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Atmospheric Chemistry and Physics Discussions

Interactive comment on "Redox activity of naphthalene secondary organic aerosol" *by* R. D. McWhinney et al.

Anonymous Referee #1

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General comments

This work examines whether redox behaviors of naphthalene SOA and oxidized particles from two-stroke engines can be predicted based on particulate mass loadings of known quinone compounds (i.e., 1, 2-naphthoquinone, 1, 4-naphthoquinone, 5-hydroxy-1,4-naphthoquinone, and 9,10-phenanthrenequinone). One major finding is that these few quinones significantly fall short of accounting for the observed redox cyling activity for both types of samples. The approach of using molecular-level information on the activities and loadings of known quinones to predict redox activity of complex SOA and oxidized engine emission particles is a useful first step in identify major missing redox-active compounds. This work contributes to our understanding of health effects of particulate matter. My major concern is the analytical reliability of the

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quinone concentrations in the phosphate extracts of the NAP-SOA and the oxidized engine emission particles (see specific comments).

Specific comments

1. The authors reported a large discrepancy in recovery of the quinone analytes using a SPE technique to for naphthalene SOA samples and oxidized two-stroke engine particle samples. In this SPE technique, phosphate buffer extracts of the samples passed through a C18-based SPE cartridge, followed by elution of the analytes using acetonitrile. For the engine particle samples, the recoveries are satisfactory for 1, 4-naphthoquinone (92+/-10%) and 9,10-phenanthrenequinone (87+/-22%), but very low for 1, 2-naphthoquinone (21+/-15%). For the nap-SOA samples, the recovery of the same analytical procedure was very low for both 1,2- and 1,4- naphthoquinone (1-3%). Such a discrepancy is difficult to comprehend and is worrisome. Was this a concentration effect (as it appears that the quinones are present in higher amounts in the NAP-SOA samples than the engine emission particles, in the text lines 25-26 on page 9117 and lines 1-2 on page 9118)? The authors ought to conduct more experiments to characterize the analytical method. Otherwise it is unconvincing how the predicted redox activities for the NAP-SOA samples could be compared with the redox activities for the engine particle samples, if the concentrations of quiones are based on different analytical approaches.

2. The authors should provide more analytical details, such as the method detection limits for the filter samples, the analytical procedure and performance (e.g., recovery) for determining the quinone compounds in the XAD cartridge samples.

3. The authors assume that the redox activities are additive for mixtures of multiple redox active compounds in predicting redox activity of complex SOA and oxidized engine emission particles. It will be good if the authors can have actual data to support such an assumption, such as comparing the redox activities of NAP-SOA vs. NAP-SOA+ known amounts of quionones.

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4. Section 3.5: it will be good to have a table to list the DTT and quinone analysis results for the oxidized engine particle samples (similar to Table 3 for the NAP-SOA samples).

Interactive comment on Atmos. Chem. Phys. Discuss., 13, 9107, 2013.