

Summary: The status of our knowledge of the gas-phase tropospheric oxidation reactions is:

1. Three reactions have been identified as being potentially important.
 - a. HO radical. The rate constant appears to be well-established.
 - b. HO₂ radical. The rate constant is not well-established.
 - c. CH₃O₂ radical. The rate constant is not well established.
2. The SO₂ + O₃ + alkenes reaction may be an important dark reaction.

Table 2-4: Rate Constants for Hydroxyl, Peroxyl, and Methoxyl Radicals

Reaction	Second order rate constant, $\text{cm}^3\text{mole}^{-1}\text{s}^{-1}$	Source
$\text{HO} + \text{SO}_2 \rightarrow \text{HOSO}_2 \rightarrow \text{H}_2\text{SO}_4$	$(1.1 \pm 0.3) \times 10^{-12}$	Calvert et al. (1978)
$\text{HO}_2 + \text{SO}_2 \rightarrow \text{HO} + \text{SO}_3 \rightarrow \text{H}_2\text{SO}_4$	$>(8.7 \pm 1.3) \times 10^{-16}$	Calvert et al. (1978)
	$<1 \times 10^{-18}$	Graham et al. (1979)
	$\leq 2 \times 10^{-17}$	Burrows et al. (1979)
$\text{CH}_3\text{O}_2 + \text{SO}_2 \rightarrow \text{CH}_3\text{O} + \text{SO}_3 \rightarrow \text{H}_2\text{SO}_4$	$(5.3 \pm 2.5) \times 10^{-15}$	Calvert et al. (1978)
	5×10^{-17}	Sanders and Watson (1981)