



Covestro is guided by a simple and powerful purpose: **to make the world a brighter place.** The company focuses on innovation and sustainability to develop premium polymer materials that benefit society and coming generations.

With its materials and application solutions found in nearly every area of modern life, Covestro is among the leading suppliers of high-performance polymers. Covestro develops sustainable solutions to the greatest challenges of our age: climate change, resource depletion, urban expansion, and population growth. These concerns will inevitably lead to a higher demand for renewable energies, alternative resources, energy-efficient transportation, and sustainable, affordable housing.

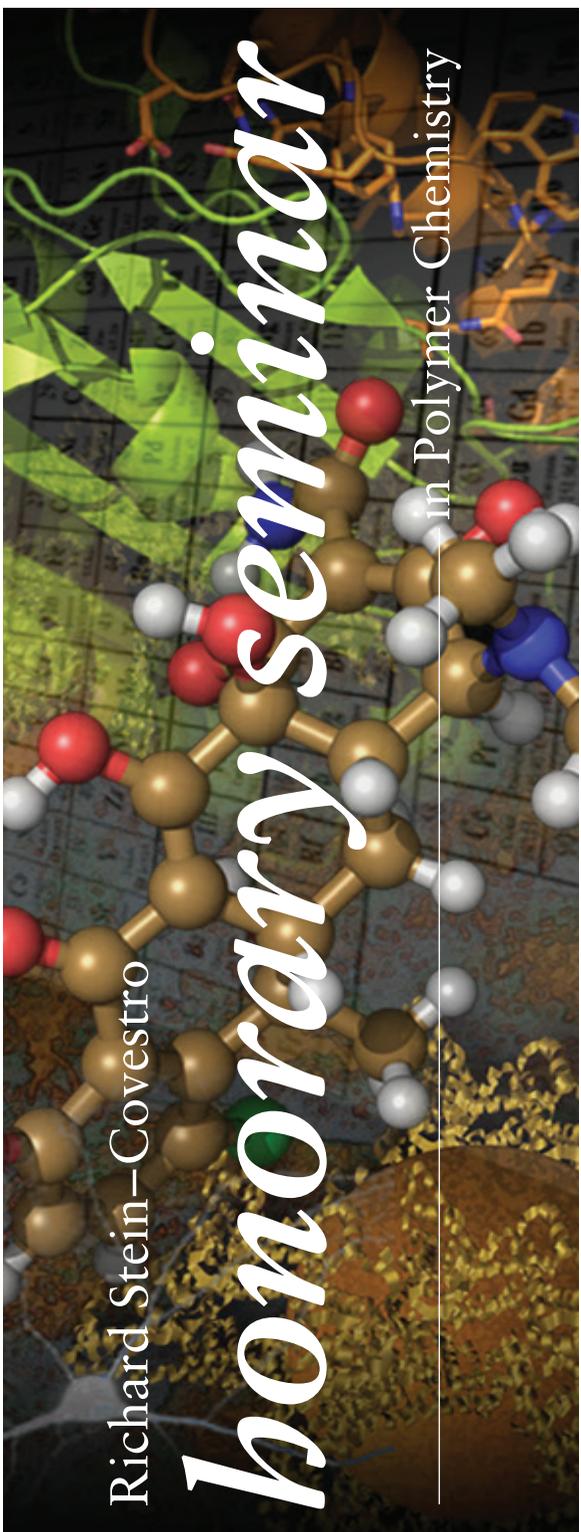
Covestro aims to meet this demand with long-lasting, light, environmentally friendly and cost-effective materials, which in many cases are suitable replacements for conventional materials such as steel and glass. The main segments served are the automotive, electrical and electronics, construction, medical, sports, and leisure industries.

At the backbone of their organization's success are its 16,200 employees, who work at around 30 sites across the globe – from smaller technical centers and innovation hubs, to large-scale production plants. Covestro's activities are coordinated from its corporate headquarters in Leverkusen, Germany, with sales of more than €14.1 billion in 2017. More at www.covestro.com.

Previous Stein-Covestro Speakers

Prof. Karen L. Wooley, 2017-2018
Prof. Krzysztof Matyjaszewski, 2016-2017
Professor Mitch Winnik, 2015-2016
Professor David A. Tirrell, 2014-2015
Professor Christopher Ober, 2013-2014
Professor Frank S. Bates, 2012-2013
Dr. Mohan Srinivasarao, 2011-2012
Professor James Heath, 2010-2011
Dr. Catherine Coleman, 2009-2010
Professor Edwin L. Thomas, 2008-2009

Professor George Whitesides, 2007-2008
Professor Julia Kornfield, 2006-2007
Professor Jean M.J. Fréchet, 2005-2006
Professor Samuel Stupp, 2004-2005
Dr. Craig J. Hawker, 2003-2004
Dr. Richard Turner, 2002-2003
Dr. Elsa Reichmanis, 2001-2002
Dr. Robert Langer, 2000-2001
Professor Robert H. Grubbs, 1999-2000
Professor Herbert Morawetz, 1998-1999
Dr. Robert L. Kruse, 1997-1998



Richard Stein – Covestro

Annives Kravonoy
in Polymer Chemistry

The Department of Chemistry, University of Massachusetts Amherst
presents

PROFESSOR PAULA THERESE HAMMOND

MIT, Department of Chemical Engineering

“Polyelectrolytes for Drug Delivery: from
Cancer to Wound Healing”

Thursday, September 6, 2018
11:30 a.m., 1634 LGRT
Refreshments at 11:00 a.m.

