

## **HETEROGENEOUS REACTIONS ON MINERAL DUST PARTICLES: ATMOSPHERIC ACIDS**

Christian Santschi and Michel J. Rossi

LPA (Laboratoire de Pollution Atmosphérique), DGR/ENAC, EPFL (Ecole  
Polytechnique Fédérale de Lausanne), CH-1015 Lausanne Switzerland

Michel.rossi@epfl.ch

We report on laboratory experiments of heterogeneous reactions of atmospheric acids such as HNO<sub>3</sub>, HCl and CF<sub>3</sub>COOH on surrogates of suspended mineral dust particles. We have used model substrates such as polycrystalline CaCO<sub>3</sub>, Saharan and Arizona dust samples as well as Kaolinite powder. The rates of uptake, the reaction products and the reaction mechanisms have been studied in detail with special emphasis on the role of adsorbed H<sub>2</sub>O in regards to the reaction mechanism. The initial rates of uptake are large but saturate at increasing exposure to the acids. Atmospheric acids dissolve carbonate via carbonic acid into CO<sub>2</sub> and H<sub>2</sub>O, the latter of which has not been detected for reaction with HCl, presumably because of the formation of a hygroscopic product (CaCl<sub>2</sub>). The reaction mechanism involves the formation of basic adsorption (reaction) sites which are maintained through the equilibrium  $\text{CaCO}_3 + \text{H}_2\text{O} \rightleftharpoons \text{Ca}(\text{OH})_2 + \text{CO}_2$  which has been measured from rates of CO<sub>2</sub> uptake. No reaction products have been observed on Kaolinite samples under conditions where significant amounts of HNO<sub>3</sub> have been adsorbed. The uptake coefficients  $\gamma$  of the non-reactive adsorption are of the order of 0.2 and are independent of the amount of surface-bound H<sub>2</sub>O.