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Atmospheric Chemistry and Physics Discussions

Interactive comment on "Secondary organic aerosol formation from photooxidation of naphthalene and alkylnaphthalenes: implications for oxidation of intermediate volatility organic compounds (IVOCs)" *by* A. W. H. Chan et al.

Anonymous Referee #1

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This is an interesting paper describing the results of laboratory studies on secondary organic aerosol (SOA) formation from polycyclic aromatic hydrocarbons (PAHs). The paper is interesting and deserves to be published after taking the following comments into account:

A. I fear that the SOA production estimates in section 5 are biased towards the importance of PAHs. The light aromatics react slower with OH than the PAHs and therefore, the relative importance of PAHs is higher after a shorter reaction time. After 12 hours, the longest reaction time considered in tables 4 and 5, the removal of light aromatics is

not complete, so I would at least add a column with a significantly longer reaction time to show what happens when the chemistry is complete.

B. The problem is more complicated than that, because after a certain reaction time, the NOx levels can no longer be assumed to be high and the SOA yields are higher than near the sources. A paper from the same group (Henze, ACP 2008) studied the relative importance of low-NOx versus high-NOx pathways for light aromatics and found that the majority of the SOA from these compounds was formed through the low-NOx pathway. Again, this indicates that the production estimates in tables 4 and 5 may be biased towards PAHs. I do not suggest that the authors do a full model calculation of PAH oxidation in the atmosphere, but to bracket the actual atmospheric importance, it would be very good if the calculations in tables 4 and 5 would be rerun with the low-NOx yields.

C. In many studies the amount of SOA formed in an air mass is related to that of an inert tracer such as CO or acetylene. The emissions from Schauer, which the authors use as input for their calculations, do not give CO but they do give acetylene. It would be of interest to relate the amount of SOA formed from PAHs to the amount of acetylene emitted and compare that ratio to the results of field studies. For example, deGouw (JGR 2005) gives values for SOA versus acetylene in urban air. The comparison needs to be done carefully, as the field data only give information on average SOA formation in an urban plume (Diesel and gasoline vehicles), whereas the current study gives information on these separate sources.

Minor comments:

Line 3-7: I would not say that semi-volatiles were previously assumed to be inert. It was not until the work of Robinson (Science 2007) that their emissions were positively identified.

Line 21: Do we really know that PAHs account for a large fraction of semi-volatile emissions?

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Interactive comment on Atmos. Chem. Phys. Discuss., 9, 1873, 2009.

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Interactive Comment