Real refractive indices and volatility of secondary organic aerosol generated from photooxidation and ozonolysis of limonene, α-pinene and toluene

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1. Particle losses in the thermodenuder

Losses of SOA particle within the TD are due to a combination of sedimentation, diffusion and thermophoresis were determined in a separate experiment using NaCl (99%, Sigma Aldrich) aerosol, generated by nebulizing a 0.005 M NaCl solution (Collison spray nebulizer, BGI Inc.). NaCl particles were chosen because they do not volatilize at the temperatures of interest [*Huffman et al.*, 2008]. The nebulized aerosol was dried through two silicagel driers in series and injected into the chamber. The relative humidity (RH) of the chamber was 28-32 % during the measurements in all cases reported here. Since the loss processes are size and temperature dependent, we explored the dependencies by plotting the losses as a function of particle size as well as a function of temperature (Figure 3S). The curves at each of the 5 temperatures were obtained by taking the ratio of the output size distribution to the input distribution, averaging 8-10 scans. Error bars indicate the standard deviation of each of the data points. The particles losses increase for smaller sizes and are approximately constant above 80 nm, consistent with the results of *Huffman et al.*, [2008]. For small particles (< 50 nm), as the TD temperature increases the particle losses increase from 5% at 65 ºC to approximately 20% at 95 ºC due to additional thermophoretic forces [*Burtscher et al.*, 2001]. Above 50 nm, particle losses are independent of temperature and above 80 nm, they also cease to be size dependent. The averaged losses for each temperature curve are used for the volatility calculation (section 3.2).

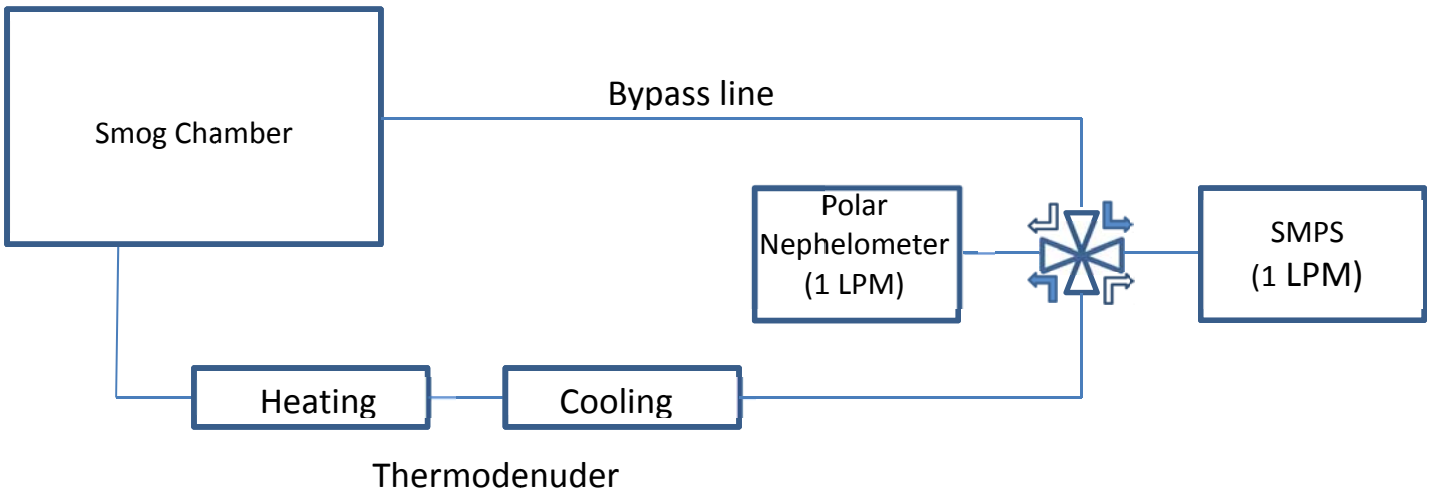

Figure S2. Schematic drawing of the experimental setup used for SOA volatility, angular scattering and size distribution.

