

Bioinspired Polymers for Protein Drug Delivery



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Reception at 3:30 p.m.

Abstract

Proteins are notoriously unstable. This causes protein drugs to be discarded and wasted and is inconvenient to patients. In addition it increases shipping and storage costs for the many scientists who use proteins in their research. We created two classes of polymers that are very effective stabilizers of proteins. The first class of polymers has trehalose in the side chains. The polymers can be either attached to the protein or simply added to stabilize the biomolecules to near boiling temperatures and repeated lyophilization. The polymers significantly outperform the native sugar, trehalose as well as other gold standards in the field like poly(ethylene glycol) (PEG). The second class of materials mimic the polysaccharide heparin and stabilize a growth factor important in wound healing, basic fibroblast growth factor (bFGF). We found that by conjugating the polymer to bFGF, the protein was rendered stable to a wide range of environmentally and therapeutically relevant stressors that normally inactivate it. For example, the protein is completely inactive when stored in the refrigerator, heated, subjected to enzymes, or exposed to weak or strong acid. Yet the bFGF-heparin mimicking polymer conjugate was stable to all of these stresses. These two polymer classes and their application in protein therapeutics, as well as in lithography, will be discussed.

Speaker Biography

Heather D. Maynard received a B.S. with Honors in Chemistry from the University of North Carolina at Chapel Hill in 1992 and a M.S. in Materials Science in 1995 from the University of California, Santa Barbara for work with Fred Wudl and Brad Chmelka. Her Ph.D. from the California Institute of Technology was awarded in the summer of 2000 for research in the group of Nobel Prize winner Robert Grubbs. She then moved to the laboratory of Jeffrey Hubbell at the Swiss Federal Institute of Technology in Zurich (ETH), where from 2000-2002 she was an American Cancer Society Postdoctoral Fellow. Dr. Maynard joined the UCLA faculty as an Assistant Professor in August 2002 as the first Howard Reiss Career Development Chair in the Department of Chemistry and Biochemistry and as a member of the California NanoSystems Institute. She is now a Professor and Director of the Chemistry Biology Interface Training Program. Since arriving at UCLA, Maynard has given over 190 invited, plenary, keynote and named lectures. Maynard has been selected as an Outstanding Emerging Investigator by the *Journal of Materials Chemistry* and has received the Amgen New Faculty Award, Seaborg Award, NSF Career Award, Seaborg Award for Outstanding Research, the Hanson-Dow Award for Excellence in Teaching, an Alfred P. Sloan Fellowship, and the Herbert Newby Award for Outstanding Research at UCLA. Maynard is an ACS POLY, Leverhulme, Kavli Frontiers, and Royal Society of Chemistry Fellow. Maynard is on the editorial board of *Polymer Chemistry* and the editorial advisory boards of *Bioconjugate Chemistry*, *J. of Polymer Chemistry*, *Macromolecular Biosciences*, and *Biomacromolecules*. Her research interests focus on combining polymers with biomolecules for applications in biotechnology, nanotechnology, and medicine.