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Atmospheric Chemistry and Physics Discussions

Interactive comment on "Importance of atmospheric aging in reactivity of mineral dust aerosol: a case study of heterogeneous reaction of gaseous hydrogen peroxide on processed mineral particles" *by* Y. Zhao et al.

Anonymous Referee #2

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This paper reports an experimental study of the H2O2 heterogeneous interaction with Al2O3 surface. The uptake coefficient of H2O2 is determined as a function of relative humidity (RH) and surface concentration of nitrate or sulfite. Pretreatment of the alumina surfaces with HNO3 and SO2 is shown to affect the H2O2 uptake in a complex way: increase or decrease of the uptake coefficient depending on the surface coverage and RH. Possible mechanisms of the H2O2 interaction with HNO3 and SO2 processed Al2O3 surface are discussed.

I would limit my review to one major comment concerning the measurement of the

uptake coefficient of H2O2 which was the main objective of this experimental study. In fact, the original experimental data allowing to understand how the uptake coefficient was measured and to judge the quality of the experimental results are not presented in the manuscript. In the revised version the authors should detail the experimental approach used and particularly the following issues should be addressed:

- to indicate how the contact time between H2O2 and surface was calculated and if it was varied;

- to give an example of H2O2 consumption kinetics;

- to show original data from which uptake coefficient was determined;

- to show the experimental data on the dependence of the uptake coefficient on exposure time of the surface to H2O2 and to specify which value of the uptake coefficient was really measured: the question is if the steady state for the uptake coefficient really exists and even if so, the timescale of the surface deactivation can be different under different RH and surface coatings;

- to make and report error analysis on the measurements of the uptake coefficient.

All these points concerning the measurements of the uptake coefficient are very important, especially when considering that all the effects observed in this study are relatively weak, not well pronounced. For example, all the data obtained for HNO3 treated surfaces under different RH and with different surface coverage (Figure 3) can be described as (0.8 +/- 0.3)$\times$10-7, i.e. are similar within 35% uncertainty, which is realistic for this kind of measurements.

Considering that the observed effects are rather weak, the experiments with higher (than 15% and 6%, respectively) coverage of nitrate and sulfite would be very useful to confirm the observed trends. Additional experiments with varied concentration of H2O2 would also be desirable.

In conclusion, although the manuscript seems to provide a new and interesting infor-

mation, in my opinion, the work cannot be published in its present form and needs significant revision and, probably, additional experiments.

Interactive comment on Atmos. Chem. Phys. Discuss., 11, 28563, 2011.