DEPARTMENT OF CHEMISTRY AND ENVIRONMENTAL SCIENCE
SEMINAR SERIES
SPRING 2023

WEDNESDAY, MARCH 1, 2023
TIERNAN HALL – LECT. HALL 2
1:00PM-2:20PM

GUEST SPEAKER

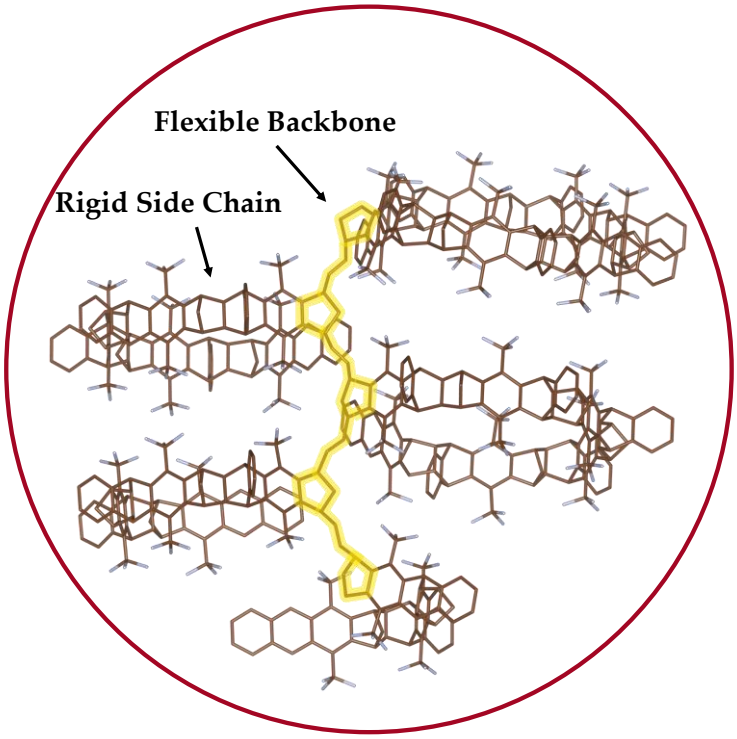
Dr. Timothy Swager
John D. MacArthur Professor
of Chemistry at the Massachusetts Institute of Technology
Cambridge, MA

TOPIC

Functional Porous Polymers from Bicyclic Bridged Building Blocks

ABSTRACT

The ability of triptycene and related structures to produce materials with unusual properties is simply remarkable. Beyond their initial utility in preventing self-quenching in emissive semiconducting polymers for chemical sensors, we have found that they can guide and enhance alignment to liquid crystals, produce high modulus low dielectric constant materials, functional as gas permeable materials, simultaneously give dramatic increases in strength and ductility of polymers, and provide for novel electronic interactions. In this lecture I will detail select examples from our recent triptycene polymer efforts including: (1) post-polymerization functionalization to give materials with high proton and anion conductivities, (2) scalable synthesis of materials that behave as chemical sponges for aromatic molecules, (3) polymerization of shape persistent iptycene macromonomers to produce high free volume materials, (4) the use of high free volume to create high performance gas separation membranes, (5) iptycene materials as stabilizing hosts for catalytic nanoparticles, (6) polymers and molecules with electronically active elements that communicate by homo-conjugation to give thermally activated delayed fluorescence and (7) photoredox catalysis.



BIO

Timothy M. Swager is the John D. MacArthur Professor of Chemistry at the Massachusetts Institute of Technology. A native of Montana, he received a BS from Montana State University in 1983 and a Ph.D. from the California Institute of Technology in 1988. After a postdoctoral appointment at MIT he was on the chemistry faculty at the University of Pennsylvania 1990-1996 and returned to MIT in 1996 as a Professor of Chemistry and served as the Head of Chemistry from 2005-2010. He has published more than 500 peer-reviewed publications and more than 120 issued/pending patents. Swager's honors include: Election to the National Academy of Sciences, an Honorary Doctorate from Montana State University, National Academy of Inventors Fellow, The Pauling Medal, The Lemelson-MIT Award for Invention and Innovation, Election to the American Academy of Arts and Sciences, The American Chemical Society Award for Creative Invention, The American Chemical Society Award in Polymer Chemistry, The Christopher Columbus Foundation Homeland Security Award, and The Carl S. Marvel Creative Polymer Chemistry Award (ACS). Swager's research interests are in design, synthesis, and study of organic-based electronic, sensory, energy harvesting, membrane, high-strength, liquid crystalline, and colloid materials. His liquid crystal designs demonstrated shape complementarity to generate specific interactions between molecules and includes fundamental mechanisms for increasing liquid crystal order by a new mechanism referred to as minimization of free volume. Swager's research in electronic polymers has been mainly directed at the demonstration of new conceptual approaches to the construction of sensory materials. These methods are the basis of the FidoTM explosives detectors (FLIR Systems Inc), which have the highest sensitivity of any explosives sensor. Other areas actively investigated by the Swager group include radicals for dynamic nuclear polarization, applications of nano-carbon materials, organic photovoltaic materials, polymer actuators, separation membranes, and luminescent molecular probes for medical diagnostics. He has founded five companies (DyNuPol, Iptyx, PolyJoule, C2 Sense and Xibus Systems) and has served on a number of corporate and government boards.

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