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Atmospheric Chemistry and Physics Discussions

Interactive comment on "Uptake of NO_3 and N_2O_5 to Saharan dust, ambient urban aerosol and soot: a relative rate study" *by* M. J. Tang et al.

Anonymous Referee #1

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This manuscript describes a new approach to the measurement of the relative uptake coefficients of NO3 and N2O5 to aerosol particles. In this approach the losses of NO3 and N2O5 to the same aerosol sample are measured using cavity ringdown spectroscopy obviating the need to characterize the particle sizes, morphologies or surface area. Measurements of the ratio of uptake coefficients on Saharan dust are presented, and from these data the uptake coefficient of NO3 is inferred to be an order of magnitude smaller than the only other value reported. These experiments serve to illustrate the approach and how it can be used to constrain uncertainty on uptake coefficients. A large measured ratio of NO3 and N2O5 uptake coefficients from experiments on ambient urban aerosols implies that these particles contained a substantial amount of organic species or a coating of organic species. Additional experiments with soot aerosol demonstrated a range of ratios, presumably from the variation in the soot

source conditions.

Overall, this manuscript is very well written and focused on describing this new approach to measuring ratios of uptake coefficients on complex aerosol. Since it eliminates the need to determine the aerosol surface area, this approach should prove useful for the study of a wide range of aerosols, and other researchers may benefit by using this approach. The content is appropriate to Atmospheric Chemistry and Physics, the length is commensurate with the content, and the data are interpreted well and in such a way as to support the conclusions. This manuscript should be accepted for publication as is, but the following comments are provided for the authors' consideration.

1) Does the measured ratio of uptake coefficients change if one reactant is in large excess to the other? For example, inhibited uptake of one species may be observed if the other species occupies a substantial number of surface sites. Were any experiments conducted with a large [N2O5]/[NO3] ratio (or vice versa)?

2) It is mentioned that the measurements of Saathoff et al., 2001 and Karagulian and Rossi, 2007 support a large uptake coefficient for NO3 than for N2O5 on soot (section 3.3, page 11). It would be helpful if these results are quoted so as to allow comparison to the present work.

Interactive comment on Atmos. Chem. Phys. Discuss., 10, 391, 2010.