

Interactive comment on “Amine reactivity with charged sulfuric acid clusters” by B. R. Bzdek et al.

Anonymous Referee #2

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Comments

Some of the introduction has to do with nucleation in the troposphere which is mostly through non-ion processes (some might call them neutral) which seems to be addressed by this research only indirectly: if not addressable directly, these parts can be pared down significantly. In place, please add some experimental details.

The terminology of neutralized and un-neutralized to describe the ratio of base to acid is a little confusing when trying to understand ions of different polarities and also in trying to make some statements about non-ion clusters (neutral.)

Please expand on the following experimental topics to help the reader. At least summarize briefly if explained in detail elsewhere.

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-How accurately is the concentration of amine/ammonia known? How was it determined? Uncertainties are 1 sigma? Precision? Accuracy?

-The conditions inside the ICFTTR are not representative of the atmosphere.

i) What about high pressure limits? The addition steps are likely to be influenced by a bath gas.

ii) In the atmosphere, many ions will be heavily hydrated. It is likely that rates will be affected but also perhaps thermodynamics. Please address this here.

Discussion. The laboratory work on sulfuric clusters of Curtius, Lovejoy and Froyd and its application to atmospheric clusters (Eisele et al. JGR 2006) should be compared to these results. Their results can help guide the discussion in this paper. The paper would be improved by having a more focused and quantitative statements about how the results apply to the atmosphere. With detection of ambient ions, can you make any quantitative statements? Are your results consistent with observations? Are there perhaps direct (but maybe qualitative) cautions this work implies for these type of measurements?

Then, separate from this, how they might apply to measurements of neutral clusters (as in Zhao et al.) in the atmosphere. For example, you might want to give an example of a neutral cluster of 4 H₂SO₄ and 4 NH₃ (the waters of hydration can be stated to be assumed to act as bystanders.) Once ionized, what happens to it? How would this vary with ion exposure time to amines? Some of the laboratory cluster work of Eisele and Hanson circa 2001 has some information about species loss upon ionization. How much better (or worse) would the amines remain on the ion? Would positive work better than negative, to retain the base content?

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