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DRIFTS and Knudsen cell study of the heterogeneous reactivity of SO₂ and NO₂ on mineral dust

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Abstract. The heterogeneous oxidation of SO₂ by NO₂ 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 SO₂ and NO₂. 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 NO₂. The Knudsen cell study gave uptake coefficients of the order of 10⁻⁶ and 10⁻⁷ for SO₂ and NO₂ respectively. There was no significant difference in uptake when SO₂ or NO₂ were introduced individually compared to experiments in which SO₂ and NO₂ were present at the same time.

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