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DRIFTS and Knudsen cell study of the heterogeneous reactivity of SO_2 and NO_2 on mineral dust

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Abstract. The heterogeneous oxidation of SO_2 by NO_2 on mineral dust was studied using Diffuse Reflectance Infrared Fourier Transform Spectroscopy (DRIFTS) and a Knudsen cell. This made it possible to characterise, kinetically, both the formation of sulfate and nitrate as surface products and the gas phase loss of the reactive species. The gas phase loss rate was determined to be first order in both SO_2 and NO_2. From the DRIFTS experiment the uptake coefficient, γ, for the formation of sulfate was determined to be of the order of 10^{-10} using the BET area as the reactive surface area. No significant formation of sulfate was seen in the absence of NO_2. The Knudsen cell study gave uptake coefficients of the order of 10^{-6} and 10^{-7} for SO_2 and NO_2 respectively. There was no significant difference in uptake when SO_2 or NO_2 were introduced individually compared to experiments in which SO_2 and NO_2 were present at the same time.

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