev} \cdot K_{eq}$	b
1272	$CH_3O \rightarrow H + HCHO$	$k_{rev} \cdot K_{eq}$	b
1273	$H_2 + HCHO \rightarrow CH_3O + H$	$k_{rev} \cdot K_{eq}$	b
1274	$CH_3OH \rightarrow CH_3O + H$	$k_{rev} \cdot K_{eq}$	b
1275	$CH_3OH + H \rightarrow CH_3O + H_2$	$k_{rev} \cdot K_{eq}$	b
1276	$H_2 + HCHO \rightarrow CH_2OH + H$	$k_{rev} \cdot K_{eq}$	b
1277	$CH_3 + H_2O \rightarrow CH_3OH + H$	$k_{rev} \cdot K_{eq}$	b
1278	$CH_3O + OH \rightarrow CH_3OO + H$	$k_{rev} \cdot K_{eq}$	b
1279	$CH_3OOH + H \rightarrow CH_3OO + H_2$	$k_{rev} \cdot K_{eq}$	b
1280	$CO + H_2O \rightarrow HCO + OH$	$k_{rev} \cdot K_{eq}$	b
1281	$H + HCOOH \rightarrow HCHO + OH$	$k_{rev} \cdot K_{eq}$	b
1282	$COOH + H_2O \rightarrow HCOOH + OH$	$k_{rev} \cdot K_{eq}$	b
1283	$H_2O + HCHO \rightarrow CH_3O + OH$	$k_{rev} \cdot K_{eq}$	b
1284	$H_2O_2 + HCHO \rightarrow CH_3O + HO_2$	$k_{rev} \cdot K_{eq}$	b
1285	$CH_3OH + O_2 \rightarrow CH_3O + HO_2$	$k_{rev} \cdot K_{eq}$	b
1286	$H_2O + HCHO \rightarrow CH_2OH + OH$	$k_{rev} \cdot K_{eq}$	b
1287	$CH_3OH + OH \rightarrow CH_2OH + H_2O$	$k_{rev} \cdot K_{eq}$	b
1288	$H_2O_2 + HCHO \rightarrow CH_2OH + HO_2$	$k_{rev} \cdot K_{eq}$	b
1289	$H_2O + HCOOH \rightarrow CH_2OH + HO_2$	$k_{rev} \cdot K_{eq}$	b
1290	$CH_3O + H_2O_2 \rightarrow CH_3OH + HO_2$	$k_{rev} \cdot K_{eq}$	b
1291	$CH_3OO + H_2O \rightarrow CH_3OOH + OH$	$k_{rev} \cdot K_{eq}$	b
1292	$CH_3OH + O_2 \rightarrow CH_3OO + OH$	$k_{rev} \cdot K_{eq}$	b
1293	$CH_3OOH + O_2 \rightarrow CH_3OO + HO_2$	$k_{rev} \cdot K_{eq}$	b
1294	$CH_3OOH + HO_2 \rightarrow CH_3OO + H_2O_2$	$k_{rev} \cdot K_{eq}$	b
1295	$CO + OH \rightarrow HCO + O$	$k_{rev} \cdot K_{eq}$	b
1296	$CO_2 + H \rightarrow HCO + O$	$k_{rev} \cdot K_{eq}$	b
1297	$CO + HO_2 \rightarrow HCO + O_2$	$k_{rev} \cdot K_{eq}$	b
1298	$HCO + OH \rightarrow HCHO + O$	$k_{rev} \cdot K_{eq}$	b
1299	$HCO + HO_2 \rightarrow HCHO + O_2$	$k_{rev} \cdot K_{eq}$	b
1300	$HCHO + OH \rightarrow CH_3O + O$	$k_{rev} \cdot K_{eq}$	b
1301	$HCHO + HO_2 \rightarrow CH_3O + O_2$	$k_{rev} \cdot K_{eq}$	b
1302	$CH_2OH + OH \rightarrow CH_3OH + O$	$k_{rev} \cdot K_{eq}$	b
1303	$CH_3O + O_2 \rightarrow CH_3OO + O$	$k_{rev} \cdot K_{eq}$	b
1304	$CH_4 + CO \rightarrow CH_3 + HCO$	$k_{rev} \cdot K_{eq}$	b
1305	$CH_3 + CO \rightarrow CH_2 + HCO$	$k_{rev} \cdot K_{eq}$	b

