THE OHIO STATE UNIVERSITY

The William G. Lowrie Department of Chemical and Biomolecular Engineering Graduate Program

Cordially invites you to attend a seminar on

Durable Surface Energy Control with Initiated Chemical Vapor Deposited (iCVD) Polymers

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Monday, October 21, 4 PM
430 Koffolt Lab
CBEC 151 W Woodruff Ave

Bio

Karen K. Gleason is the Alexander and I. Michael Kasser Professor of Chemical Engineering at MIT. She is a member of the National Academy of Engineering and a fellow of the American Institute of Chemical Engineering (AIChE). During her faculty career at MIT, Prof. Gleason served as Executive Officer of the Chemical Engineering Department, Associate Director for the Institute of Soldier Nanotechnologies; Associate Dean of Engineering for Research; and as Associate Provost. In the later role, she had primary responsibility for space allocation, planning, and management across the MIT campus. Additionally, she provided oversight for the Technology Licensing Office (TLO), the Industrial Liaison Program (ILP), and successfully led negotiations to establish significant new industry-sponsored alliances. Prof. Gleason has authored more than 300 publications, holds >35 issued US patents, and is sole editor of the book CVD Polymers Fabrication of Organic Surfaces and Devices, published by Wiley in 2015. She currently serves as a Deputy Editor for American Association for the Advancement of Science's journal, Science Advances. Prof. Gleason's honors include the Charles M.A. Stine Award from the AIChE, the Distinguished Women in Chemistry or Chemical Engineering Award from the International Union of Pure and Applied Chemistry (IUPAC), the Donders Visiting Professorship Chair at Utrecht University, Netherlands, the AIChE Process Development Research Award, and Young Investigator Awards from both the National Science Foundation and the Office of Naval Research. She has delivered the Van Ness Award Lecture at the Rensselaer Polytechnic University, the Tis Lahiri Lecture at Vanderbilt University, and the Adel Sarofilm Distinguished Lecture, University of Utah. Prof. Gleason is a co-founder of GVD Corporation and DropWise Technology Corporation. Her PhD is from the University of California at Berkeley and her BS and MS degrees are from MIT, where she also won All-American honors in swimming.

Abstract

Multiple iCVD homopolymer and co-polymer compositions have been employed for the tuning of surface energy from ultrahydrophobic to ultrahydrophilic and for fine-tuning the surface energy over much narrow ranges as well. The iCVD approach is particularly valuable for insoluble materials, including low-surface energy fluoropolymers and durable crosslinked networks. The iCVD surface modification layers can be ultrathin (<20 nm) and are able to conformally cover geometric features in the substrate. For iCVD poly(divinylbenzene) (PDVB), this combination of features enabled the controlled wetting and directed self-assembly of block co-polymers inside of confined features. Ultrathin and conformal iCVD fluoropolymers on aligned carbon nanotube stamps prevent densification of the stamp upon drying, enabling high-speed flexographic printing with nanoparticle inks.

Since film growth proceeds upwards from the substrate, iCVD offers the opportunity for interfacial engineering prior to beginning iCVD synthesis. Indeed, linker-free graftingcan be achieved in situ immediately prior to the iCVD growth on substrates from which hydrogen atoms can be abstracted. Linker-free grafted cross-linked PDVB layers display outstanding robustness and have served as a base layer for a covalent attached top layer of iCVD fluoropolymers. The grafted PDVB/fluoropolymer bilayers provide resistance against the attachment of ice and natural gas hydrates and even proved durable when sandblasted. Grafting is essential for tethering swellable hydrophilic surface modification layers. Indeed the durability of iCVD hydrogels and zwitterionic layers is greatly enhanced by grafting for the prevention of delamination.