Materials Science and Engineering Department

Spring Seminar Series

Layer-by-layer Assembly of Two-dimensional MXene Nanosheets with Polyelectrolyte for Applications in Sensing and Energy Storage

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3-4PM | Hill Seminar Room (LeBow 240)

A broad family of two-dimensional ceramic nanosheets referred to as MXenes have caught the world's attention because of their wide compositional diversity and tailorability to different engineering applications, including energy storage, catalysis, electromagnetic interference shielding, sensors, composites, and batteries. One challenge is to translate these applications into a thin-film platform.

This presentation will discuss the water-based solution-assembly of two-dimensional MXene nanosheets with polyelectrolyte using the layer-by-layer assembly technique. This approach produces conformal MXene-based coatings on a variety of surfaces including hydrophobic poly(dimethylsiloxane), glass, thread and fiber, and silicon. The result is a conformal coating consisting of a brick-and-mortar-type architecture with tunable layer thicknesses. We take advantage of the MXene-polymer morphology to demonstrate strain, humidity, and pH sensors, as well as electrodes for electrochemical energy storage. We close with discussion of some of the major challenges for keeping MXenes chemically and colloidally stable which is essential for advanced manufacturing.

Jodie L. Lutkenhaus is holder of the Axalta Chair and Professor in the Artie McFerrin Department of Chemical Engineering at Texas A&M University. Lutkenhaus received her B.S. in Chemical Engineering in 2002 from The University of Texas at Austin and her Ph.D in Chemical Engineering in 2007 from Massachusetts Institute of Technology. Current research areas include polyelectrolytes, redox-active polymers, energy storage, and composites. She has received recognitions including World Economic Forum Young Scientist, Kavli Fellow, NSF CAREER, AFOSR Young Investigator, and the 3M Non-tenured Faculty Award. She is the past-Chair of the AICHE Materials Engineering & Sciences Division. Lutkenhaus is the Deputy Editor of *ACS Applied Polymer Materials* and a member of the U.S. National Academies Board of Chemical Sciences & Technology.

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