

This study simulates 1) the chamber wall induced deposition of organic vapors generated from the photooxidation of a spectrum of long-chain alkanes and alkenes and 2) the impact of vapor-wall interactions on the SOA formation. The mechanism used in the simulation includes a complicated scheme of gas-phase photochemistry, as well as a heterogeneous chemistry pathway that has been recently found to play a very important role in the alkane SOA formation. The predicted alkane/alkene SOA yields well captured the chamber measurements, indicating a very decent representation of chemical reactions characterizing alkane/alkene SOA in the model. This study adds further insights into a few recent experimental studies highlighting the impact of vapor wall losses on the SOA yield. In addition, the authors reported, for the first time, that the vapor wall deposition influence the chemical composition of SOA. In view of this, I would highly recommend publication on ACP with some minor issues that require clarification.

General:

1. The representation of gas-wall partitioning is a bit confusing. If I understand correctly, the parameters on the right hand side of Equation (1) are all constants, which is reasonable since this equation gives the relationship between the deposition rate on the wall ($k_{gw, eq}$) and evaporation rate from the wall ($k_{wg, eq}$) at equilibrium. Then, the question is how to represent k_{gw} and k_{wg} at different time steps? Here, k_{gw} largely depends on the gas phase diffusion and wall accommodation, and generally follows a first-order decay trend. On the other hand, k_{wg} depends on the amount of total absorbing organic mass in the chamber wall. For example, an organic vapor 'A' is injected into the chamber. At $t = 0$, all of the vapor 'A' is present in the gas phase and there is zero amount of 'A' on the chamber wall and thus $k_{wg,A}(t = 0)$ should be zero. As more and more vapor 'A' accumulates on the chamber wall due to deposition, the evaporation rate of 'A' continues increasing, and eventually, the deposition and evaporation rates of 'A' reach equilibrium. My point is the Teflon film can be treated as a giant absorbing organic mass, with its amount characterized by C_w , which is a constant. But for individual species, their deposition/evaporation rates depend not only on C_w , but

also on the amount of their own masses on the wall. The authors need to clarify this.

2. Could the authors consider adding more discussions regarding the impact of gas-wall partitioning on SOA composition? Particularly, 1) Are the wall loss rates the same for all the products generated from one hydrocarbon? Or different wall loss rates are applied to individual compounds based on their chemical properties, such as vapor pressure? 2) Why the first generation products exhibit the most significant gas-wall partitioning, see the dodecane case in Figure 8? Shouldn't be the case that the lower the volatility of compounds, the more deposition occurring on the wall? Is there any other process that could affect the gas-wall-particle distribution of oxidative products, e.g., the chemical reaction timescale vs. the total simulated SOA growth duration?

Minor:

3. Page 23895, Line 19: The '0.35 yield unit' is a bit confusing, since the SOA mass yield ($\Delta M/\Delta HC$) is actually unitless. Would it be better to give a relative increase, e.g., one order of magnitude, in the SOA yield upon vapor wall loss correction?
4. Page 23896, Line 22: The authors may want to also consider citing Zhang et al. (2014, PNAS) since this paper systematically evaluated the impact of vapor wall losses on SOA yields generated from a series of biogenic and anthropogenic precursors.
5. Page 23896, Line 23: The authors need to clarify in what way the loss of organic vapors on chamber walls is not well characterized, like the deposition rates of structurally different species? Or the impact on the SOA yield and composition?
6. Page 23897, Line 5: The expression of either k_{gw} or k_{wg} should be given.
7. Page 23897, Line 16: Are the authors comfortable with this assumption? The gas-phase diffusion onto particles should be really fast if one plugs numbers into Equation (2). Could the authors give some comments on different diffusion

- processes, i.e., gas phase diffusion, gas-particle interface transfer, and particle phase diffusion, that ultimately control particle growth?
8. Page 23905, Line 16: Add (ΔM) after 'the ratio of SOA mass produced'. Also, specify the reaction time at which the SOA yields are measured.
 9. Page 23906, Line 25: What is the timescale with respect to gas-particle partitioning in the simulations?
 10. Page 23907, Line 9: Could the authors explain why the discrepancies between simulated vs. observed SOA yields rise with the size of precursors for the terminal alkene cases?
 11. Page 23910, Line 6: It is interesting to see that the volatility domain where significant partitioning to walls belong to the semi-volatile regime. Is it because the precursor concentrations are at ppm level?
 12. Page 23919, Table 1: Are the initial CH₃ONO concentrations actual measurements? If not, how did the author estimate their values? As shown in Figure 6, the simulated delHC masses are in general lower than the measurements. Is this due to the underestimation of initial CH₃ONO mixing ratio?
 13. Page 23922, Figure 2: Label the three panels with gas-particle/wall timescales, i.e., 6 min, 1h, and equilibrium.
 14. Page 23924, Figure 4: Why the number of products from 2-methyl-1-alkanes photochemistry does not follow a nice trend like those generated from other alkane and alkene precursors?