Northeastern University
College of Engineering

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Distinguished Seminar Speaker

Enabling Sub-Ambient Li-Ion Performance and Postoperative Anti-Adhesion Protection with Functional Material Design

Peter Kofinas, Ph.D.

University of Maryland

Professor and Chair | Dept. of Chemical and Biomolecular Engineering |

A. James Clark School of Engineering

Abstract: Abstract: Research in the Kofinas Laboratory focuses on the design, synthesis, and processing of functional materials for energy storage, printed electronics, and biomedical technologies. This presentation will focus on two complementary thrusts:
Electrolytes for lithium-ion batteries in extreme environments: We develop solid and water-based polymer electrolyte platforms engineered for improved safety and long-term reliability. A key emphasis is enabling stable ion transport at low temperatures, with target performance metrics that include broadened electrochemical stability windows and sustained ionic conductivity under sub-ambient conditions relevant to cold-weather and extreme-environment operation.
Anti-adhesion biomaterials for surgery: We design biodegradable, functional polymer blends to mitigate postoperative adhesions. Using solution blow spinning, we directly deposit conformal fibrous mats onto wet and irregular tissue surfaces. Upon warming to body temperature, these fibers transition into protective films that adhere selectively, provide localized coverage, and degrade on a controlled timeline. These features intended to support use across abdominal, cardiac, and gynecologic procedures. Across both thrusts, we integrate polymer chemistry, transport and electrochemistry, interfacial science, and scalable processing, paired with application-driven testing. The overarching goal is to translate functional polymer systems into safer lithium-ion batteries and clinically practical anti-adhesion barriers suitable for operating-room deployment.

Biography: Peter Kofinas is Professor and Chair of the Department of Chemical and Biomolecular Engineering at the University of Maryland (since July 2017). A member of the UMD faculty since 1996, he previously served as Associate Dean for Faculty Affairs and Graduate Programs in the A. James Clark School of Engineering and also as Equity Officer and Diversity Officer. He holds affiliate (courtesy) appointments in Bioengineering and in Materials Science and Engineering. Kofinas earned his SB and SM in Chemical Engineering from MIT in 1989 and a PhD in Polymers from MIT in 1994, followed by two years as a postdoctoral associate in MIT's Department of Chemical Engineering. He directs the Functional Macromolecular Laboratory (FML; fml.umd.edu), which advances functional polymers for medicine and pharmaceutics, energy storage, and microelectronics. His group focuses on the synthesis and structure-property relationships of complex polymer architectures, with current projects in lithium-ion battery electrolytes, additive manufacturing for printed electronics, and sprayable surgical materials to prevent postoperative adhesions. Kofinas is a recipient of the NSF CAREER Award and the Clark School's Outstanding Junior Faculty Teaching, Senior Faculty Outstanding Research, and Faculty Outstanding Service awards. He holds the endowed Keystone Professorship for excellence in undergraduate teaching and is also an Engaged Faculty Award honoree. Born in Switzerland and raised in Greece, he is bilingual in French and Greek and speaks fluent English, German, Spanish, and Italian. A former concert pianist, he is currently a Brazilian Jiu-Jitsu purple belt.

Department of Chemical Engineering
201Cullinane Hall
Northeastern University
360 Huntington Avenue
Boston, MA 02115