Geophysical Research Abstracts,
Vol. 10, EGU2008-A-04938, 2008
SRef-ID: 1607-7962/gra/EGU2008-A-04938
EGU General Assembly 2008

Influence of nitric acid and ammonia on heterogeneous uptake and oxidation of sulfur dioxide on yellow sand particles

K. Sakamoto, T. Kaneko, Y. Horita, Y. Tonegawa, H. Takada, A. Sorimachi, K. Sekiguchi, Q. Wang, H. Ishihara

Graduate School of Science and Engineering, Saitama University, Japan

(sakakazu@env.gse.saitama-u.ac.jp / phone: +81-48-858-3519)

In China, large amounts of sulfur dioxide (SO_2) from coal combustion have been emitted with the progression of industrial and economic activities. In addition, since the emissions of ammonia from anthropogenic and natural sources, and nitrogen oxides and hydrocarbons from automobile exhaust and fossil fuel combustion have been increasing, there is the possibility that O_3 and HNO_3 would be produced through photochemical reactions. Taking into account those circumstances, the evaluation of the uptake extent of acidic gases, oxidants, and ammonia to mineral dust particles may provide interesting information about the transport and fate of such gases. There are some laboratory studies about the heterogeneous reactions of air pollutants on Chinese mineral dust particles. Furthermore, these reports showed that coexistent components might importantly contribute to heterogeneous uptake and/or to oxidation of SO_2. On the other hand, there are a few reports about the possibility that yellow sand particles act as chemical reaction sites in the atmosphere, and as carriers of chemical products, on the basis of chemical analysis of the yellow sand particles during the long-range transport from the source to Japan. Therefore, there is the possibility that air pollutants were attached to yellow sand particles and/or reacted with the particles.

In order to obtain information about influence of moisture, NO_2, HNO_3, and NH_3 on heterogeneous reaction of SO_2 on soil particles collected in Lanzhou, China, laboratory experiments were performed in the use of a cylindrical flow reactor. We focused

uptake and oxidation of SO_2 in this study. The uptake of SO_2 was estimated by monitoring the concentration of SO_2 continuously. As a result, a high reactivity of SO_2 with Lanzhou soil particles was shown. However, the uptake of SO_2 was controlled in the presence of HNO_3 at $< 10\%$ RH, which suggests a rapid acidification of the particle surface by HNO_3 uptake. At 80%RH, the uptake of SO_2 increased significantly in comparison with $< 10\%$RH and had little influence of NO_2 and HNO_3. The sulfur oxidation was discussed by means of oxidation ratio of sulfur (ORS). In the case of coexisting NH_3 with SO_2, NH_3 seemed to promote SO_2 uptake and slightly restrained oxidation of S(VI) only under dry conditions.