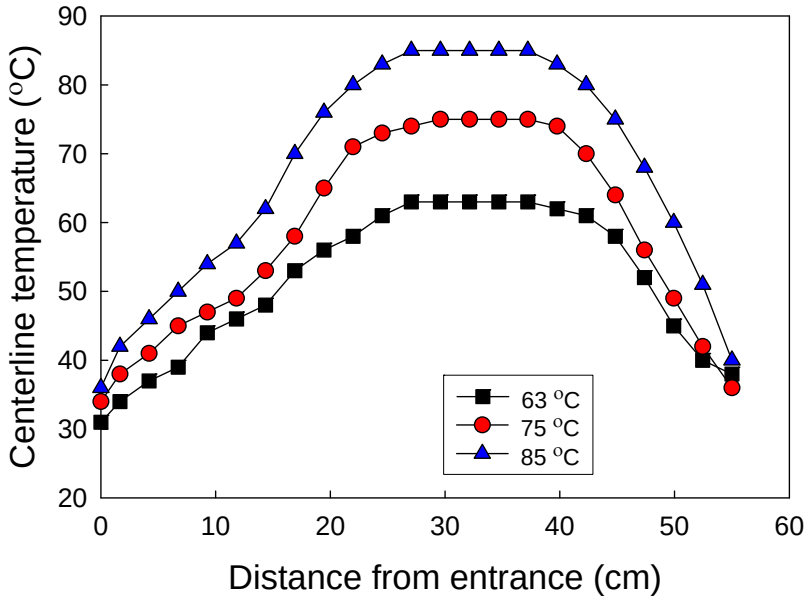

Figure S1. Temperature profile along the axis of the heating section at a flow rate of 1LPM for three set temperatures.

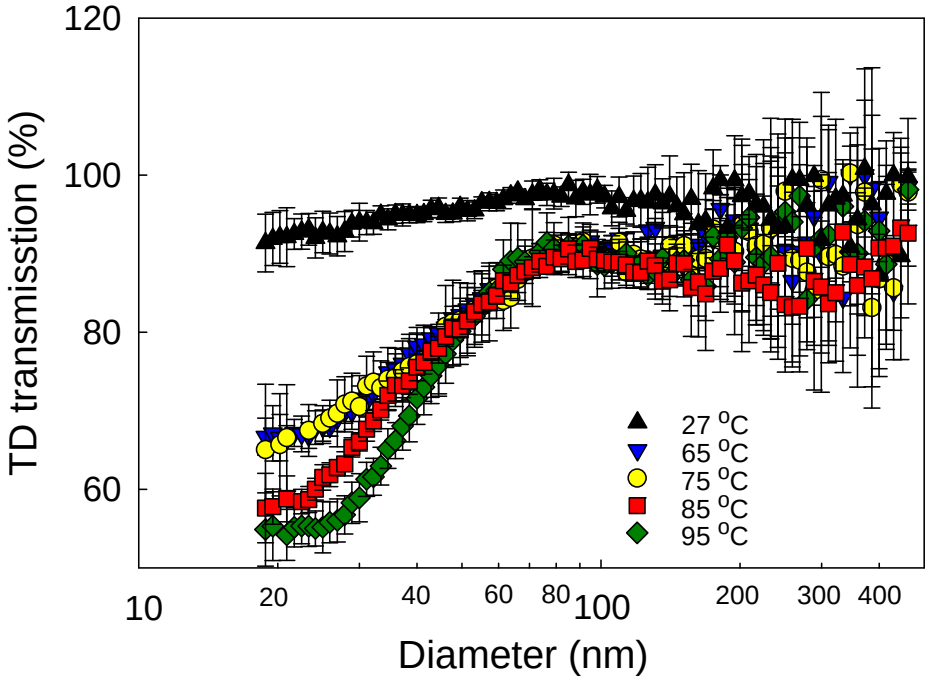

Figure S3. Particle number loss as a function of size within the TD at five different temperatures, as due to diffusion, thermophoresis and sedimentation. NaCl particles were used for the study of number loss because of their non-volatility under all experimental temperatures.

