TRENT UNIVERSITY

CHEMISTRY/PHYSICS SEMINAR SERIES

Dr. Conrard Gisesse Tetsassi Feugmo

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Wednesday, February 28, 2024
11:00 a.m. to 11:50 a.m. in ENW 115

Optimizing Electrochemical Carbon Capture: Computational Design of Redox-Amines for Enhanced Efficiency and Sustainability

ABSTRACT

The quest for net-zero emissions has catalyzed the evolution of carbon capture, storage, and utilization (CCUS) initiatives. Traditional CO2 capture techniques, notably those employing amine-based solutions to treat power plant emissions, are being reassessed due to their significant energy demands and inefficiencies related to Carnot limits during thermal regeneration. In pursuit of more sustainable alternatives, this study delves into the burgeoning field of electrochemical carbon capture concentration (eCCC) systems. These novel systems, which function at ambient conditions and are amenable to renewable energy sources, hold the potential to diminish the energy footprint of carbon capture processes. Central to our research is the computational design and analysis of sp2 amines for electrochemical CO2 sequestration, harnessing pH swing techniques. We investigate sp2 amine molecules, characterized by their redox activity, for their utility in eCCC, assessing their solubility, redox potential compatibility with aqueous environments, and the reversibility of their electrochemical reactions. The integration of AI in computational molecule screening further refines the selection process, pinpointing candidates most likely to enhance the efficiency and scalability of eCCC technology.

BIOGRAPHY – CONRARD GISESSE TETSASSI FEUGMO

Dr. Conrard G. Tetsassi Feugmo currently serves as an Assistant Professor in the Chemistry Department at the University of Waterloo, with a distinguished academic background including an M.Sc. in Nanotechnologies from Belgium's Louvain School of Engineering and a Ph.D. in Computational Chemistry from the University of Namur in Belgium. His research portfolio is notably diverse, utilizing computational techniques like Density Functional Theory (DFT), Molecular Dynamics (MD), Phase Field Crystal (PFC), and Artificial Intelligence (AI) to innovate advanced materials tailored for energy storage and conversion, encompassing hydrogen technology, solid-state electrolytes, and High Entropy Alloys (HEAs). He maintains a particular focus on developing constrained multi-objective optimization algorithms, along with HEAs materials, applicable to aerospace and nuclear technologies. Formerly a Research Officer at the NRC's Advanced Materials Research Facility in Mississauga, his invaluable experience underscores his dedication to advancing computational chemistry and materials science to tackle global energy challenges.