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

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ABSTRACT: 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.

BIOGRAPHY: Chris Bowman has been on the Faculty at the University of Colorado at Boulder since 1992. He serves as a University of Colorado Distinguished Professor, the James and Catherine Patten Endowed Chair, Clinical Professor of Restorative Dentistry, and is Co-Director of the NSF I/UCRC for Fundamentals and Applications of Photopolymerizations. His research interests center on photopolymerization, polymers for micro/nano technology, and biomaterials development. He has authored or co-authored over 300 publications. He earned both his B.S. (1988) and Ph.D. (1991) in Chemical Engineering at Purdue University.

EVENT DETAILS

DATE:
Wednesday,
October 8, 2014

TIME:
11:00 AM

LOCATION:
Carnegie 315
Stevens Institute of Technology

ATTENDANCE:
Public