#	Reaction	Rate equation	Ref.
1306	$CH_2CO + H_2O \rightarrow CH_3 + COOH$	$k_{rev} \cdot K_{eq}$	b
1307	$CH_4 + CO_2 \rightarrow CH_3 + COOH$	$k_{rev} \cdot K_{eq}$	b
1308	$CH_3 + HCO \rightarrow CH_2 + HCHO$	$k_{rev} \cdot K_{eq}$	b
1309	$CH_2CO + H \rightarrow CH + HCHO$	$k_{rev} \cdot K_{eq}$	b
1310	$CH_4 + HCHO \rightarrow CH_3 + CH_3O$	$k_{rev} \cdot K_{eq}$	b
1311	$CH_3 + HCHO \rightarrow CH_2 + CH_3O$	$k_{rev} \cdot K_{eq}$	b
1312	$CH_4 + HCHO \rightarrow CH_2OH + CH_3$	$k_{rev} \cdot K_{eq}$	b
1313	$C_2H_4 + OH \rightarrow CH_2 + CH_2OH$	$k_{rev} \cdot K_{eq}$	b
1314	$CH_3 + HCHO \rightarrow CH_2 + CH_2OH$	$k_{rev} \cdot K_{eq}$	b
1315	$CH_2OH + CH_3 \rightarrow CH_2 + CH_3OH$	$k_{rev} \cdot K_{eq}$	b
1316	$CH_3 + CH_3O \rightarrow CH_2 + CH_3OH$	$k_{rev} \cdot K_{eq}$	b
1317	$CH_3 + CH_3OOH \rightarrow CH_3OO + CH_4$	$k_{rev} \cdot K_{eq}$	b
1318	$CH_3O + CH_3O \rightarrow CH_3 + CH_3OO$	$k_{rev} \cdot K_{eq}$	b
1319	$CH_3O + HCHO \rightarrow CH_2 + CH_3OO$	$k_{rev} \cdot K_{eq}$	b
1320	$C_2H_5 + O_2 \rightarrow CH_2 + CH_3OO$	$k_{rev} \cdot K_{eq}$	b
1321	$CO + HCHO \rightarrow HCO + HCO$	$k_{rev} \cdot K_{eq}$	b
1322	$CH_3OH + CO \rightarrow CH_3O + HCO$	$k_{rev} \cdot K_{eq}$	b
1323	$CH_3OH + CO \rightarrow CH_2OH + HCO$	$k_{rev} \cdot K_{eq}$	b
1324	$HCHO + HCHO \rightarrow CH_2OH + HCO$	$k_{rev} \cdot K_{eq}$	b
1325	$CH_3OH + HCHO \rightarrow CH_3O + CH_3O$	$k_{rev} \cdot K_{eq}$	b
1326	$CH_3OH + HCHO \rightarrow CH_2OH + CH_3O$	$k_{rev} \cdot K_{eq}$	b
1327	$CH_3OH + HCHO \rightarrow CH_2OH + CH_2OH$	$k_{rev} \cdot K_{eq}$	b
1328	$CH_3OOH + HCHO \rightarrow CH_3O + CH_3OO$	$k_{rev} \cdot K_{eq}$	b
1329	$CH_2OH + CH_3OOH \rightarrow CH_3OH + CH_3OO$	$k_{rev} \cdot K_{eq}$	b
1330	$CH_3O + CH_3OOH \rightarrow CH_3OH + CH_3OO$	$k_{rev} \cdot K_{eq}$	b
1331	$CH_3OOH + HCHO \rightarrow CH_2OH + CH_3OO$	$k_{rev} \cdot K_{eq}$	b
1332	$CH_3OH + HCOOH \rightarrow CH_2OH + CH_3OO$	$k_{rev} \cdot K_{eq}$	b
1333	$CH_3OOH + HCO \rightarrow CH_3OO + HCHO$	$k_{rev} \cdot K_{eq}$	b
1334	$C_2H_4 + H_2O \rightarrow C_2H_5 + OH$	$k_{rev} \cdot K_{eq}$	b
1335	$C_2H_4 + H_2O_2 \rightarrow C_2H_5 + HO_2$	$k_{rev} \cdot K_{eq}$	b
1336	$CH_3 + HCHO \rightarrow C_2H_4 + OH$	$k_{rev} \cdot K_{eq}$	b
1337	$CH_3CHO + H \rightarrow C_2H_4 + OH$	$k_{rev} \cdot K_{eq}$	b
1338	$CH_3 + HCO \rightarrow C_2H_3 + OH$	$k_{rev} \cdot K_{eq}$	b
1339	$CH_3CO + H \rightarrow C_2H_3 + OH$	$k_{rev} \cdot K_{eq}$	b
1340	$C_2H_2 + H_2O \rightarrow C_2H_3 + OH$	$k_{rev} \cdot K_{eq}$	b
1341	$CH_2CO + H_2 \rightarrow C_2H_3 + OH$	$k_{rev} \cdot K_{eq}$	b
1342	$CH_4 + CO \rightarrow C_2H_3 + OH$	$k_{rev} \cdot K_{eq}$	b
1343	$C_2H_4 + OH \rightarrow C_2H_3 + H_2O$	$k_{rev} \cdot K_{eq}$	b
1344	$C_2H_4 + HO_2 \rightarrow C_2H_3 + H_2O_2$	$k_{rev} \cdot K_{eq}$	b
1345	$CH_2CO + H \rightarrow C_2H_2 + OH$	$k_{rev} \cdot K_{eq}$	b

