

## 1.056 Reaction of Limonene with HOCl and Cl<sub>2</sub> in the Dark Followed by Particle Formation under Indoor Fluorescent Light.

Early Career Scientist

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Abstract:

Application of bleach solution (major component NaOCl) in indoor environments emits gaseous hypochlorous acid (HOCl) and chlorine (Cl<sub>2</sub>), both of which are strong oxidants. In contrast to the outdoor atmosphere, where mixing ratios of HOCl and Cl<sub>2</sub> in marine air are low (10s to 100s of pptv), indoor HOCl and Cl<sub>2</sub> can reach high levels during cleaning activities (100s of ppbv). These gases may react with unsaturated organic compounds on indoor surfaces and in indoor air. In this study, we studied the reaction of limonene, one of the most common indoor volatile organic compounds (VOCs) arising from use of cleaning products, fragrance, air fresheners, with HOCl and Cl<sub>2</sub> in the dark and under indoor irradiation conditions in an environmental smog chamber. Experiments were conducted with indoor relevant concentrations of reactants (HOCl, Cl<sub>2</sub> and limonene), relative humidity and irradiation. A dark reaction was observed between limonene and HOCl/Cl<sub>2</sub>. The gas-phase reaction products were investigated using chemical ionization mass spectrometry. With subsequent use of indoor fluorescent lights, a significant mass loading of secondary particles formed. Aerosol mass spectrometry measurements indicate a large contribution of particulate organochlorine species. This is the first study on the reaction of HOCl and Cl<sub>2</sub> with unsaturated organics relevant for indoor air chemistry. Results suggest that secondary particle formation may occur in indoor environments due to the use of common cleaning products.