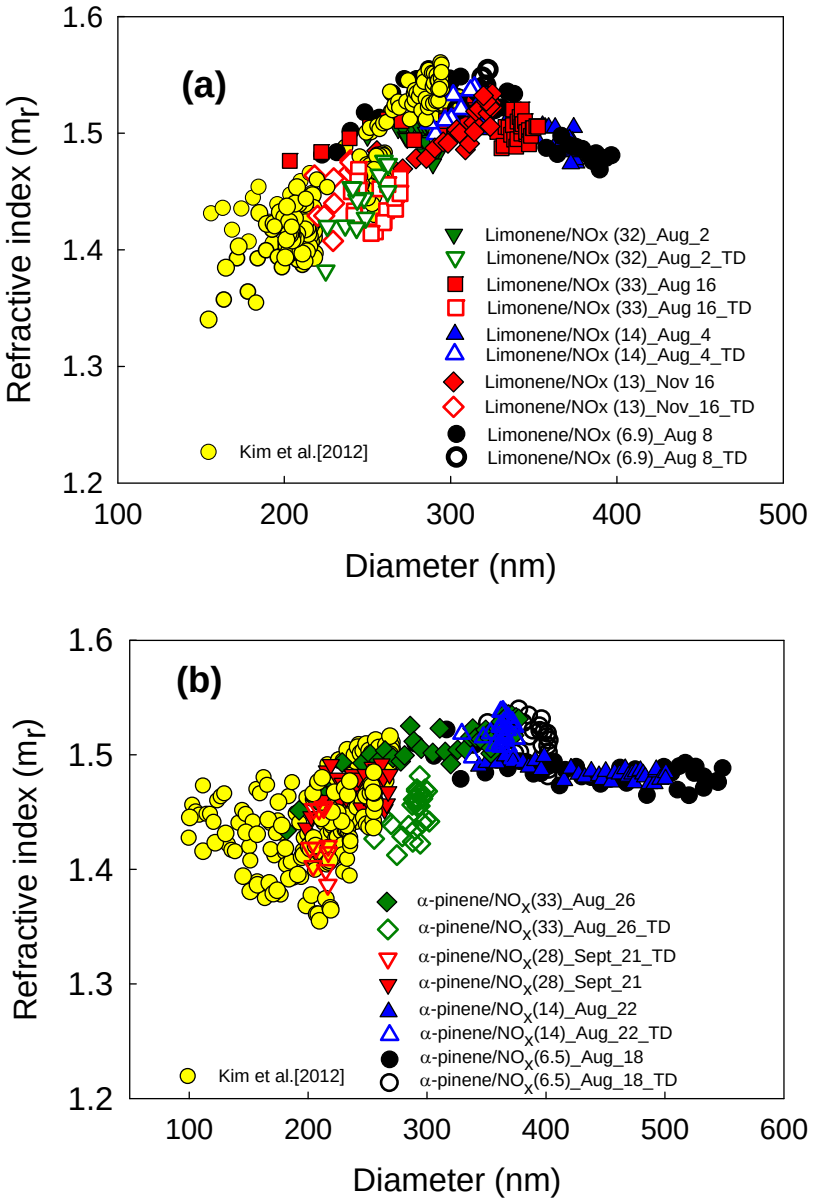

Figure S4 Comparisons of refractive indices of SOA from current studies (both thermodenuded and undenuded) with previous values*Kim et al.*, 2012.

References

Burtscher, H., et al. (2001), Separation of volatile and non-volatile aerosol fractions by thermodesorption: instrumental development and applications, *J. Aerosol. Sci.*, *32*(4), 427-442.

Huffman, J. A., P. J. Ziemann, J. T. Jayne, D. R. Worsnop, and J. L. Jimenez (2008), Development and characterization of a fast-stepping/scanning thermodenuder for chemically-resolved aerosol volatility measurements, *Aerosol Science and Technology*, *42*(5), 395-407.

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