#	Reaction	Rate equation	Ref.
1346	$C_2H_2 + O \rightarrow C_2H + OH$	$k_{rev} \cdot K_{eq}$	b
1347	$CH_2 + CO \rightarrow C_2H + OH$	$k_{rev} \cdot K_{eq}$	b
1348	$C_2H_2 + O_2 \rightarrow C_2H + HO_2$	$k_{rev} \cdot K_{eq}$	b
1349	$HCCO + OH \rightarrow C_2H + HO_2$	$k_{rev} \cdot K_{eq}$	b
1350	$CH_3CHO + H \rightarrow C_2H_5 + O$	$k_{rev} \cdot K_{eq}$	b
1351	$CH_3 + HCHO \rightarrow C_2H_5 + O$	$k_{rev} \cdot K_{eq}$	b
1352	$C_2H_4 + OH \rightarrow C_2H_5 + O$	$k_{rev} \cdot K_{eq}$	b
1353	$CH_3 + HCO \rightarrow C_2H_4 + O$	$k_{rev} \cdot K_{eq}$	b
1354	$CH_2CO + H_2 \rightarrow C_2H_4 + O$	$k_{rev} \cdot K_{eq}$	b
1355	$C_2H_3 + HO_2 \rightarrow C_2H_4 + O_2$	$k_{rev} \cdot K_{eq}$	b
1356	$C_2H_2 + OH \rightarrow C_2H_3 + O$	$k_{rev} \cdot K_{eq}$	b
1357	$CH_3 + CO \rightarrow C_2H_3 + O$	$k_{rev} \cdot K_{eq}$	b
1358	$CH_2 + HCO \rightarrow C_2H_3 + O$	$k_{rev} \cdot K_{eq}$	b
1359	$HCHO + HCO \rightarrow C_2H_3 + O_2$	$k_{rev} \cdot K_{eq}$	b
1360	$CH_2 + CO \rightarrow C_2H_2 + O$	$k_{rev} \cdot K_{eq}$	b
1361	$H + HCCO \rightarrow C_2H_2 + O$	$k_{rev} \cdot K_{eq}$	b
1362	$HCO + HCO \rightarrow C_2H_2 + O_2$	$k_{rev} \cdot K_{eq}$	b
1363	$CH + CO \rightarrow C_2H + O$	$k_{rev} \cdot K_{eq}$	b
1364	$CO + HCO \rightarrow C_2H + O_2$	$k_{rev} \cdot K_{eq}$	b
1365	$CH + CO_2 \rightarrow C_2H + O_2$	$k_{rev} \cdot K_{eq}$	b
1366	$C_2H_5 + CH_3OOH \rightarrow C_2H_6 + CH_3OO$	$k_{rev} \cdot K_{eq}$	b
1367	$C_2H_6 + CO \rightarrow C_2H_5 + HCO$	$k_{rev} \cdot K_{eq}$	b
1368	$C_2H_6 + HCHO \rightarrow C_2H_5 + CH_3O$	$k_{rev} \cdot K_{eq}$	b
1369	$C_2H_4 + CH_3OH \rightarrow C_2H_5 + CH_2OH$	$k_{rev} \cdot K_{eq}$	b
1370	$C_2H_6 + HCHO \rightarrow C_2H_5 + CH_2OH$	$k_{rev} \cdot K_{eq}$	b
1371	$CH_3CH_2O + CH_3O \rightarrow C_2H_5 + CH_3OO$	$k_{rev} \cdot K_{eq}$	b
1372	$C_2H_5 + CO_2 \rightarrow C_2H_4 + COOH$	$k_{rev} \cdot K_{eq}$	b
1373	$C_2H_5 + HCHO \rightarrow C_2H_4 + CH_2OH$	$k_{rev} \cdot K_{eq}$	b
1374	$C_2H_4 + HCO \rightarrow C_2H_3 + HCHO$	$k_{rev} \cdot K_{eq}$	b
1375	$C_2H_4 + HCHO \rightarrow C_2H_3 + CH_3O$	$k_{rev} \cdot K_{eq}$	b
1376	$C_2H_4 + HCHO \rightarrow C_2H_3 + CH_2OH$	$k_{rev} \cdot K_{eq}$	b
1377	$C_2H_4 + CH_2OH \rightarrow C_2H_3 + CH_3OH$	$k_{rev} \cdot K_{eq}$	b
1378	$C_2H_4 + CH_3O \rightarrow C_2H_3 + CH_3OH$	$k_{rev} \cdot K_{eq}$	b
1379	$C_2H_3 + CO_2 \rightarrow C_2H_2 + COOH$	$k_{rev} \cdot K_{eq}$	b
1380	$C_2H_3 + HCHO \rightarrow C_2H_2 + CH_2OH$	$k_{rev} \cdot K_{eq}$	b
1381	$C_2H_2 + HCHO \rightarrow C_2H + CH_3O$	$k_{rev} \cdot K_{eq}$	b
1382	$C_2H_2 + HCHO \rightarrow C_2H + CH_2OH$	$k_{rev} \cdot K_{eq}$	b
1383	$C_2H_2 + CH_2OH \rightarrow C_2H + CH_3OH$	$k_{rev} \cdot K_{eq}$	b
1384	$C_2H_2 + CH_3O \rightarrow C_2H + CH_3OH$	$k_{rev} \cdot K_{eq}$	b
1385	$CH_3O + HCCO \rightarrow C_2H + CH_3OO$	$k_{rev} \cdot K_{eq}$	b

