

Interactive comment on “Kinetics and mechanism of the uptake of N₂O₅ on mineral dust at 298 K” by S. Seisel et al.

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I would like to follow up on the referee, editor and author comments to the publication entitled “Kinetics and mechanism of the uptake of N₂O₅ on mineral dust at 298K” by Seisel et al.. The points I would like to make are as follows;

1. With respect to the article on N₂O₅ uptake on mineral dust, I think this is a very important reaction to study as it is a removal process for NO and NO₂ and welcome the publication by Seisel et al. as it represents the first such investigation. We have discussed the importance of doing laboratory studies on this reaction in a recent book chapter (Johnson and Grassian, 2005b). We are working on this reaction in my laboratory (using different methods than the one used in the Seisel et al. work so our data

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should complement the current study) and will report the results shortly (Mogili et al, 2005). I think in a revised version Seisel et al. should clarify what they mean by sample holder geometric area, particle geometric area and particle BET area as I found the discussion a little unclear in the comment posted on 12.09.2005 (SC S2567).

2. I am not anonymous Referee #2 and would like Markus Ammann, the editor handling this article, to confirm this. I do think Referee #2 did a good job pointing out some issues that I think are important. I also think Referee #1 made some useful points as well in their original review.

3. I don't know why our work is the centerpiece of some of the discussion given it was hardly, if at all, referenced in the original paper. Although Referee #2 does appropriately provide references, Referee #1 does not. In my opinion, references should be given when discussing the work of others otherwise the comments are difficult to assess.

4. In my group, we have been working toward gaining a better understanding of the interaction between atmospheric gases and mineral dust. We have designed a variety of different experiments in order to understand the molecular level details of these important reactions. The Knudsen cell technique is one method we have used. Very early on, we decided to investigate the use of geometric area in determining uptake coefficients and published a paper on this topic (Underwood et al, 2000). We followed up on the Underwood et al. article to address some of the complications of using the Knudsen cell technique and the interpretation of the data (see Li et al., 2002)

More recently (Johnson et al, 2005a), we followed the lead taken by Barbara Finlayson-Pitts and co-workers using isolated, single particles in our Knudsen cell laboratory studies (Hoffman et al, 2003 and 2004). This eliminates any diffusion issues in the underlying particle layers.

Although the method proposed by Hoffman et al. has some of its own complications in calculating uptake coefficients it provides an important change in methodology in doing laboratory studies on the heterogeneous chemistry of atmospheric particles. We

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also made some recommendations in Johnson et al. (2005a), the recommendations were for nitric acid uptake specifically but more generally I will conclude with the following recommendations for laboratory studies of heterogeneous reactions on mineral dust: -Measure reaction kinetics on the components of mineral dust aerosol as a f(RH); -Measure reaction kinetics on the components of mineral dust aerosol in complex mixtures of gases that better represent the gas-phase chemical composition of the atmosphere; -Measure reaction kinetics of complex mixtures of authentic mineral dust aerosol using single particle techniques.

In addition, I would recommend that single or isolated particle studies be done when measuring rates of reaction to eliminate complications due to diffusion in underlying layers. The measurements become much more difficult due to lower signals and thus represents a challenge to overcome. The question then becomes what is the surface area of an individual particle. I think that this will be an interesting debate and for small particles this becomes the geometric area of the particle. As Editor Markus Ammann says in his comments “the dispute about surface area in gas-particle interaction studies is an old, important, intense and unresolved one.”

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