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Atmospheric Chemistry and Physics Discussions

Interactive comment on "Real refractive indices and volatility of secondary organic aerosol generated from photooxidation and ozonolysis of limonene, α-pinene and toluene" *by* H. Kim and S. E. Paulson

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Overall Response We appreciate Prof. Nakayama taking the time to provide insightful and helpful comments for this manuscript. These comments have helped us clarify and substantially improve the manuscript.

SC from Nakayama**********

In this paper and Kim et al. (2012), the refractive index (RI) at 532 nm are reported,

while the RI values at 670 nm reported by Barkey et al. (2007) and Kim et al. (2010). Wavelength dependence of the real part of the RI should also be taken into account in the "atmospheric implications" section (Fig.6), as shown the wavelength dependence of the RI values for the a-pinene-SOAs (ozonolysis and photooxidation) and toluene-SOAs (photooxidation) in the literatures (Yu et al. 2008, Nakayama et al. 2012, 2013). This is an excellent point, thank you for taking the time to point it out. This has been separated out in the revised figure, reproduced here in the supplementary file.

Figure 6. Comparisons of refractive indices of thermodenuded and undenuded SOA studied in previous studies (Kim et al., 2010, 2012). Ranges of refractive index for each SOA result from changing chemical composition as the particles are growing or aging; error bars are $\pm$ 0.03 for Kim et al. Studies. This is the absolute error for the mr retrievals. Errors for Barkey et al. (2007) were $\pm$ 0.15; Lang-Yona et al. (2010) $\pm$ 0.05; Nakayama et al. (2010) $\pm$ 0.04 and Yu et al. (2008) $\pm$ 0.03 uncertainties, respectively. Uncertainties of Schnaiter et al. (2005) study is not available. Horizontal lines indicate SOA or organic aerosol refractive indeces assumed by different current aerosol/climate models. Black symbols represent literature values of SOA generated using same hydrocarbon and oxidation chemistries denoted in the figure. The phenol data is not published and generated at HC/NOx=35-41. HC/NOx ratios are 20-33, 13-19 and 6.3-11 for low, intermediate and high NOx, respectively.

In Figure 3, the real part of RI values for the toluene-SOAs generated under different HC/NOx conditions are shown as a function of particle diameter. Nakayama et al. (2013, Fig. 6) showed that the real part of RI at 532 nm for the toluene-SOAs slightly increased as increasing [NOx]ini (decreasing HC/NOx ratio) as well as increasing particle size and O/C ratio of the SOAs. The higher O/C ratio of the toluene-SOAs (O/C = 0.64-0.73, Nakayama et al. 2013) than those for the a-pinene-SOAs (O/C = 0.43-0.47, Nakayama et al. 2012) may contribute to the observed difference in the real part of RI, although non-negligible value of imaginary part of RI (0.0010 0.00070.0008+- at 532nm, Nakayama et al. 2013) might also contribute to the real

part of RI for the toluene-SOAs under high [NOx]ini conditions. Thank you. Your comments have helped us develop our discussion, and the discussion has been added to the manuscript.

Please also note the supplement to this comment:
http://www.atmos-chem-phys-discuss.net/13/C2769/2013/acpd-13-C2769-2013-supplement.pdf

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Interactive comment on Atmos. Chem. Phys. Discuss., 13, 1949, 2013.