#	Reaction	Rate equation	Ref.
1386	$CH_2 + CO \rightarrow H + HCCO$	$k_{rev} \cdot K_{eq}$	b
1387	$CH_3 + CO \rightarrow CH_2CO + H$	$k_{rev} \cdot K_{eq}$	b
1388	$H_2 + HCCO \rightarrow CH_2CO + H$	$k_{rev} \cdot K_{eq}$	b
1389	$CH_3 + HCO \rightarrow CH_3CO + H$	$k_{rev} \cdot K_{eq}$	b
1390	$CH_2CO + H_2 \rightarrow CH_3CO + H$	$k_{rev} \cdot K_{eq}$	b
1391	$CH_2OH + CH_3 \rightarrow CH_3CH_2O + H$	$k_{rev} \cdot K_{eq}$	b
1392	$CH_3CH_2OH \rightarrow CH_3CH_2O + H$	$k_{rev} \cdot K_{eq}$	b
1393	$C_2H_5 + OH \rightarrow CH_3CH_2O + H$	$k_{rev} \cdot K_{eq}$	b
1394	$C_2H_4 + H_2O \rightarrow CH_3CH_2O + H$	$k_{rev} \cdot K_{eq}$	b
1395	$CH_3CHO + H_2 \rightarrow CH_3CH_2O + H$	$k_{rev} \cdot K_{eq}$	b
1396	$CH_4 + HCHO \rightarrow CH_3CH_2O + H$	$k_{rev} \cdot K_{eq}$	b
1397	$CH_3CH_2OH \rightarrow CH_3CHOH + H$	$k_{rev} \cdot K_{eq}$	b
1398	$CH_2OH + CH_3 \rightarrow CH_3CHOH + H$	$k_{rev} \cdot K_{eq}$	b
1399	$C_2H_5 + OH \rightarrow CH_3CHOH + H$	$k_{rev} \cdot K_{eq}$	b
1400	$C_2H_4 + H_2O \rightarrow CH_3CHOH + H$	$k_{rev} \cdot K_{eq}$	b
1401	$CH_3CHO + H_2 \rightarrow CH_3CHOH + H$	$k_{rev} \cdot K_{eq}$	b
1402	$CH_4 + HCHO \rightarrow CH_3CHOH + H$	$k_{rev} \cdot K_{eq}$	b
1403	$C_2H_5 + H_2O \rightarrow CH_3CH_2OH + H$	$k_{rev} \cdot K_{eq}$	b
1404	$CH_3CHOH + H_2 \rightarrow CH_3CH_2OH + H$	$k_{rev} \cdot K_{eq}$	b
1405	$CH_2CH_2OH + H_2 \rightarrow CH_3CH_2OH + H$	$k_{rev} \cdot K_{eq}$	b
1406	$CH_3CH_2O + H_2 \rightarrow CH_3CH_2OH + H$	$k_{rev} \cdot K_{eq}$	b
1407	$CH_2OH + CO \rightarrow CH_2CO + OH$	$k_{rev} \cdot K_{eq}$	b
1408	$H_2O + HCCO \rightarrow CH_2CO + OH$	$k_{rev} \cdot K_{eq}$	b
1409	$HCHO + HCO \rightarrow CH_2CO + OH$	$k_{rev} \cdot K_{eq}$	b
1410	$CH_3 + CO_2 \rightarrow CH_2CO + OH$	$k_{rev} \cdot K_{eq}$	b
1411	$CH_2CO + H_2O \rightarrow CH_3CO + OH$	$k_{rev} \cdot K_{eq}$	b
1412	$CH_3CO + H_2O \rightarrow CH_3CHO + OH$	$k_{rev} \cdot K_{eq}$	b
1413	$CH_3 + HCOOH \rightarrow CH_3CHO + OH$	$k_{rev} \cdot K_{eq}$	b
1414	$CH_3COOH + H \rightarrow CH_3CHO + OH$	$k_{rev} \cdot K_{eq}$	b
1415	$CH_2CH_2OH + H_2O \rightarrow CH_3CH_2OH + OH$	$k_{rev} \cdot K_{eq}$	b
1416	$CH_3CHOH + H_2O \rightarrow CH_3CH_2OH + OH$	$k_{rev} \cdot K_{eq}$	b
1417	$CH_3CH_2O + H_2O \rightarrow CH_3CH_2OH + OH$	$k_{rev} \cdot K_{eq}$	b
1418	$CH_3CHOH + H_2O_2 \rightarrow CH_3CH_2OH + HO_2$	$k_{rev} \cdot K_{eq}$	b
1419	$CH + CO_2 \rightarrow HCCO + O$	$k_{rev} \cdot K_{eq}$	b
1420	$CO + HCHO \rightarrow CH_2CO + O$	$k_{rev} \cdot K_{eq}$	b
1421	$HCO + HCO \rightarrow CH_2CO + O$	$k_{rev} \cdot K_{eq}$	b
1422	$CH_2 + CO_2 \rightarrow CH_2CO + O$	$k_{rev} \cdot K_{eq}$	b
1423	$CH_2CO + OH \rightarrow CH_3CO + O$	$k_{rev} \cdot K_{eq}$	b
1424	$CH_3 + CO_2 \rightarrow CH_3CO + O$	$k_{rev} \cdot K_{eq}$	b
1425	$CH_3CO + OH \rightarrow CH_3CHO + O$	$k_{rev} \cdot K_{eq}$	b

