CHEMICAL ENGINEERING

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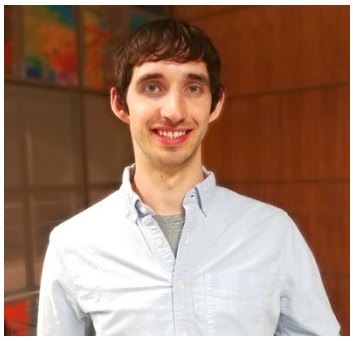

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Monday, July 20, 2020

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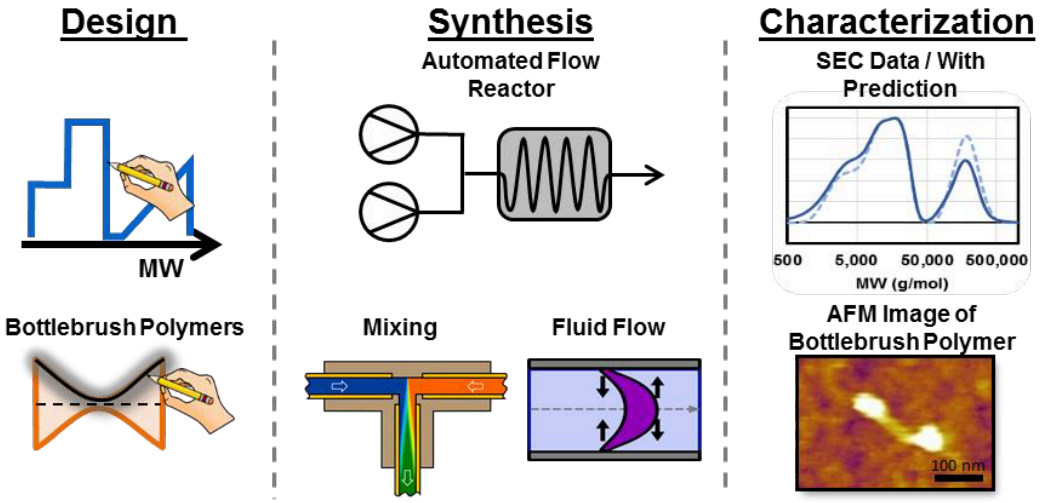
Engineering Approaches to Controlled Polymer Synthesis

ABSTRACT: To deliver on society's need for better materials, the development of tunable materials with a wide range of properties is needed. Polymers are among the most relied upon material in this regard because of their low cost and high tunability. The wide range of tunability of their macroscopic properties stem from the expansive options in engineering their molecular structure (molecular weight, composition, and topology). The rational design of their molecular structure relies on the establishment of fundamental structure-function relationships. A critical requirement for the development of structure-function relationships is the precise synthesis and characterization of large libraries of materials. Historically, this process has required significant manual labor resulting in slow progression, and limited design rules. Automated synthesis is well poised to address these limitations, enabling the rapid engineering of polymer materials to address contemporary problems in science and technology.



In this presentation, I will discuss the development of automated flow reactors for the synthesis of polymers with precise architectures and molecular weight distributions. Automated flow reactors are ideal for synthesizing complex polymers as they provide a simple to use, chemistry agnostic system that delivers the highest precision possible. This enables a new paradigm in synthesis to emerge where the a-priori design of a polymer structure can be instantly produced with the click of a button. However, the development of automated flow reactors for polymer synthesis is not trivial due to mixing and fluid flow limitations, which has necessitated the development of reactor design rules. Each synthesis is supported by detailed characterizations and mathematical modeling to verify the production of a well-defined material. This work hopes to ultimately push the limits in complex polymer architectures, while also reducing the amount of manual labor needed for the development of structure function relationships enabling the accelerated development of new materials.

BIOGRAPHY: Dr. Dylan Walsh has recently become a post-doctoral researcher in the chemical engineering department at MIT working in the labs of Profs. Klavs Jensen and Brad Olsen. His current research is focused on the development of intelligent automated reactors for polymer synthesis. Dylan completed his Ph.D. in chemical engineering at the University of Illinois –Urbana Champaign under the supervision of Prof. Damien Guironnet. He was a DuPont Science and Engineering fellow and a Dow Chemical Company graduate fellow. His research focused on the development of precision polymer synthesis for the manufacturing of functional soft materials. Before his Ph.D., Dylan attended the University of Minnesota - Twin Cities, where he earned two degrees: chemical engineering and chemistry. His undergraduate research focused on the development of novel catalytic organometallic reactions.

LECTURE 1:00 - 2:00 Zoom
Networking Hour on Zoom Following

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