

# SEMINAR SERIES 2023 - 2024

SOUTHERN ONTARIO CENTRE FOR ATMOSPHERIC AEROSOL RESEARCH  
UNIVERSITY OF TORONTO

## Aerosols as Catalytic Microreactors: From Making Air Pollution and Clouds Rain, to a Sustainable Solution for Micropollutant Remediation



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In the atmosphere, tiny aerosolized particles catalyze chemical reactions with gaseous pollutants, leading to the production of more ozone and smog, and transform terpenes emitted by trees into toxic particulate matter. Some rare particles can catalyze the freezing of supercooled water droplets, causing clouds to glaciate, a major but uncertain player in precipitation over land and in climate change. I will present my group's research into the heterogeneous chemistry involving nitrogen oxides such as  $\text{N}_2\text{O}_5$  hydrolysis, and the chlorinated gases produced such as  $\text{ClNO}_2$  that we found can occur in the complex chloride-containing biomass-burning aerosol produced by wildfires. New mineral phases produced by the combustion were also found to be the principal source of the ice nucleants that are often emitted by biomass burning. We have been studying the potential for biomass burning aerosol to facilitate photosensitization and produce oxidants that may play an unrecognized role in the photobleaching of the brown carbon common to wildfire smoke. We are also investigating the role that combustion of household materials plays in driving human exposure to chemical toxics, and evaluating remediation approaches to destroy these contaminants, such as the highly persistent polyfluorinated alkyl substances (PFAS). With my startup company Sudoc I am also developing applications of the TAML catalytic activators of hydrogen peroxide invented at the Institute for Green for the sustainable treatment of wastewater that enables water recycling. I will conclude by discussing recent activity to inform emerging policies for preventing chemical pollution. My efforts to advance sustainable chemistry focus on identifying problematic molecular features so that better alternatives can be used earlier in the chemical and materials manufacturing supply chain, such as for clean energy technology.

**Wednesday, April 10, 2024 3:00PM - 4:00PM EDT**

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Meeting ID: 296 066 880 798  
Passcode: R2ZUpk

