

Number	Reaction	Rate coefficient ^d
Neutral chemistry		
R1	$\text{Ca} + \text{O}_3 \rightarrow \text{CaO} + \text{O}_2$	$8.2 \times 10^{-10} \exp(-192/T)^b$
R2	$\text{Ca} + \text{O}_2(a^1\Delta_g) \rightarrow \text{CaO} + \text{O}$	$2.7 \times 10^{-12} c$
R3	$\text{CaO} + \text{O} \rightarrow \text{Ca} + \text{O}_2$	$1.1e \times 10^{-9} \exp(-421/T)^d$
R4	$\text{CaO} + \text{O}_3 \rightarrow \text{CaO}_2 + \text{O}_2$	$5.7 \times 10^{-10} \exp(-267/T)^e$
R5	$\text{Ca} + \text{O}_2(+M) \rightarrow \text{CaO}_2$	$1.2 \times 10^{-30} (T/200)^{3.65} f$
R6	$\text{CaO}_2 + \text{O} \rightarrow \text{CaO} + \text{O}_2$	$4.4 \times 10^{-11} \exp(-202/T)^d$
R7	$\text{CaO}_2 + \text{O}_3 \rightarrow \text{CaO}_3 + \text{O}_2$	$1 \times 10^{-10} (T/200)^{0.5} g$
R8	$\text{CaO}_2 + \text{H} \rightarrow \text{CaOH} + \text{O}$	$1.2 \times 10^{-11} d$
R9	$\text{CaO} + \text{H}_2\text{O}(+M) \rightarrow \text{Ca}(\text{OH})_2$	$7.3 \times 10^{-25} (T/200)^{-2.12} e$
R10	$\text{CaO} + \text{O}_2(+M) \rightarrow \text{CaO}_3$	$6.4 \times 10^{-28} (T/200)^{-0.358} e$
R11	$\text{CaO} + \text{CO}_2(+M) \rightarrow \text{CaCO}_3$	$2.9 \times 10^{-27} (T/200)^{-1.07} e$
R12	$\text{CaO}_3 + \text{H}_2\text{O} \rightarrow \text{Ca}(\text{OH})_2 + \text{O}_2$	$5 \times 10^{-12} g$
R13	$\text{CaO}_3 + \text{CO}_2 \rightarrow \text{CaCO}_3 + \text{O}_2$	$5 \times 10^{-12} g$
R14	$\text{CaO}_3 + \text{O} \rightarrow \text{CaO}_2 + \text{O}_2$	$2 \times 10^{-11} g$
R15	$\text{CaO}_3 + \text{H} \rightarrow \text{CaOH} + \text{O}_2$	$1.7 \times 10^{-11} d$
R16	$\text{CaCO}_3 + \text{O} \rightarrow \text{CaO}_2 + \text{CO}_2$	$4.0 \times 10^{-12} \exp(-4689/T)^{d,h}$
R17	$\text{Ca}(\text{OH})_2 + \text{H} \rightarrow \text{CaOH} + \text{H}_2\text{O}$	$1 \times 10^{-11} d$
R18	$\text{CaOH} + \text{H} \rightarrow \text{Ca} + \text{H}_2\text{O}$	$1.0 \times 10^{-10} i$
R19	$\text{CaOH} + \text{O}_2(+M) \rightarrow \text{O}_2\text{CaOH}$	$k_0 = 8.9 \times 10^{-26} (300/T)^{4.99} i$ $k_\infty = 1.5 \times 10^{-10} (T/300)^{0.167}$ $F_c = 0.136$
R20	$\text{O}_2\text{CaOH} + \text{O} \rightarrow \text{OCaOH} + \text{O}_2$	$2 \times 10^{-10} i$
R21	$\text{OCaOH} + \text{O} \rightarrow \text{CaOH} + \text{O}_2$	$1.5 \times 10^{-10} i$
R22	Polymerization of CaOH, Ca(OH) ₂ , OCaO ₂ H, OCaOH, CaCO ₃	$9 \times 10^{-8} j$
Ion–molecule chemistry		
R23	$\text{Ca} + \text{O}_2^+ \rightarrow \text{Ca}^+ + \text{O}_2$	$1.8 \times 10^{-9} k$
R24	$\text{Ca} + \text{NO}^+ \rightarrow \text{Ca}^+ + \text{NO}$	$4.0 \times 10^{-9} k,l$
R25	$\text{Ca}^+ + \text{O}_3 \rightarrow \text{CaO}^+ + \text{O}_2$	$3.9 \times 10^{-10} m,n$
R26	$\text{CaO}^+ + \text{O} \rightarrow \text{Ca}^+ + \text{O}_2$	$4.2 \times 10^{-11} o$
R27	$\text{Ca}^+ + \text{O}_2(+M) \rightarrow \text{CaO}_2^+$	$4.2 \times 10^{-29} (T/200)^{-2.37} m$
R28	$\text{CaO}_2^+ + \text{O} \rightarrow \text{CaO}^+ + \text{O}_2$	$1.0 \times 10^{-10} o$
R29	$\text{Ca}^+ + \text{N}_2 + \text{M} \rightarrow \text{Ca} \cdot \text{N}_2^+ + \text{M}$	$2.3 \times 10^{-30} (T/200)^{-2.49} m$
R30	$\text{Ca}^+ + \text{CO}_2(+M) \rightarrow \text{Ca}^+ \cdot \text{CO}_2$	$4.3 \times 10^{-29} (T/200)^{-3.09} m$
R31	$\text{Ca}^+ + \text{H}_2\text{O}(+M) \rightarrow \text{Ca}^+ \cdot \text{H}_2\text{O}$	$1.2 \times 10^{-28} (T/200)^{-2.12} m$
R32	$\text{Ca} \cdot \text{N}_2^+ + \text{O}_2 \rightarrow \text{CaO}_2^+ + \text{N}_2$	$3 \times 10^{-10} o$
R33	$\text{Ca}^+ \cdot \text{CO}_2 + \text{O}_2 \rightarrow \text{CaO}_2^+ + \text{CO}_2$	$1.2 \times 10^{-10} o$
R34	$\text{Ca}^+ \cdot \text{CO}_2 + \text{H}_2\text{O} \rightarrow \text{Ca}^+ \cdot \text{H}_2\text{O} + \text{CO}_2$	$1.3 \times 10^{-9} o$
R35	$\text{Ca}^+ \cdot \text{H}_2\text{O} + \text{O}_2 \rightarrow \text{CaO}_2^+ + \text{H}_2\text{O}$	$4.0 \times 10^{-10} o$
R36	$\text{CaX}^+ + e^- \rightarrow \text{Ca} + \text{X} \text{ (X = O, O}_2, \text{N}_2, \text{CO}_2, \text{H}_2\text{O)}$	$3 \times 10^{-7} (T/295)^{-1/2} p$
R37	$\text{Ca}^+ + e^- \rightarrow \text{Ca} + h\nu$	$3.8 \times 10^{-12} (T/200)^{-0.9} q$
Photochemical reactions		
R38	$\text{Ca} + h\nu \rightarrow \text{Ca}^+ + e^-$	$5 \times 10^{-5} r$