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Atmospheric Chemistry and Physics Discussions

Interactive comment on "Secondary organic aerosol production from modern diesel engine emissions" *by* S. Samy and B. Zielinska

Anonymous Referee #1

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General Comments

This manuscript presents the results of studies of secondary organic aerosol formation from reactions of diesel exhaust (DE) under a variety of conditions. DE is reacted with OH radicals directly and in the presence of added formaldehyde, added toluene, and an added VOC mixture. Reactions are also carried out in the dark with NO3 radicals formed from N2O5. A suite of about 50 gas and particle phase products are analyzed by GCMS with derivatization and aerosol mass is measured with an SMPS. The study is carried out in the Euphore chamber in light and in dark. The focus of the paper is to investigate SOA formation in atmospherically realistic complex DE mixtures as a contrast to the usual studies of single compounds.

Specific Comments

The work is technically sound and the quality of the experiments and measurements is high. There is some nice data here that should be published, and some interesting results are presented. Unfortunately, I find the manuscript very difficult to read. In particular, I do not come away feeling I have learned anything definite, other than that reactions of complex mixtures are complicated. The manuscript seems to be more of a report of observations, with none being emphasized more than the others, so there is little sense of what is important here. The major section headings: SOA production; POC concentrations; Toluene addition experiments, seem to reflect this. I wish I could offer some concrete suggestions about how to re-organize the manuscript, but I will leave that to the authors. I think there must be a few major points the authors want to make, and then these should be supported with the appropriate data. I would also suggest that some thought be given as to how to avoid so many references to experiment labels (e.g., D-1, L-2a, L-3b, . . .) throughout the text. I read this 4 times and I still need to keep looking back to the tables.

1. Since there is also EC in the system, do you have any idea how much SOA might be formed by adsorption onto EC instead of condensation?

2. The experiments are all carried out at RH < 1%. What might be the effect of higher RH on the results?

Technical Corrections

1. Figure 1. I believe the units are probably meant to be micrograms/m3.

2. I don't see that Figure 5 has much value. I suggest deleting it.

3. Table 3: I suggest adding (N2O5) below D-2 (VOC). This table seems a little misleading to me. I read this assuming that it gives the amounts of these compounds in the particle and gas phase. But no data are given for the non-aromatic acids in the gas phase. Why? I interpret this to mean that their amounts are zero. But this is clearly not the case because of the results shown in Figure 3. I suggest including all analyses.

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4. Table 4. I suggest adding a footnote stating what reactant the yields are measured relative to.

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