

# SEMINAR SERIES 2023 - 2024

SOUTHERN ONTARIO CENTRE FOR ATMOSPHERIC AEROSOL RESEARCH  
UNIVERSITY OF TORONTO

## Multi-phase Oxidation of Tire Derived Chemicals on Atmospheric Surfaces



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Tires are comprised of a complex mixture of chemicals that are added to the rubber to increase their durability and stability. Such tire derived chemicals (TDCs), often found within tire wear particles (TWP), encompass a wide array of organic compounds. With increased mitigation efforts to control on-road exhaust emissions, non-exhaust TWP are expected to progressively become the major source of traffic related particles emitted to the atmosphere. As a result, understanding the chemical composition of airborne TWP, their transformation products, and their associated toxicity will be critical to effectively mitigating air pollution related to tire wear chemicals. *N'*-phenyl-*p*-phenylenediamines (PPDs), a class of tire wear cyclic amines used as anti-oxidants during the manufacturing of tires, have been gaining attention due to their high toxicity to aquatic life. In the current work heterogeneous oxidation experiments of select PPDs with multiple atmospheric oxidants were performed in real-time using Attenuated total reflectance- Fourier transform infrared spectroscopy (ATR-FTIR). The results shed light on the major reaction pathways, and the various oxidation products formed, while providing insight into their oxidation mechanisms and chemical kinetics. Multiple oxidation products such as quinones, nitramines and nitrosamines were detected, which form very rapidly, highlighting the important role that atmospheric transformations can play in the overall fate of tire wear chemicals which are ultimately found in aquatic environments. The work also suggests that more attention should be paid to the transformation of cyclic amines emitted from tires to the atmosphere, along with their toxicity, as a potentially important route to human health impacts via airborne exposure.

**Wednesday, March 6, 2024 3:00PM - 4:00PM EST**

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