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Atmospheric Chemistry and Physics Discussions

Interactive comment on "Study of OH-initiated degradation of 2-aminoethanol" *by* M. Karl et al.

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We would like to thank referee #1 for the time spent to read our manuscript. We greatly appreciate the recommendations given in the initial evaluation and in this comment. We will take all specific comments into account in the revision of the manuscript.

SOA model

they model their SOA data using the two-product model, but they show on Figure 2 that the simpler one-product model fits the data equally well if not slightly better.

We agree to follow the recommendation on the SOA model. Currently, too little is known about individual SOA compounds to reliably base a two-product model on. The clear advantage of the one-product model is the need for fewer parameters. The one-product model also is in better agreement with the data point of experiment E5. As

suggested by this referee, the finding that the one-product is sufficient to explain the data indicates that the vapor pressures of the SOA compounds are very similar or that only a very small fraction of a less volatile product is formed. References to the two-product model in section 3.4 will be deleted and a statement will be added that its consideration gave no improvement.

In this regard, it might also be of interest to discuss the Kp value derived from the one-product model relates to the Kp values expected for the nitrate salt.

In the following we translate the vapor pressure of the SOA compound into a "pseudo" Kp and compare to the estimated Kp for MEA nitrate salt. This work uses succinic acid, a dicarboxylic acid, to represent SOA compounds from MEA oxidation. The vapor pressure of succinic acid and its temperature dependence adopted from Bilde et al. (2003) is used for MEAp1. The dissociation constant of MEA nitrate particles used in this work is 1.41x10^{-12} Pa^2 at 293.15 K, adopted from Ge et al. (2011b). The vapor pressure of succinic acid at 293.15 K is calculated to be 1.64x10^{-5} Pa using the data by Bilde et al., 2003. Based on the simple relationship Kp (in units Pa^2) = (p^0/2)^2 (Mozurkewich, 1993), the "pseudo" Kp of MEAp1 is 6.72x10^{-11} Pa^2, a factor of 50 higher than the MEA nitrate Kp. Thus in the one-product model approach, the SOA compound has a higher volatility than MEA nitrate.

We have already noted in the manuscript that the dissociation constant of MEA nitrate is a highly uncertain parameter. Salo et al. (2011) used a volatility tandem differential mobility analyzer (VTDMA) to determine the volatility properties of alkyl aminium and ethanol aminium nitrate particles. For the ethanol aminium nitrate particles the derived vapor pressure was 8.9x10^{-5} Pa (at 298 K) with an uncertainty range of (5.9-12.9)x10^{-5} Pa. Based on the measured vapor pressure by Salo et al. (2011) the value Kp = 7.37x10^{-10} Pa^2 at 293.15 K for the MEA nitrate is estimated using the relation mentioned above. The experimental value is two orders of magnitude higher than the

ACPD
11, C12281–C12283, 2011

value estimated based on thermodynamic data for vapor-solution equilibria by Ge et al. (2011b).

This discussion will be added to section 6.2.

Shorten discussion section

We will try to follow the recommendation to shorten the text of the discussion section, without loss of given information and suggestions for further reading. Section 6.3 will be deleted; the text of section 6.3 will partly be moved into the particle formation section and partly into conclusions.

It would have been good to include in Table 1 the initial reactant concentrations, though these could be inferred from the figures showing the data.

The initial reactant concentrations will be added to Table 1.

It is also planned to add PTR-TOF concentration data on 2-nitroamino ethanol in Figure 5a.

References:

Mozurkewich, M. (1993): The dissociation constant of ammonium nitrate and its dependence on temperature, relative humidity and particle size. Atmos. Environ., 27A (2), 261-270.

Salo, K., Westerlund, J., Andersson, P. U., Nielsen, C. J., D'Anna, B., Hallquist, M. (2011): Thermal characterization of alkyl aminium nitrate nanoparticles. J. Phys. Chem. A, 115 (42), 11671-11677.

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