TRENT UNIVERSITY

CHEMISTRY/PHYSICS SEMINAR SERIES

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11:00 a.m. to 11:50 a.m. on Zoom

Prescriptions to Inform the Design of Polymeric Materials

ABSTRACT

The diversity and versatility of polymeric materials provide many opportunities for product design. Polymers are typically inexpensive (in terms of both material and processing costs), lightweight, and have tailorable application properties. As a result, they are employed in both commodity and specialty applications (e.g., as coatings, paints, adhesives, foams, fibres, films, and bulk molded materials).

The range of polymeric materials available for engineering applications can be overwhelming. Technical data are typically available once a material is selected, but how is that initial selection made? How can that material be tailored for a specific application? Many scientists and engineers use trial-and-error approaches; often the synthesis is the priority, and finding a suitable application is an afterthought. In other cases, researchers may have an application in mind, and they try various recipes until they are satisfied with the result. However, both of these approaches are ineffective. Not only are valuable experimental resources wasted during the trial-and-error stage, but there is also no guarantee that the polymer products have been optimized for the intended application.

As material requirements for particular applications become more specific and strict, using a targeted approach to design polymeric materials becomes a necessity. Following a general design framework prevents researchers from using trial-and-error approaches or shoehorning materials into applications for which they are non-optimal. To obtain polymer products with desirable properties (both fundamental characteristics and for a specific application), one must always begin with a strong understanding of existing materials and methods. This background knowledge informs preliminary design of experiments, which in turn provides insight for additional experiments to synthesize (and characterize) optimally designed materials.

A general framework for the design of polymeric materials has been developed and implemented for applications including enhanced oil recovery, polymeric sensing materials, and flocculants for water treatment. Select case studies will be presented at the time of presentation, highlighting the potential to use a general design framework in a sequential, iterative manner to move towards optimally designed materials for each target application.

BIOGRAPHY – Alison Scott

Dr. Alison Scott is an Assistant Professor in the Department of Process Engineering and Applied Science at Dalhousie University in Halifax, Nova Scotia. She obtained her BASc, MASc and PhD in Chemical Engineering from the University of Waterloo. Dr. Scott's research in Polymer Reaction Engineering has dealt with a wide variety of topics, including controlled radical polymerization, crosslinking systems, multivariate statistical analysis, reactive processing, polymeric sensing materials, and water-soluble copolymer and terpolymer systems. She currently oversees a team of researchers (undergraduate and graduate students) whose work covers various aspects of designed polymeric materials, water-soluble polymers, and sustainable materials & processes.