#	Reaction	Rate equation	Ref.
1426	$CH_3CO + HO_2 \rightarrow CH_3CHO + O_2$	$k_{rev} \cdot K_{eq}$	b
1427	$CH_3CHO + HO_2 \rightarrow CH_3CH_2O + O_2$	$k_{rev} \cdot K_{eq}$	b
1428	$CH_3 + HCOOH \rightarrow CH_3CHOH + O$	$k_{rev} \cdot K_{eq}$	b
1429	$CH_3CHO + OH \rightarrow CH_3CHOH + O$	$k_{rev} \cdot K_{eq}$	b
1430	$CH_3COOH + H \rightarrow CH_3CHOH + O$	$k_{rev} \cdot K_{eq}$	b
1431	$CH_3CHO + HO_2 \rightarrow CH_3CHOH + O_2$	$k_{rev} \cdot K_{eq}$	b
1432	$CH_2OH + HCHO \rightarrow CH_2CH_2OH + O$	$k_{rev} \cdot K_{eq}$	b
1433	$CH_3CHOH + OH \rightarrow CH_3CH_2OH + O$	$k_{rev} \cdot K_{eq}$	b
1434	$CH_2CH_2OH + OH \rightarrow CH_3CH_2OH + O$	$k_{rev} \cdot K_{eq}$	b
1435	$CH_3CH_2O + OH \rightarrow CH_3CH_2OH + O$	$k_{rev} \cdot K_{eq}$	b
1436	$CH_3CHOH + HO_2 \rightarrow CH_3CH_2OH + O_2$	$k_{rev} \cdot K_{eq}$	b
1437	$CH_2CH_2OH + HO_2 \rightarrow CH_3CH_2OH + O_2$	$k_{rev} \cdot K_{eq}$	b
1438	$CH_3CH_2O + HO_2 \rightarrow CH_3CH_2OH + O_2$	$k_{rev} \cdot K_{eq}$	b
1439	$C_2H_5 + CO \rightarrow CH_2CO + CH_3$	$k_{rev} \cdot K_{eq}$	b
1440	$CH_4 + HCCO \rightarrow CH_2CO + CH_3$	$k_{rev} \cdot K_{eq}$	b
1441	$C_2H_4 + CO \rightarrow CH_2 + CH_2CO$	$k_{rev} \cdot K_{eq}$	b
1442	$CH_3 + HCCO \rightarrow CH_2 + CH_2CO$	$k_{rev} \cdot K_{eq}$	b
1443	$CH_2CO + CH_4 \rightarrow CH_3 + CH_3CO$	$k_{rev} \cdot K_{eq}$	b
1444	$CH_2CO + CH_3 \rightarrow CH_2 + CH_3CO$	$k_{rev} \cdot K_{eq}$	b
1445	$CH_3CHOH + CH_4 \rightarrow CH_3 + CH_3CH_2OH$	$k_{rev} \cdot K_{eq}$	b
1446	$CH_2CH_2OH + CH_4 \rightarrow CH_3 + CH_3CH_2OH$	$k_{rev} \cdot K_{eq}$	b
1447	$CH_3CH_2O + CH_4 \rightarrow CH_3 + CH_3CH_2OH$	$k_{rev} \cdot K_{eq}$	b
1448	$CH_3CHO + CO \rightarrow CH_3CO + HCO$	$k_{rev} \cdot K_{eq}$	b
1449	$CH_3CHO + HCO \rightarrow CH_3CO + HCHO$	$k_{rev} \cdot K_{eq}$	b
1450	$CH_2CO + CH_3OH \rightarrow CH_3CO + CH_3O$	$k_{rev} \cdot K_{eq}$	b
1451	$CH_3CHO + HCHO \rightarrow CH_3CO + CH_3O$	$k_{rev} \cdot K_{eq}$	b
1452	$CH_2OH + CH_3CHO \rightarrow CH_3CO + CH_3OH$	$k_{rev} \cdot K_{eq}$	b
1453	$CH_3CO + CH_3OH \rightarrow CH_3CHO + CH_3O$	$k_{rev} \cdot K_{eq}$	b
1454	$CH_3CO + CH_3OOH \rightarrow CH_3CHO + CH_3OO$	$k_{rev} \cdot K_{eq}$	b
1455	$CH_2CO + CH_3CHO \rightarrow CH_3CO + CH_3CO$	$k_{rev} \cdot K_{eq}$	b
1456	$CO + OH \rightarrow COOH$	$k_{rev} \cdot K_{eq}$	b
1457	$CO_2 + H \rightarrow COOH$	$k_{rev} \cdot K_{eq}$	b
1458	$H + HCO \rightarrow HCHO$	$k_{rev} \cdot K_{eq}$	b
1459	$H + HCHO \rightarrow CH_2OH$	$k_{rev} \cdot K_{eq}$	b
1460	$CH_2 + H_2O \rightarrow CH_3OH$	$k_{rev} \cdot K_{eq}$	b
1461	$CH_2OH + H \rightarrow CH_3OH$	$k_{rev} \cdot K_{eq}$	b
1462	$CH_3O + OH \rightarrow CH_3OOH$	$k_{rev} \cdot K_{eq}$	b
1463	$CH_3 + COOH \rightarrow CH_3COOH$	$k_{rev} \cdot K_{eq}$	b
1464	$CH_3 + HCHO \rightarrow CH_3CHOH$	$k_{rev} \cdot K_{eq}$	b
1465	$C_2H_4 + OH \rightarrow CH_2CH_2OH$	$k_{rev} \cdot K_{eq}$	b

