PA18) Characterization of the Thermal Denuder for Volatility Measurement of Organic Aerosols

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1. Introduction

Direct volatility measurement of aerosols is a complex process. Thermal denuder is a common instrument to measure volatility of organic aerosols. In this study, a new KNU thermal denuder has been designed, fabricated, characterized, and applied to measure volatilities of standard compounds and aerosols.

2. Meterials and Methods

The KNU thermal denuder system was characterized for the centerline axial temperature profile, axial temperature ramping with time, and size-resolved particle transmission. The centerline axial temperature and temperature ramping as a function of time in the heating section was measured at set temperatures from 50℃ to 280℃ in six steps. The particle transmission efficiency of the thermal denuder was evaluated by measuring particle size distribution at the outlet of the heating section as a function of axial temperature and residence time with respect to the inlet.

3. Results and Discussion

The temperature profile can be divided into three sections: entrance and exit sections with increasing and decreasing temperatures, respectively, and a middle flat section where the temperature remained uniform. This observation is generally consistent with the previous studies (Saha et al., 2015; Gkatzelis et al., 2016). In the center of the heated tube, corresponding to each set temperature, the measured temperature reached the set value in approximately 3.5 min. Similar observations regarding time were noticed at the inlet and outlet of the heating tube.

4. References

Gkatzelis, G. I., Papanastasiou, D. K., Florou, K., Kaltsonoudis, C., Louvaris, E., Pandis, S. N., 2016, Measurement of nonvolatile particle number size distribution, Atmos. Meas. Tech., 9, 103-114.

Saha, P. K., Khlystov, A., Grieshop, A. P., 2015, Determining aerosol volatility parameters using a “Dual Thermodenuder” system: Application to laboratory-generated organic aerosols, Aerosol Sci. Technol., 49(8), 620-632.