Paula Hammond

PAULA T. HAMMOND is the David H. Koch Chair Professor of Engineering at the Massachusetts Institute of Technology, and the Head of the Department of Chemical Engineering. She is a member of MIT's Koch Institute for Integrative Cancer Research, the MIT Energy Initiative, and a founding member of the MIT Institute for Soldier Nanotechnology. Her research in nanomedicine encompasses the development of new biomaterials to enable drug delivery from surfaces with spatio-temporal control. She also investigates novel responsive polymer architectures for targeted nanoparticle drug and gene delivery, and has developed self-assembled materials systems for electrochemical energy devices.



Professor Paula Hammond was elected into the National Academy of Engineering in 2017. She was elected into the National Academy of Medicine in 2016, and into the 2013 Class of the American Academy of Arts and Sciences. She is also the recipient of the 2013 AIChE Charles M. A. Stine Award, which is bestowed annually to a leading researcher in recognition of outstanding contributions to the field of materials science and engineering, and the 2014 AIChE Alpha Chi Sigma Award for Chemical Engineering Research. She has designed multilayered nanoparticles to deliver a synergistic combination of siRNA or inhibitors with chemotherapy drugs in a staged manner to tumors, leading to significant decreases in tumor growth and a great lowering of toxicity. Professor Hammond has published over 320 papers, and over 20 patent applications. She is the co-founder and member of the Scientific Advisory Board of LayerBio, Inc. and a member of the Scientific Advisory Board of Moderna Therapeutics.

ABSTRACT The alternating adsorption of oppositely charged molecular species, known as the electrostatic layer-by-layer (LbL) process, is a simple and elegant method of constructing highly tailored ultrathin polymer and composite thin films. We have utilized this method to develop thin films that can deliver proteins and biologic drugs such as growth factors with highly preserved activity from surfaces with sustained release periods of several days; manipulation of the film composition can lead to simultaneous or sequential release of different components, resulting in highly tunable multi-agent delivery (MAD) nanolayered release systems. The nature of the layering process enables the incorporation of different drugs within different regions of the thin film architecture; the result is an ability to uniquely tailor both the independent release profiles of each therapeutic, and the order of release of these molecules to the targeted region of the body. We demonstrate the use of this approach to release or present signaling molecules such as growth factors and siRNA and DNA to regulate genes to facilitate tissue regeneration in-situ, address soft tissue wound healing, deliver vaccines from microneedle surfaces, or administer targeted nanotherapies that are highly synergistic for cancer treatments. Poly(propargyl-L-glutamate) (PPLG), and similar polypeptides subsequently introduced, has enabled a broad range of new approaches to designing artificial polypeptide systems with properties that engage or mimic biology. Applications of these functional charged polypeptides to design systems toward active or responsive drug delivery applications, including the release of nucleic acid-protein complexes for enhanced RNA delivery will also be discussed.

RICHARD STEIN was born in Far Rockaway, New York in 1925. He was an undergraduate at Brooklyn Polytechnic, where he made some of the first light scattering studies of the dimensions of polymers in solution. He received his Ph.D. from Princeton for work with Professor Tobolsky on using birefringence and X-ray diffraction to study polymer orientational relaxation. He then spent a postdoctoral year at Cambridge University to extend his studies using infrared dichroism. Stein joined the University of Massachusetts Chemistry faculty in 1950, where he began his pioneering studies into the development of rheo-optical techniques for studying orientation and phase transition phenomena in amorphous, crystalline and liquid crystalline polymers. Stein initiated the Polymer Science and Engineering Department and now serves as Emeritus Goessmann Professor in Chemistry. He has over 400 publications, and has been consulting for companies such as Monsanto and Bayer for over 45 years.

Dr. Stein's efforts have been recognized by awards from the American Chemical Society, the American Physical Society, the Society of Rheology, the Society of Plastics Engineers, the Society of Polymer Science in Japan, and the Plastics Hall of Fame. In 1999, the Materials Research Society conferred on him its highest honor, the Von Hippel Award. He received a Distinguished Alumni Award from Polytechnic University in Brooklyn, and has been awarded three honorary doctorates. Dr. Stein was named to the National Science and National Engineering Academies, as well as the American Academy of Arts and Sciences. He was a member of the first delegation in Chemistry to the People's Republic of China.

Professor Stein is still actively involved in research. He was a founder of the Pioneer Valley Biochar Initiative, a member of the Planning Committee for the North American Biochar Symposium in 2013, and co-organizer of the UMass contribution to the National Teach-In for Global Warming Solutions, and of the New England Biochar Symposium, in 2009. He gives public lectures on the topic, and in 2011, he co-authored a book titled "The Energy Problem." In June of 2014, Prof. Stein was presented with a certificate

of Congressional Recognition for his outstanding service to UMass and to the community. In August of 2015, Senator Rosenberg presented Prof. Stein with an official Joint House Senate resolution recognizing his many accomplishments and contributions to the Commonwealth.



Richard Stein