

Interactive comment on “Role of glyoxal in SOA formation from aromatic hydrocarbons: gas-phase reaction trumps reactive uptake” by S. Nakao et al.

Anonymous Referee #1

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This is a very interesting paper, which shows that uptake of glyoxal on deliquesced ammonium sulfate aerosols is inhibited by the presence of a coating from secondary organic aerosol material formed by photooxidation of aromatic precursors. Growth of organic aerosol material by uptake of glyoxal has been a hotly debated topic of research for several years. The experiments described in this paper show that aerosol produced by photooxidation of toluene is not efficient in taking up glyoxal.

I have no major objections to the design of the experiments. However, some of the questions raised in this paper would certainly benefit from further discussion. In my opinion, the discussion section is disproportionately short. Here are some ideas for further discussion:

1. What evidence do the authors have that the aerosols produced by photooxidation of
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aromatics in the presence of deliquesced inorganic seed have core-shell morphology? It is not at all obvious to me that it should be the case.

2. What is the relative amount of seed material vs organics condensed on it? If uptake of glyoxal was still going on at the same level as with pure ammonium sulfate, would the authors even notice it? An estimate would help.

3. The authors mentioned that glyoxal oligomers did not evaporate in the thermode-nuder because of their low vapor pressure. Perhaps they similarly do not evaporate fully in the AMS ionizer? If this is the case, the evidence based on the conserved C₄H₉⁺ fraction becomes questionable.

4. The organic material produced by oxidation of aromatics generally has low water solubility. Aerosols made by oxidation of biogenic precursors, such as isoprene and alpha-pinene are generally more water soluble. Would the authors expect the same results for aerosols made for these biogenic precursors? I would avoid generalizing their conclusions to all types of SOA.

Specific minor comments:

Page 30601, line 16: acquired -> attracted

Page 30602, line 10: insert a comma before Calvert

Page 30602, line 19: the extent of the contribution . . . is poorly understood

Page 30602, line 25: radical or non-radical reactions -> free-radical initiated and various condensation reactions

Page 30603, line 10: use SI units

Page 30603, line 11: 272 115 is not the best way to start a sentence, and also can be confused for 271,115

Page 30607, line 3: available -> possible

Page 30609, line 2: added to match OH levels in previous experiment – it is not clear from the text how OH was measured or estimated

Table 1: The notation involving EPA may be confusing, people may think these are abbreviations of some EPA standard operating procedures.

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