Centre en chimie verte et catalyse

Center in Green Chemistry and Catalysis

Green Chemistry and Catalysis Seminar: Milad Abolhasani - Accelerated Materials and Molecular Discovery Enabled by Self-Driving Fluidic Labs

E-mail: abolhasani@ncsu.edu | Webpage: **www.AbolhasaniLab.com**

Monday, April 24, 2023, 03:00 am to 04: 30 pm – McGill University, Otto Maass, **room: 217**

Tuesday, April 25, 2023 11:00 am to 12: 30 pm – Université de Montréal, MIL campus, Pavilion A, **room: A.2521**

Abstract:

Accelerating the discovery of new molecules and materials, as well as green and sustainable ways to synthesize and manufacture them, will have a profound impact on the global challenges in energy, sustainability, and healthcare. The current human-dependent paradigm of experimental research in chemical and materials sciences fails to identify technological solutions for worldwide challenges in a short timeframe. This limitation necessitates the development and implementation of new strategies to accelerate the pace of discovery. Recent advances in reaction miniaturization, automated experimentation, and data science provide an exciting opportunity to reshape the discovery and manufacturing of new molecules and materials related to energy transition and sustainability. In this talk, I will present a 'self-driving fluidic lab (SDFL)' for autonomous discovery and manufacturing of emerging advanced functional materials and molecules, with multi-step chemistries, through integration of flow chemistry, online characterization, and machine learning (ML). I will discuss how modularization of different chemical synthesis and processing stages in tandem with a constantly evolving ML modeling and decision-making under uncertainty can enable a resource-efficient navigation through high dimensional experimental design spaces (>1020 possible experimental conditions). Example applications of SDFL for the autonomous synthesis of clean energy nanomaterials will be presented to illustrate the potential of autonomous robotic experimentation in reducing synthetic route discovery timeframe from >10 years to a few months. Finally, I will present the unique reconfigurability aspect of flow chemistry to close the scale gap in chemical and materials research through facile switching from the reaction exploration/exploitation to smart manufacturing mode.

Biography:

Milad Abolhasani is an Associate Professor and a University Faculty Scholar in the Department of Chemical and Biomolecular Engineering at North Carolina State University. He received his Ph.D. from the University of Toronto in 2014. Prior to joining NC State University, he was an NSERC Postdoctoral Fellow in the Department of Chemical Engineering at MIT (2014-2016). At NC State University, Dr. Abolhasani leads a diverse research group that studies self-driving labs tailored toward accelerated development and manufacturing of advanced functional materials and molecules using fluidic micro-processors. Dr. Abolhasani has received numerous awards and fellowships, including NSF CAREER Award, AIChE 35 Under 35, Dreyfus Award for Machine Learning in the Chemical Sciences & Engineering, AIChE NSEF Young Investigator Award, I &EC Research 2021 Class of Influential Researchers, AIChE Futures Scholar, The John C. Chen Young Professional Leadership Scholarship (AIChE), ACS-PRF Doctoral New Investigator Award, and Emerging Investigator recognition from Lab on a Chip, Reaction Chemistry & Engineering, and Journal of Flow Chemistry.