#	Reaction	Rate equation	Ref.
1466	$CO + O \rightarrow C + O_2$	$k_{rev} \cdot K_{eq}$	[b]
1467	$CO_2 + O_2 \rightarrow CO + O_3$	$k_{rev} \cdot K_{eq}$	[b]
1468	$CO + CO \rightarrow C + CO_2$	$k_{rev} \cdot K_{eq}$	[b]

Constants:

$N_A = 6.02214076 \times 10^{23} mol^{-1}$
$k_B = 1.38064852 \times 10^{-23} J/K$
$R = 8.31446261815324 JK^{-1} mol^{-1}$
n_M = total number density of neutral species (cm^{-3})

Notes:

[a] falloff expression, Lindemann-Hinshelwood expression with broadening factor:
$k = \frac{k_0[M]k_\infty}{k_0[M]+k_\infty} F$; $logF = \frac{logF_c}{1+\left[\frac{log(k_0[M]/k_\infty)}{N}\right]^2}$; $N = 0.75 - 1.27 logF_c$

[b] reaction rate expression calculated from equilibrium constant and reverse reaction rate:
$K_{eq} = e^{\left(\frac{-\Delta G_r}{RT}\right)} \cdot \left(\frac{p}{R \cdot T}\right)^{\Delta v}$; $p = 1bar$; $\Delta v = \sum \mu_P - \sum \mu_R$

[c] estimated: equal to $O^- + M \rightarrow e + O + M$ [158]
[d] estimated: equal to $O + O \rightarrow O_2^+ + e$ [163]
[e] estimated: equal to $e + e + A^+ \rightarrow e + A$ [150]
[f] estimated: equal to $e + A^+ + M \rightarrow A + M$ [150]

Table S2: Cross sections reference list

#	**Process**	**Type**	**Ref.**
1	$C \rightarrow C$	$effective$	[148]
2	$C \rightarrow C(1D)(1.264eV)$	$excitation$	[148]
3	$C \rightarrow C(1S)(2.684eV)$	$excitation$	[148]
4	$CH \rightarrow CH$	$effective$	[148]
5	$CH_2 \rightarrow CH_2$	$effective$	[148]
6	$CH_3 \rightarrow CH_3$	$effective$	[148]
7	$CH_4 \rightarrow CH_4$	$elastic$	[24]
8	$CH_4 \rightarrow CH_4(V24)(0.162eV)$	$excitation$	[24]
9	$CH_4 \rightarrow CH_4(V13)(0.361eV)$	$excitation$	[24]
10	$C_2H_2 \rightarrow C_2H_2$	$elastic$	[175]
11	$C_2H_2 \rightarrow C_2H_2(v5)(0.09eV)$	$excitation$	[175]
12	$C_2H_2 \rightarrow C_2H_2(V2)(0.255eV)$	$excitation$	[175]
13	$C_2H_2 \rightarrow C_2H_2(V31)(0.407eV)$	$excitation$	[175]
14	$C_2H_2 \rightarrow C_2H_2 * (1.911ev)$	$excitation$	[175]
15	$C_2H_2 \rightarrow C_2H_2 * (5.089eV)$	$excitation$	[175]
16	$C_2H_2 \rightarrow C_2H_2 * (7.902eV)$	$excitation$	[175]
17	$C_2H_4 \rightarrow C_2H_4$	$elastic$	[175]
18	$C_2H_4 \rightarrow C_2H_4(V1)(0.11eV)$	$excitation$	[175]
19	$C_2H_4 \rightarrow C_2H_4(V2)(0.36eV)$	$excitation$	[175]
20	$C_2H_4 \rightarrow C_2H_4(3.8eV)$	$excitation$	[175]
21	$C_2H_4 \rightarrow C_2H_4(5eV)$	$excitation$	[175]

