College of Computational, Mathematical, and Physical Sciences

Department of Chemistry

Departmental Seminar

Wednesday May 13, at 2:00 PM

MACN 101

Dr. Mitch Nascimento

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MacDiarmid Institute for Advanced Materials and Nanotechnology

University of Auckland, New Zealand

Title: "The Missing Link: the role of crosslinkers in polysulfide gold adsorption"

Abstract: Electronic waste is the fastest growing stream of domestic solid waste, projecting to eclipse 74 million tonnes generated per year by 2030.[1] Of this, only 17 % of e-waste is properly recycled, leading to millions of tonnes of metals left in garbage piles. While seemingly inert, these waste metals, alongside other metal contamination streams like open-pit mines,[2] are a major source of groundwater and soil pollutants with high risk to human health and living organisms.[3] As such, improved chemical processes to recover and reuse these metals would represent a significant boon to the circular economy and potentially lessen the need for new mining ventures. Sorption-based separation methods are a preferred method for e-waste recovery, given their high efficiency combined with inexpensive and straightforward implementation. More optimally, sorbents could be synthesized using other waste streams and natural materials, making the sorbent active in both the use and recovery of wastes in a circular economy.

To this end, we have sought to combine elemental sulfur - a significant waste product of petroleum refinement - and naturally derived unsaturated oils for the development of polysulfides through inverse vulcanization.[4] Such sulfur-rich systems have shown much promise for the adsorption of waste heavy metals, especially gold, which has gained increasing value and application in modern electronics.[5,6] Here we will discuss our recent work in the synthesis and design of inverse vulcanized sulfur/silicone resins with synthetically modified unsaturated oil dopants for gold adsorptivity, and the impact of chemical structure on the macroscopic adsorption properties of inverse vulcanized materials.

References:

1. Forti et al. The Global E-waste Monitor 2020: Quantities, Flows and the Circular Economy Potential; United Nations University (UNU)/United Nations Institute for Training and Research (UNITAR) – co-hosted SCYCLE Programme; International Telecommunication Union (ITU) & International Solid Waste Association (ISWA): Bonn, Germany; Geneva, Switzerland; Rotterdam, Denmark, **2020**
2. *Environ. Geol.* **2001**, 40, 305– 311.
3. *Int. J. Environ. Res. Public Health* **2020**, 17, 2204.
4. *RSC Appl. Polym.* **2025**, 3, 10-42
5. *ACS Appl. Polym. Mater.* **2025**, 7, 8529–8537.
6. *Nat. Sustain.* **2025**, 8, 947–956.

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Coffee & Timbits will be served at 1:00 PM