Response to short comment (SC) from Yongchun Liu

This paper investigates the generation of OH radicals when extracting SOA into water with the presence or absence of Fe^{2+} ions. This research is interesting.

Response:

We thank Yongchun Liu for the short comment and the positive evaluation of our work. Our detailed response to each comment will be shown in below.

P30025, l 14-17: The maximum values of OH formation efficiency appeared with similar ratios of $FeSO_4$ to SOA for β-pinene SOA and α-pinene SOA. Is there any explanation for this phenomenon since organic peroxides in the two types of SOA are different? What is the reason that OH formation efficiency decreased with high ratio of $FeSO_4$/SOA in the other two types of SOA? While the OH formation efficiency increased continuously in limonene SOA with increasing ratio of $FeSO_4$/SOA.

Response: Previous studies have shown that α–pinene and β–pinene SOA contain a high abundance of organic peroxides (Docherty et al., 2005; Badali et al., 2015). As shown and explained in the kinetic modelling (Sect. 2.4 and shaded area in Fig. 4), the decrease of OH radical production with increasing Fe^{2+} concentration is supposedly induced by reaction of the BMPO-OH adduct with Fe^{2+} (Yamazaki and Piette, 1990). Destruction of BMPO-OH can be viewed as iron-catalysed reactions, as Fe^{2+} is constantly recovered in the presence of peroxides. Hence, at high [Fe^{2+}]/[SOA], destruction dominates over production. Such behaviour is more prominent for α–pinene and β–pinene SOA, due to higher concentrations of organic hydroperoxides. For limonene SOA, the OH production increased rather gradually with lower abundance of organic hydroperoxides, leading in return to a less prominent destruction of the BMPO-OH adducts by Fe^{2+}. We will clarify this point in the revised manuscript and supplement.

P30025, l 26-30: What is the change trend of ([BMPO-OR]+[BMPO-OH]) and ([BMPOOR]/[BMPO-OH]) as a function of the ratio of $FeSO_4$/SOA. Does the pH of the solution affect ([BMPO-OR]/[BMPO-OH])?

Response: The trend of [BMPO-OR]+[BMPO-OH] was similar to that of [BMPO-OH] as shown in Fig. 4. This is because [BMPO-OR] is much smaller than [BMPO-OH], even though [BMPO-OR] increased upon increase of $FeSO_4$/SOA. We did not observe a clear trend in [BMPO-OR]/[BMPO-OH] and did not observe significant effects of pH on the ratio

between organic and OH radicals. As quantification of organic radicals is not the focus and beyond the scope of this study, we intend to investigate these aspects in detail in follow-up studies.

P30026, l 12-13: How about the formation efficiency of BMPO-OH adduct by mixtures of tert-Butyl hydroperoxide with Fe^{2+}?

Response: We have not used tert-Butyl hydroperoxide, but tert-Butyl peroxide and cumene hydroperoxide. As shown in Fig. S5, tert-Butyl peroxide did not produce OH radicals even in the presence of Fe^{2+}. The production of the BMPO-OH adducts was similar to behaviour of terpene SOA. It increased up to certain Fe^{2+} concentrations, and decreased afterwards due to reaction of BMPO-OH adduct with Fe^{2+}.

P30027, l 2-4: The paper "Decreasing effect and mechanism of $FeSO_4$ seed particles on secondary organic aerosol in _-pinene photooxidation. Environmental Pollution, 193: 88-93" proposed that "The formed OH radicals would promote chemical aging of SOA especially in the presence of iron ions". This paper is quite relevant to the topic of this study and I urge the authors to compare the results with this paper.

Response: Thanks for pointing out this interesting paper. This work is indeed closely related to our work and we will refer to it in the revised manuscript.

References:

Yamazaki, I., and Piette, L. H.: ESR spin-trapping studies on the reaction of Fe^{2+} ions with H_2O_2-reactive species in oxygen toxicity in biology, J. Biol. Chem., 265, 13589-13594, 1990.