#	Process	Type	Ref.
22	$C_2H_4 \rightarrow C_2H_4(7eV)$	*excitation*	[175]
23	$C_2H_6 \rightarrow C_2H_6$	*elastic*	[175]
24	$C_2H_6 \rightarrow C_2H_6(V24)(0.16eV)$	*excitation*	[175]
25	$C_2H_6 \rightarrow C_2H_6(v13)(0.371eV)$	*excitation*	[175]
26	$C_2H_6 \rightarrow C_2H_6 * (7.53eV)$	*excitation*	[175]
27	$C_2H_6 \rightarrow C_2H_6 * (10.12eV)$	*excitation*	[175]
28	$CO \rightarrow CO$	*elastic*	[24]
29	$CO \rightarrow CO(J = 0 - J = 1)(0.000479992eV)$	*rotational*	[46]
30	$CO \rightarrow CO(J = 1 - J = 2)(0.000959985eV)$	*rotational*	[46]
31	$CO \rightarrow CO(J = 2 - J = 3)(0.00143998eV)$	*rotational*	[46]
32	$CO \rightarrow CO(J = 3 - J = 4)(0.00191997eV)$	*rotational*	[46]
33	$CO \rightarrow CO(J = 4 - J = 5)(0.00239996eV)$	*rotational*	[46]
34	$CO \rightarrow CO(J = 5 - J = 6)(0.00287995eV)$	*rotational*	[46]
35	$CO \rightarrow CO(J = 6 - J = 7)(0.00335995eV)$	*rotational*	[46]
36	$CO \rightarrow CO(J = 7 - J = 8)(0.00383994eV)$	*rotational*	[46]
37	$CO \rightarrow CO(J = 8 - J = 9)(0.00431993eV)$	*rotational*	[46]
38	$CO \rightarrow CO(J = 9 - J = 10)(0.00479992eV)$	*rotational*	[46]
39	$CO \rightarrow CO(J = 10 - J = 11)(0.00527992eV)$	*rotational*	[46]
40	$CO \rightarrow CO(J = 11 - J = 12)(0.00575991eV)$	*rotational*	[46]
41	$CO \rightarrow CO(J = 12 - J = 13)(0.0062399eV)$	*rotational*	[46]
42	$CO \rightarrow CO(J = 13 - J = 14)(0.00671989eV)$	*rotational*	[46]
43	$CO \rightarrow CO(J = 14 - J = 15)(0.00719989eV)$	*rotational*	[46]
44	$CO \rightarrow CO(J = 15 - J = 16)(0.00767988eV)$	*rotational*	[46]

#	Process	Type	Ref.
45	$CO \rightarrow CO(J = 16 - J = 17)(0.00815987eV)$	$rotational$	[46]
46	$CO \rightarrow CO(v0 - v1)(0.266eV)$	$excitation$	[24]
47	$CO \rightarrow CO(v0 - v2)(0.54eV)$	$excitation$	[24]
48	$CO \rightarrow CO(v0 - v3)(0.81eV)$	$excitation$	[24]
49	$CO \rightarrow CO(v0 - v4)(1.07eV)$	$excitation$	[24]
50	$CO \rightarrow CO(v0 - v5)(1.33eV)$	$excitation$	[24]
51	$CO \rightarrow CO(v0 - v6)(1.59eV)$	$excitation$	[24]
52	$CO \rightarrow CO(v0 - v7)(1.84eV)$	$excitation$	[24]
53	$CO \rightarrow CO(v0 - v8)(2.09eV)$	$excitation$	[24]
54	$CO \rightarrow CO(v0 - v9)(2.33eV)$	$excitation$	[24]
55	$CO \rightarrow CO(v0 - v10)(2.58eV)$	$excitation$	[24]
56	$CO \rightarrow CO(a3P)(6.006eV)$	$excitation$	[24]
57	$CO \rightarrow CO(a3Su+)(6.8eV)$	$excitation$	[24]
58	$CO \rightarrow CO(A1P)(8.024eV)$	$excitation$	[24]
59	$CO \rightarrow CO(b3Su+)(10.399eV)$	$excitation$	[24]
60	$CO \rightarrow CO(B1Su+)(10.777eV)$	$excitation$	[24]
61	$CO \rightarrow CO(C1Su+)(11.396eV)$	$excitation$	[24]
62	$CO \rightarrow CO(E1P)(11.524eV)$	$excitation$	[24]
63	$CO_2 \rightarrow CO_2$	$effective$	[24]
64	$CO_2 \rightarrow CO_2(v010)(0.083eV)$	$excitation$	[24]
65	$CO_2 \rightarrow CO_2(v020)(0.167eV)$	$excitation$	[24]
66	$CO_2 \rightarrow CO_2(v100)(0.167eV)$	$excitation$	[24]
67	$CO_2 \rightarrow CO_2(v030 + 110)(0.252eV)$	$excitation$	[24]

#	Process	Type	Ref.
68	$CO_2 \rightarrow CO_2(v001)(0.291eV)$	*excitation*	[24]
69	$CO_2 \rightarrow CO_2(v040 + 120 + 011)(0.339eV)$	*excitation*	[24]
70	$CO_2 \rightarrow CO_2(Xv200)(0.339eV)$	*excitation*	[24]
71	$CO_2 \rightarrow CO_2(Xv050 + 210 + 130 + 021 + 101)(0.422eV)$	*excitation*	[24]
72	$CO_2 \rightarrow CO_2(Xv300)(0.5eV)$	*excitation*	[24]
73	$CO_2 \rightarrow CO_2(Xv060 + 220 + 140)(0.505eV)$	*excitation*	[24]
74	$CO_2 \rightarrow CO_2(Xv0n0 + n00)(2.5eV)$	*excitation*	[24]
75	$CO_2 \rightarrow CO_2(e1)(7eV)$	*excitation*	[24]
76	$CO_2 \rightarrow CO_2(e2)(10.5eV)$	*excitation*	[24]
77	$H \rightarrow H$	*elastic*	[24]
78	$H \rightarrow H(1p)(10.21eV)$	*excitation*	[24]
79	$H \rightarrow H(2s)(10.21eV)$	*excitation*	[24]
80	$H \rightarrow H(3)(12.11eV)$	*excitation*	[24]
81	$H \rightarrow H(4)(12.76eV)$	*excitation*	[24]
82	$H \rightarrow H(5)(13.11eV)$	*excitation*	[24]
83	$H_2 \rightarrow H_2$	*elastic*	[24]
84	$H_2 \rightarrow H_2(J = 0 - J = 2)(0.044eV)$	*rotational*	[46]
85	$H_2 \rightarrow H_2(J = 1 - J = 3)(0.073eV)$	*rotational*	[46]
86	$H_2 \rightarrow H_2(J = 2 - J = 4)(0.1eV)$	*rotational*	[46]
87	$H_2 \rightarrow H_2(J = 3 - J = 5)(0.12eV)$	*rotational*	[46]
88	$H_2 \rightarrow H_2(v0 - v1)(0.516eV)$	*excitation*	[24]
89	$H_2 \rightarrow H_2(v0 - v2)(1eV)$	*excitation*	[24]
90	$H_2 \rightarrow H_2(v0 - v3)(1.5eV)$	*excitation*	[24]

