Determination of the Vapor Pressures of Organic Aerosol Formers and Nitrotoluenes by the Concatenated Gas Saturation Technique

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A recently constructed gas saturation apparatus has been used to determine the vapor pressures of five organic aerosol forming compounds and three nitrotoluene compounds near room temperature. Vapor pressure data for organic aerosol formers are needed to improve global climate models. Among other things, vapor pressure data for nitrotoluenes are needed to facilitate the detection of explosives. The gas saturation technique involves the saturation of a carrier gas stream with the vapor of a condensed phase of the compound of interest. The vapor is then stripped from a measured volume of the saturated carrier gas, the amount of vapor is determined, and the vapor pressure is calculated by assuming ideal gas behavior. In our apparatus the carrier gas flows through a series of eighteen "concatenated" saturator-adsorber pairs. After stopping the flow of carrier gas, the adsorbed material is eluted from each adsorber and analyzed by gas chromatography with flame ionization detection. In this way it is possible to make eighteen simultaneous vapor pressure measurements, which greatly speeds data collection. An additional advantage of the concatenated approach is that it allows for simultaneous measurements on a control compound, which was *n*-tetradecane for this work. Measured values for the vapor pressure of *n*-tetradecane were the same as reference values (within our experimental uncertainty), which gives us confidence in the data collected simultaneously for the other compounds. For all of the compounds, vapor pressure data were measured in the temperature range 283.15 K to 313.15 K. At these temperatures the vapor pressures range from approximately 1 Pa to 70 Pa, and have an expanded (k = 2) uncertainty of approximately 30 %.