



Aerosol chamber study of methylene-cyclohexane, cyclohexene and limonene ozonolysis

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Secondary Organic Aerosol (SOA) formation from the ozonolysis of methylene-cyclohexane, cyclohexene and limonene was investigated in a series of indoor chamber experiments. Aerosol chamber experiments were carried out using either neutral seed particles (Na_2SO_4) or acid seed particles ($(\text{NH}_4)_2\text{SO}_4 / \text{H}_2\text{SO}_4$). The initial mixing ratios of hydrocarbons were 100 ppbv for cyclohexene and (+)-limonene, and 300 ppbv for methylene-cyclohexane. The initial mixing ratios of ozone for the former two experiments were approximately 70 ppbv and 100 ppbv for the latter experiment. Resulting SOA was analysed using capillary electrophoresis coupled to electrospray ionisation mass spectrometry (CE/ESI-MS). Only carboxylic acids greater than C_5 were detected in all samples. Adipic acid and glutaric acid were the two major ozonolysis products in both methylene-cyclohexane and cyclohexene ozonolysis. A number of dimers and oligomers were also detected in methylene-cyclohexane and limonene ozonolysis but not in cyclohexene ozonolysis. The mass to charge ratios (m/z) of the dimers and oligomers ranged from 250 to 900 m/z which are slightly smaller than reported dimer and oligomer masses in α -pinene ozonolysis. The resulting mass spectra of the three dimers with m/z of 229, 257 and 273 ($[\text{M}-\text{H}]^-$) in cyclohexane ozonolysis were further analysed to determine monomer units and deduce a possible formation mechanism. The influence of the acidity on oligomer formation was also investigated. No significant difference in SOA yields was found between acidic seed and neutral seed experiments of methylene-cyclohexane and cyclohexene ozonolysis. The result suggests that the acid catalysed SOA yield enhancement may strongly depend on SOA precursor hydrocarbon.