#	Process	Type	Ref.
91	$H_2 \rightarrow H_2(b3Su)(8.9eV)$	$excitation$	[24]
92	$H_2 \rightarrow H_2(B1Su)(11.4eV)$	$excitation$	[24]
93	$H_2 \rightarrow H_2(c3Pu)(11.75eV)$	$excitation$	[24]
94	$H_2 \rightarrow H_2(a3Sg)(11.8eV)$	$excitation$	[24]
95	$H_2 \rightarrow H_2(C1Pu)(12.4eV)$	$excitation$	[24]
96	$H_2 \rightarrow H_2(E1Sg, F1Sg)(12.4eV)$	$excitation$	[24]
97	$H_2 \rightarrow H_2(e3Su)(13.4eV)$	$excitation$	[24]
98	$H_2 \rightarrow H_2(B1Su)(13.8eV)$	$excitation$	[24]
99	$H_2 \rightarrow H_2(D1Pu)(14eV)$	$excitation$	[24]
100	$H_2 \rightarrow H_2(B1Su)(14.6eV)$	$excitation$	[24]
101	$H_2 \rightarrow H_2(D1Pu)(14.6eV)$	$excitation$	[24]
102	$H_2O \rightarrow H_2O$	$elastic$	[46]
103	$H_2O \rightarrow H_2O(R)(0.04eV)$	$excitation$	[46]
104	$H_2O \rightarrow H_2O(VA)(0.198eV)$	$excitation$	[46]
105	$H_2O \rightarrow H_2O(V1)(0.453eV)$	$excitation$	[46]
106	$O \rightarrow O$	$elastic$	[24]
107	$O \rightarrow O(1D)(1.96eV)$	$excitation$	[24]
108	$O \rightarrow O(1S)(4.18eV)$	$excitation$	[24]
109	$O \rightarrow O(4S0)(9.2eV)$	$excitation$	[24]
110	$O \rightarrow O(2D0)(12.5eV)$	$excitation$	[24]
111	$O \rightarrow O(2P0)(14.1eV)$	$excitation$	[24]
112	$O \rightarrow O(3P0)(15.7eV)$	$excitation$	[24]
113	$O_2 \rightarrow O_2$	$effective$	[24]

#	Process	Type	Ref.
114	$O_2 \rightarrow O_2(v0 - v1)(0.19eV)$	$excitation$	[24]
115	$O_2 \rightarrow O_2(v0 - v2)(0.38eV)$	$excitation$	[24]
116	$O_2 \rightarrow O_2(v0 - v3)(0.6eV)$	$excitation$	[24]
117	$O_2 \rightarrow O_2(v0 - v4)(0.8eV)$	$excitation$	[24]
118	$O_2 \rightarrow O_2(a1Dg)(0.977eV)$	$excitation$	[24]
119	$O_2 \rightarrow O_2(b1Sg+)(1.627eV)$	$excitation$	[24]
120	$O_2 \rightarrow O_2(A3Su+, C3Du, c1Su-)(4.5eV)$	$excitation$	[24]
121	$O_2 \rightarrow O_2(9.97eV)$	$excitation$	[24]
122	$O_2 \rightarrow O_2(14.7eV)$	$excitation$	[24]
123	$O_3 \rightarrow O_3$	$effective$	[148]

Table S3: Overview of estimated power density from various literature sources. The plasma volume is not specifically measured in these sources and therefore, we could only make a rough estimate of the power density. Despite some outliers above 1500 W cm^{-3}, our chosen power density values (500, 1000 and 1500 W cm^{-3}) provide good coverage of this literature data.

Plasma	**Power (W)**	**Volume (cm^{-3})**	**Power density (W cm^{-3})**	**Ref.**
GAP	500	0.37	1351	[176]
GAP	224	0.383	585	[177]
GAP	225 – 475	0.13	1731 – 3653	[178]
APGD	90 – 160	0.43[a]	209 – 372	[179]
cAPGD	100	0.43[a]	233	[179]
cAPGD	80 – 125[b]	0.43[a]	186 – 291	[180]
GAP	349 – 472	0.14[a]	2415 – 3266	[181]
MW	900 – 1400	1.08 – 2.19[a]	639 – 833	[182]
MW	550 – 700	0.71[a]	772 – 982	[183]
GA	1300	0.68[a]	1916	[184]
GA	1000	0.75[a]	1326	[185]

[a] Estimated based on the reactor geometry
[b] Estimated from figures

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