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Atmospheric Chemistry and Physics Discussions

Interactive comment on "Heterogeneous reactions of NO_2 with $CaCO_3$-$(NH_4)_2SO_4$ mixtures at different relative humidities" *by* Fang Tan et al.

Anonymous Referee #1

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Mineral dust and sulfate are common components in atmospheric particulate maters (PMs), and their coagulation in the atmosphere can form new types of PMs whose physical and chemical characters will be altered, thus affecting on atmospheric physical and chemical processes. Because only few studies investigated the heterogeneous reactions under complex conditions, there is still large gap to explain many phenomena of field measurements by using the current knowledge of atmospheric chemistry. The new finding in this study about the heterogeneous reactions of NO2 on the surface of CaCO 3-(NH 4) 2 SO 4 mixtures provided important information, that is, the heterogeneous reactions in the atmosphere may play important role on formation of nitrate, CaSO 4 âĂć0.5H 2 O (bassanite), CaSO 4 âĂć2H 2 O (gypsum) and (NH 4) 2 Ca(SO 4) 2 âĂćH 2 O (koktaite). This reviewer recommends the manuscript be published in the journal after considering the following one specific: The formation rates of nitrate

based on the integrated absorbance of the IR peak area between 1390 and 1250 cm -1 are inconsistent with the final concentrations of nitrate measured by IC. The intensity of the IR absorbance in the DRIFTS can only reveal the surface concentration of nitrate, whereas the nitrate concentrations measured by IC are the bulk concentrations in the PMs. The surface nitrate formed through the heterogeneous reactions was suspected to easily diffuse into inner layer of the PMs under high RH conditions. The authors should present the explanations.

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