

## ***Interactive comment on “Size dependent chemical ageing of oleic acid aerosol under dry and humidified conditions” by S. Al-Kindi et al.***

### **Anonymous Referee #2**

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Review of Al-Kindi et al., ACPD, 2016

The authors have measured size dependent chemical aging of oleic acid particles under dry and humid conditions. Chemical composition was measured using an ATOFMS instrument, showing that smaller particles contain smaller products such as nonanal and oxononanoic acid, while larger particles contain more high molar mass products. Size distribution was also monitored by SMPS, demonstrating evaporation of nonanal and shrink of oxidized particles. Oleic acid – ozone system has been extensively studied both by experiments and modeling over a decade. The authors did good job in overviewing the past findings in introduction. The experiments seem to be planned carefully and conducted very well. The manuscript is written clearly and it was easy to follow. I am happy to recommend publication of this study in ACP after the below several minor comments are addressed and implemented in the revised manuscript.

## Specific comments/questions:

- The actual ozone concentration and reaction time are both not clearly stated. These are critical information to be specified. Ozone concentration seems to be very high (20 ppm at the O<sub>3</sub> generator exit) with very short reaction time. This might lead to potential artifacts in ozone uptake and chemical transformation pathways of oleic acid (e.g., Renbaum and Smith, ACP, 11, 6881-6893, 2011). This issue needs to be discussed.
- Was the size distribution under humid condition (presented in Fig. 2b) measured under dry conditions or same humidity as reaction conditions (65% RH) in SMPS? In other words, I am asking whether the sheath flow of SMPS was kept always dry or humidified depending on reaction conditions.
- It seems that exposure (time \* O<sub>3</sub> concentration) was not large enough to react away all of oleic acid molecules (13-31% of OL remained unreacted in Fig. 7&8). Have you tried to increase exposure? Would particles evaporate even more in that case? Is it possible for authors to present the evolution of particle size (or mass) as a function of reaction time or particle size dependence on O<sub>3</sub> concentration?
- P18, L20: Do authors have any evidence to believe it is the primary ozonide, but not secondary ozonide? Is POZ stable enough to be detected by ATOFMS?
- P23, L10: There seems to be misunderstanding of explanation of Shiraiwa et al. (2010). They did not show large concentration gradient of OL in the bulk, but actually they showed OL is homogeneous in the bulk due to rapid bulk diffusion. Ozone can be constrained in the near-surface bulk due to reactions with oleic acid.
- P15, L17: Can you quantify OL dimer? Did it disappear after exposure to ozone? Could it potentially affect reaction kinetics/pathways (e.g., Fig. 9, Zahardis & Petrucci, 2007)?

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