

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

M. Karl et al.

mka@nilu.no

Received and published: 5 January 2012

We are very thankful that William R. Stockwell has provided this careful and constructive review of our manuscript and will consider his comments in the revised manuscript. We find his comments very useful pointing to the problems associated with determination of a rate constant in a relatively complex chemical system.

In the following we address the main points raised in his review:

1. Only two chamber runs

It is true that only two experiments from a series of MEA photo-oxidation experiments were targeting at the determination of the OH+MEA rate constant. This is due to the large expenses and instrumental efforts connected with such experiments as stated by the referee. The long experiment times possible in the EUPHORE chamber, its
C13907

general high purity of air and its large volume on the other hand offer the possibility to conduct experiments at environmental relevant concentrations of reactants and to provide aerosol data which is more comparable to ambient aerosol. We also think that the reproducibility of experiments in EUPHORE has been demonstrated before and that the background chemistry of the chamber has been well characterized. The good agreement of the rate constant values from the two experiments further underlines this.

Uncertainties of the rate determination and that only two runs were done will be highlighted in the conclusion section.

2. Unmeasured interference of NO₃

The point that the presence of the nitrate radical (NO₃) during the rate experiments potentially caused an unmeasured interference for the OH rate constant determination is well taken. The quantification of this effect is problematic because NO₃ was not measured and the rate constant of the NO₃+MEA reaction is not known from experiments. In our manuscript we therefore examined the maximum uncertainty that this interference may introduce into the determination of the OH+MEA rate constant. The computed value for the NO₃+MEA rate constant given in our manuscript is $1.48 \times 10^{-13} \text{ cm}^3 \text{ molecule}^{-1} \text{ s}^{-1}$, in good agreement with the SAR estimate of $1.35 \times 10^{-13} \text{ cm}^3 \text{ molecule}^{-1} \text{ s}^{-1}$ by Carter (2008). Based on our model calculations the interference of the NO₃ reaction is predicted to be less than 4%, as stated in the manuscript.

3. Wall effects

The loss of MEA by the replenishment flow in the chamber is well constrained by SF₆ measurements and the loss to particles is well constrained by the AMS measurements. This leaves the wall loss of MEA as the main uncertainty in the rate determination experiments. The rate of wall loss is much faster than the rates of the other losses, and it is the least well characterized loss term. Therefore we estimated the maximum uncertainty that the wall effects can have on the resulting OH rate constant.

4. Error analysis

Bootstrap error analysis of the LSQ model will be included in the revised manuscript.

5. More experiments needed

We agree that there is a need for more accurate measurement of the OH+MEA rate constant. The adsorption of MEA to reactor surfaces will however always be a problem, and ways have to be found to derive more accurate rate constant values, either by increasing the volume, by preventing adsorption or by better characterizing the wall loss. In this respect, the use of large atmospheric chambers such as EUPHORE is advantageous because of its surface/volume ratio close to one. Certainly, flow tube studies on the OH+MEA reaction system would be highly desirable.

Interactive comment on Atmos. Chem. Phys. Discuss., 11, 27763, 2011.