Analysis of SOA particles formed from cyclohexene ozonolysis by a laser-ionization single-particle aerosol mass spectrometer

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Real-time analysis of secondary organic aerosol (SOA) particles formed from cyclohexene ozonolysis in a smog chamber was performed using a laser-ionization single-particle aerosol mass spectrometer (LISPA-MS). The instrument obtains both size and chemical compositions of the individual particles with a high time resolution (about 2 s at the maximum). The positive and negative ion mass spectra are obtained. For the sake of the analysis of the spectra of the SOA particles, the standard particles generated from dicarboxylic acids, which are major particulate products from the cyclohexene ozonolysis, were also analyzed by the LISPA-MS. The negative ion mass spectra of the dicarboxylic acid standard particles were characterized by the intense molecular-related ions [M - H]-, while the positive ion mass spectra of those were by fragment ions. The mass spectral analysis of the SOA particles indicated that most of the intense ions in the negative ion spectra also consisted of the molecular-related ions [M - H]- of the reaction products. The correlation between the ion signal intensities in the negative ion spectra of the SOA particles provide the information about the formation reaction pathway of dicarboxylic and hydroxy-dicarboxylic acids in the cyclohexene ozonolysis. Distributions of intense ions in the negative ion spectra varied as a function of reaction time, suggesting that the SOA particles are oxidized as a reaction of time. We will demonstrate that the real-time single-particle analysis of the individual SOA particles with high time resolution by the LISPA-MS technique can investigate the formation and transformation processes of the SOA particles in smog chambers.