

atmosphere or that the suspension of soot at ambient levels ($<10 \text{ ug/m}^3$) in aerosols, cloud droplets or rain is similar to the laboratory system.

2.3.4.4 S(IV) - Dissolved Oxidants - H₂O-- Hydrogen peroxide, ozone, and nitrogen dioxide may be important in the oxidation of SO₂ in aqueous aerosols and fogs. Although these compounds do not demonstrate high reactivity toward SO₂ in air, their reactivity is enhanced in the liquid phase. Again, caution is advised in accepting the results of studies of two-phase systems in which the investigators have not completely accounted for the possibility of the mass transport limitation of the oxidation rate. Therefore, only the recent results for single-phase systems are discussed here.

Martin et al. (1981) have used a stopped-flow reactor to investigate the kinetics of oxidation of aqueous SO₂ species by aqueous NO, NO₂⁻, and NO₃⁻. Over the pH range of 0.6 to 3.2, they found for NO and NO₃⁻ that the disappearance of S(IV) species is:

$$\frac{d[S(IV)]}{dt} = k [\text{NO or } \underline{\text{NO}_3^-}] [S(IV)] \quad (2-33)$$

$k \leq 0.01 \text{ mole l}^{-1}\text{sec}^{-1}$

However, for the same conditions, the reaction with NO₂⁻ is rapid and the formation of SO₄²⁻ can be expressed as:

$$-\frac{d[\text{SO}_4^{2-}]}{dt} = k_1 [\text{H}^+]^{0.5} [\text{HNO}_2 + \text{NO}_2] [\text{SO}_2 \cdot \text{H}_2\text{O} + \text{HSO}_3]$$

$k_1 = 142 \text{ (liter/mole)}^{1.5} \text{sec}^{-1} \quad (2-34)$