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Incremental Reactivity Effects on Secondary Organic Aerosol Formation in Urban Atmospheres with and without Biogenic Influence

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Two different surrogate mixtures of anthropogenic and biogenic volatile organic compounds (VOCs) were developed to study secondary organic aerosol (SOA) formation at atmospheric reactivities similar to urban regions with varying biogenic influence levels. Environmental chamber simulations were designed to enable the study of the incremental aerosol formation from select anthropogenic ($m-$Xylene, 1,2,4-Trimethylbenzene, and 1-Methylnaphthalene) and biogenic (α-pinene) precursors under the chemical reactivity set by the two different surrogate mixtures. The surrogate reactive organic gas (ROG) mixtures were based on that used to develop the maximum incremental reactivity (MIR) factors for evaluation of O_3 forming potential. Multiple incremental aerosol formation experiments were performed in the University of California Riverside (UCR) College of Engineering Center for Environmental Research and Technology (CE-CERT) dual 90m^3 environmental chambers. Incremental aerosol yields were determined for each of the VOCs studied and compared to yields found from single precursor studies. Aerosol physical properties of density, volatility, and hygroscopicity were monitored throughout experiments. Bulk elemental chemical composition from high-resolution time of flight aerosol mass spectrometer (HR-ToF-AMS) data will also be presented. Incremental yields and SOA chemical and physical characteristics will be compared with data from previous single VOC studies conducted for these aerosol precursors following traditional VOC/NO_x chamber experiments. Evaluation of the incremental effects of VOCs on SOA formation and properties are paramount in evaluating how to best extrapolate environmental chamber observations to the ambient atmosphere and provides useful insights into current SOA formation models. Further, the comparison of incremental SOA from VOCs in varying surrogate urban atmospheres (with and without strong biogenic influence) allows for a unique perspective on the impacts different compounds have on aerosol formation in different urban regions.