2. CHEMISTRY OF THE OXIDES OF SULFUR IN THE LOWER ATMOSPHERE

2.3.3 Gas-Phase Chemical Reactions of Sulfur Dioxide

The chemical transformation of sulfur dioxide in the atmosphere has been studied extensively over the past 20 years. Recent reviews, Calvert et al. (1978), Middleton et al. (1980) and Moller (1980), which consider analysis of laboratory and field data as well as theoretical studies, indicated that SO_2 oxidation may proceed through both gas and liquid phase reactions. The oxidation of SO_2 in the atmosphere is of considerable importance, in that it represents a major pathway for particle production through the formation of sulfates. The SO_2 oxidation process, though not completely understood mechanistically, has been demonstrated to proceed via four pathways: homogeneous gas phase reactions; heterogeneous gas-solid interface reactions; and catalyzed and uncatalyzed liquid phase reactions. Homogeneous gas phase reactions are by far the most extensively studied and best understood quantatively.

The homogeneous gas-phase chemistry of oxidation in the clean and polluted troposphere is reviewed in this section. The status of our knowledge is presented for the elementary oxidation reactions of SO_2 and the importance of volatile organic and nitrogen oxides as generators of free radical oxidizers. This review will show that the photochemical oxidation of SO_2 is potentially a significant pathway for tropospheric sulfate formation. The three most important