CHEMICAL ENGINEERING
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CHEMICAL ENGINEERING 290 SEMINAR SERIES PRESENTS

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Clicking Polymer Networks Together: Approaches to Form Smart, Functional Polymer Networks from Click Chemistry

4pm - Tuesday, January 26th 2016 in ENGR II room 1519

A new paradigm encompassing several distinct chemical reactions and, more importantly, a generalized approach to molecular design and synthesis has been rapidly adopted in the fields of chemical synthesis, biotechnology, materials science, drug discovery, surface science, and polymer synthesis and modification. The Click Chemistry paradigm focuses on implementation of highly efficient reactions that achieve quantitative conversion under mild conditions. As such, these reactions represent ideal candidates for further development, understanding and implementation. In particular, the synergistic combination of these click chemistries with photochemical initiation and polymer formation has been used to afford 4D control of polymer formation, structure and patterned assembly. Here, we will focus on several vignettes related to our implementation of photoclickable polymer systems. The first of these focuses on the development of covalent adaptable networks (CANs) where the ability to controllably alter the network structure is used to alter topography and other material properties by forming materials which can be switched revesibly from elastic to plastic simply by exposure to light. Secondly, we will focus on the development of approaches to photoinitiate the Cu(I) catalyzed azide-alkyne cycloaddition (CuAAC) click reaction. Here, implementation of this reaction in surface modification, hydrogel formation, and lithography as well as in the development of a new class of photopolymerized polymer networks will be presented. Finally, we will discuss the implementation of click chemistry in the development of sequence controlled polymer structures, particularly click-based oligonucleotides that represent a novel class of DNA mimics.

Professor Christopher N. Bowman is currently the Patten Endowed Chair of the Department of Chemical and Biological Engineering and the Director of the Materials Science and Engineering Program at the University of Colorado. Professor Bowman has served for the last fifteen years as the Co-Director of the NSF Industry/ University Cooperative Research Center for Fundamentals and Applications of Photopolymerizations and has also held various administrative positions at the University of Colorado. He received his B.S. and Ph.D. in Chemical Engineering from Purdue University in 1988 and 1991, respectively. After receiving his Ph.D., he began his academic career at the University of Colorado in January of 1992 as an Assistant Professor. Since that time Professor Bowman has built a program focused on the fundamentals and applications of crosslinked polymers formed via photopolymerization reactions. In the broad areas of the fundamentals of polymerization reaction engineering, polymer chemistry, crosslinked polymers, photopolymerizations and biomaterials, Professor Bowman has published over 300 refereed papers and been recognized with numerous awards from the American Chemical Society, the American Institute of Chemical Engineers, the Materials Research Society, and the Society for Biomaterials. His research involves the synthesis of novel monomers and the implementation of various photopolymerization reac-tions in a range of applications including adhesives, coatings, dental materials, photolithography, nanotechnology and biomaterials.

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