

Mass spectrometric study of secondary organic aerosol from the photooxidation of aromatic hydrocarbons

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Secondary organic aerosol (SOA) formed in laboratories is considered to be less oxidized than ambient organic aerosol (OA) on the basis of recent measurements using Aerodyne aerosol mass spectrometer (AMS). However, the mass spectra of SOA formed in laboratories have been insufficiently studied. In this study, SOA formed from the photooxidation of seven aromatic hydrocarbons (including benzene and toluene) was studied by using an AMS. The mass spectrum of SOA from toluene had strong peaks at $m/z = 43$ (m_{43}) and 44 (m_{44}). During 12-h irradiation, the m_{43}/OA ratio decreased and the m_{44}/OA ratio increased by photochemical aerosol aging. Similar results were also obtained for the other six aromatic hydrocarbons. The averaged m_{44}/OA ratios of seven aromatic hydrocarbons were 0.065-0.169 and distributed up to an ambient well-oxidized aerosol level (~ 0.16). The m_{44}/OA ratio of SOA formed in a laboratory is not always lower than that of ambient aerosol, showing further AMS studies of traditional SOA formation are necessary. The more the number of alkyl substituent of aromatic hydrocarbon was, the m_{44}/OA ratio of SOA decreased and the m_{43}/OA ratio of SOA increased (Figure). These results suggest that ketone type products (that are barely converted to carboxylic acids) are preferentially formed in the photooxidation of multiple-alkylated benzenes.

