



## Heterogeneous reactions of carbonyl sulfide on mineral oxides: mechanism and kinetics study

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The heterogeneous reactions of carbonyl sulfide (OCS) on the typical mineral oxides in the mineral dust particles were investigated using a Knudsen cell flow reactor and a diffuse reflectance UV-vis spectroscopy. The reaction pathway for OCS on mineral dust was identified based on the gaseous products and surface species. The hydrolysis of OCS and succeeding oxidation of intermediate products readily took place on  $\alpha$ -Al<sub>2</sub>O<sub>3</sub>, MgO, and CaO. Reversible and irreversible adsorption of OCS were observed on  $\alpha$ -Fe<sub>2</sub>O<sub>3</sub> and ZnO, respectively, whereas no apparent uptake of OCS by SiO<sub>2</sub> and TiO<sub>2</sub> was observed. The reactivity of OCS on these oxides depends on both the basicity of oxides and the decomposition reactivity of oxides for H<sub>2</sub>S. Based on the individual uptake coefficients and chemical composition of authentic mineral dust, the uptake coefficient ( $\gamma_{\text{BET}}$ ) of mineral dust was estimated to be in the range of  $3.84 \times 10^{-7}$ – $2.86 \times 10^{-8}$ . The global flux of OCS due to heterogeneous reactions and adsorption on mineral dust was estimated at 0.13–0.29 Tg yr<sup>-1</sup>, which is comparable to the annual flux of OCS for its reaction with ·OH.

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