

This manuscript by Li et al. describes observations of structural impact on SOA formation from C8-C9 aromatic hydrocarbons in chamber studies. This work provides comprehensive dataset of SOA formation, including SOA yield data, elemental chemical composition data from AMS, and SOA density and volatility data. Although SOA formation from aromatic hydrocarbons has been studied for over 20 years (as the authors cited), the insights from the analyses using new techniques and new knowledge are beyond the level that scientists had discovered 20 years ago. Thus I think this manuscript is appropriate to be published in ACP. In the revised manuscript, the authors have addressed most of the comments from previous reviewers, but some small issues still need to be addressed, mostly related to the SOA yield part:

1. It might be misleading to use the term “low NO<sub>x</sub>” to describe the experimental conditions. 20-140 ppb of NO is relatively “low NO<sub>x</sub>” in chamber studies, but not the same case for ambient conditions. This point was also raised by Reviewer #2. I think what really matters is not the NO<sub>x</sub> level, but the relative branching ratios of different RO<sub>2</sub> reaction pathways (RO<sub>2</sub> + NO vs. RO<sub>2</sub> + HO<sub>2</sub> vs. RO<sub>2</sub> + RO<sub>2</sub>), which can be simulated/estimated using SAPRC. For example, in experiment 1226B and 1421A, with very distinct NO levels, if the authors provide a simulation result (in main paper or supplemental information) to show that under such a range of NO levels, RO<sub>2</sub> + HO<sub>2</sub> is always the dominant pathway (e.g., >70% in these experiments), then I think the argument about the NO<sub>x</sub> level is clarified.

2. It is also useful to provide AMS mass spectra comparison of SOA from the same aromatic hydrocarbon under different HC:NO<sub>x</sub> conditions. How much change occurred to SOA chemical composition when initial HC:NO<sub>x</sub> condition changed? Without clarification of these changes, it is difficult to argue that the SOA yield difference is mainly due to different molecular structure, not different products under various experimental conditions.

3. The authors claimed that ortho position substituted aromatic hydrocarbons have highest SOA yield, based on observations. I think the authors should add some more discussion and provide some mechanistic insights to explain these observations, combining with the AMS chemical composition data. The discussion in Section 5, from line 14 is helpful to understand the observation, but need to re-organize and extend to a separate section with chemical structure schemes, if possible. For example, are ortho position substituted aromatic hydrocarbon products less likely to fragment due to the structure?