

## ***Interactive comment on “Organic aerosol formation from the reactive uptake of isoprene epoxydiols (IEPOX) onto non-acidified inorganic seeds” by T. B. Nguyen et al.***

**Anonymous Referee #1**

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### General comments

This manuscript describes environmental chamber experiments aimed at investigating the potential reactive uptake of isoprene-derived epoxides (IEPOX) onto a number of non-acidic aerosol seed particles under conditions of varying pH and relative humidity (RH). The main finding of the work is that IEPOX undergoes reactive uptake onto wet aerosol seeds comprised on ammonium salts, while no reactive uptake is observed when the aerosol seeds are dry or when non-ammonium salts (such as sodium) are present. These results are important in that they suggest an atmospheric mechanism by which IEPOX may undergo reactive uptake in a manner which is only weakly

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correlated to particle pH, a somewhat baffling conclusion reached from previous field studies. The ammonium-catalyzed mechanism proposed here is also novel for epoxide chemistry, and the work also raises the intriguing possibility of amine reactivity with IEPOX. The findings are relevant to the construction of accurate chemical mechanisms for the formation of isoprene-derived SOA. The work has been carefully planned and executed, and the manuscript is clearly written. For these reasons, this study is quite appropriate for Atmospheric Chemistry and Physics.

### Specific comments

p. 27684, line 24: Are the experimentally determined MS response factors (1.8) identical to the calculated dipole-polarizability MS response factors (1.4) to within the uncertainty of the measurement?

Figure 2: Why is the OA/IEPOX coefficient plotted on a log scale vs. LWC? Equation 1 suggests that there should be an inverse relationship.

p. 27691, line 12: I assume that the pH for the hydrated AS is somewhat acidic due to the bisulfate/sulfate acid dissociation process. This should be explicitly stated.

p. 27693, line 2: The actual  $k_{H^+}$  value ( $0.036 \text{ M}^{-1} \text{ s}^{-1}$ ) for IEPOX-4 has been experimentally determined by Cole-Filipiak et al. (ES&T, 44, 6718-6723, 2010).

p. 27693, line 5: Since this work identifies  $\text{NH}_4^+$  as the catalyst for IEPOX uptake, I wonder why the authors did not carry out experiments at different  $\text{NH}_4^+$  concentrations in order to ascertain whether the kinetics of the IEPOX uptake was catalyst-limited or nucleophile-limited. The subsequent discussion of differences in reactivity observed for different nucleophiles implies the latter, but this issue is not specifically discussed.

p. 27694, line 14: It is interesting that the results seem to show that  $\text{Cl}^-$  is a relatively poor nucleophile under the experimental conditions. While it is certainly possible that  $\text{SO}_4^{2-}$  is a better nucleophile than  $\text{Cl}^-$  under these conditions,  $\text{Cl}^-$  is well known to be a better nucleophile than  $\text{H}_2\text{O}$ . Since it is reported that no organochloride products were

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detected, it makes me wonder how much tetrol was produced under these conditions. I realize that the authors did not detect and quantify tetrol products in this study, but it might be useful to add a brief discussion of this issue.

p. 27695, line 16: With the Henry's Law coefficient in hand, it would be useful to provide a quick estimate of the extent of IEPOX physical partitioning under typical atmospheric conditions. Is it important at all?

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Interactive comment on Atmos. Chem. Phys. Discuss., 13, 27677, 2013.

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