This study investigates the effect of aromatic content on the secondary aerosol production from photochemical processing of gasoline vehicle exhaust. The authors observed a large increase in the SOA production when fuel with higher aromatic content is used. In view of this, the authors suggest that regulations on the gasoline aromatic content would introduce 'unexpected benefit on air quality in urban area'. As such suggestions might help to develop and implement future regulatory plans, it is necessary to take both environmental consequences and economic factors into account. That is, for the different types of fuels used, are they producing the same amount of energy or driving distance? The authors are suggested to normalize the reported SOA yields values by the total driving mileage during one test cycle, to be more illustrative to evaluate the influence of aromatic content in the fuel on the PM emissions.

The SOA formation potential and OH reactivity of aromatic compounds are among the highest achieved in chamber experiments simulating SOA production from a variety of anthropogenic and biogenic precursors. The authors may refer to any global SOA production models, like CMAQ, for the SOA yields used from a selection of VOCs in the model mechanism. It is not surprising that increasing the aromatic content leads to enhanced SOA production from gasoline exhaust. My concern is that the authors did not provide sufficient evidence to support the causal relationship between the observed increase in SOA yield and the increasing amount of aromatic content. As shown in Table S3 in the supplementary materials, less than 50% fraction of the gasoline has been identified, including mostly olefin and aromatics. What if the unidentified carbon mass really contributes to the SOA production, and variations in the recipe of these unknown species in different types of fuel are the main drivers to the observed changes in SOA production? These unresolved carbons might include long-chain alkanes and alkenes that have been demonstrated to constitute a large fraction of gasoline emissions (Gentner et al. PNAS, 2012). The authors need to ensure that for the three types of fuels tused, the aromatic content is the only variable and the rest of the carbon mass stays constant. This is the prerequisite for the further examination on the contribution of aromatics in gasoline fuels to SOA production.

Minor comments

Page 2, Line 49: The vapor pressure of benzoic acid falls into the semi-volatility range. The authors may refer to Schwantes et al. ACP (2017) for an example.

Page 2, Line 51: Please change 'exhibited' to 'shown'.

Page 3, Line 64-70: Please change 'underwent' to 'subject to'. Change to 'condition' to 'conditions'. Change 'under strong oxidizability conditions' to 'with high OH exposure'. The oxidation capacity in this study equals to one or two days of ambient OH exposure and does not necessary represent the high OH exposure cases that were reported in literatures (e.g., Lambe et al., ACP, 2015).

Page 3, Line 75: Change 'emission' to 'emissions'.

Page 4, Line 116: Delete 'were conducted'.

Page 5, line 129: Delete 'of' in front of 'relative humidity'.

Page 5, Line 140: Delete 'continually tracked'.

Page 6, Line 164: the OH concentration unite should be 'molec cm^{-3}' or 'molecule cm^{-3}'.

Page 8, Line 226: 'Administration.'? References need to be cited here.

Page 8, Line 213: Change 'reproducible' to 'reproducibility'.

Page 9, Line 247: Please provide evidence for the conclusion that 'SOA formation from C10-aromatics, alkenes and alkanes is found to be negligible'. In contrast, there have been a number of studies showing significant SOA production from photooxidation of alkanes and alkenes (e.g., Loza et al., ACP, 2014; Matsunaga and Ziemann, 2010).

Page 10, Line 271: Change 'with not' to 'without'.

Page 10, Line 278: Change 'continuous' to 'continuously'.

Page 17, Figure 1: The unite for OH exposure should be 'molec cm^{-3} hr'.

Page 18, Figure 2: SOA production from F1 is missing in subfigure (b).

Page 19: Figure 4: Please provide the data source for the emission factors for total hydrocarbon and total other NMHCs. Are they direct measurements from experiments? If so, instruments and methods for these measurements need to be given. It is difficult to differentiate these different hues of green color. Suggest to revise this figure for better visualization.