Concordia University
Centre for Research in Molecular Modeling
Faculty of Arts and Science

Université Concordia University
FACULTY OF ARTS AND SCIENCE
Department of Chemistry and Biochemistry

Joint Department of Chemistry & Biochemistry and Centre for Research in Molecular Modeling (CERMM) Seminar Series

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Bioinspired nanosystems for green chemistry and responsive drug delivery

The development of bioinspired complex structures originated from the shape and function of nanostructured soft materials to produce effects inspired by natural systems. Biomimicry based on synthetic materials can lead to the development of materials that can adapt to their microenvironment,allowing them to increase the efficiency of chemical processes while decreasing their ecological impact.

The development of new materials for functional bioinspired systems involves a prediction and characterization of the materials from the atomic to the nanoscale with a time scale ranging from ps to few ns. A synergy between experiments and theory is essential to predict efficiently novel materials and understand their properties for the development of responsive materials inspired by natural systems. The presentation will highlight the benefits of this coupling for applications in:

(1) the development of supportless nanoreactors with active metal catalyst, which can benefit from both the catalytic center and confinement effect in aqueous environments [1-3]

(2) the design and synthesis of targeted drug delivery carriers for cancer treatment to improve the efficacy of the chemotherapeutic drugs as well as to reduce the side effects linked to the treatment [4-6]

The presentation will also highlight how the application of soft, bioinspired nanomaterials in fields ranging from medicine to sustainable energy represents a fundamental advancement in science and technology.

References:

[1] V Shah, C Malardier-Jugroot, M Jugroot, Materials Chemistry and Physics,196, 92-102, 2017

[2] X Li, C Malardier-Jugroot, Macromolecules 46 (6), 2258-2266, 2013

[3] M McTaggart, C Malardier-Jugroot, M Jugroot, Chemical Physics Letters 636, 221-227, 2015

[4] X Li, M McTaggart, C Malardier-Jugroot, Biophysical chemistry 214, 17-26, 2016

[5] X Li, MR Szewczuk, C Malardier-Jugroot, Drug design, development and therapy 10, 4101, 2016

[6] Xia Li, Manpreet Sambi, Alexandria DeCarlo, Sergey Burov, Roman Akasov, Elena Markvicheva, Cecile Malardier-Jugroot, Myron Szewczuk, Nanomaterials, 8(8), 588, 2018

Dr. Malardier-Jugroot completed her graduate work at McGill University on the self-assembly of nanomaterials. After completing a post-doctoral fellowship at the University of California Berkeley (BioEngineering) on the experimental and computational study of water dynamics around proteins for water model development, Dr. Malardier-Jugroot joined the faculty of the Department of Chemistry and Chemical Engineering, at the Royal Military College of Canada where she is currently a professor and head of the department. Dr. Malardier-Jugroot currently holds the Tier II Canada Research Chair in Self-assembly and Nanomaterials.