UC San Diego
JACOBS SCHOOL OF ENGINEERING
NanoEngineering

UCSD NanoEngineering/Chemical Engineering

SPECIAL SEMINAR

DATE: February 13th 2020

Seminar Presentation: 2:30pm-3:30pm

SME room 248

"Atomic Layer Processing for Water and Energy Technologies"

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Abstract: Rising population and global economic growth has led to an increased demand for technologies that address water scarcity or enable the use of intermittent energy sources. However, many proposed innovations in areas that could address these issues (e.g. membrane separations, energy conversion) will require the ability to create nanomaterials with unprecedented structural and compositional control. In this presentation, I will discuss the tremendous potential of using atomic layer processing tools, such as vapor-phase infiltration and molecular layer deposition, to create these materials while also answering important questions about the fundamental behavior of molecules in these systems.

First, I will show how polymer conductive membranes can be made from existing polymer membranes using a combination of laser pyrolysis and alumina infiltration. These low-cost devices leverage electrical current for advanced water treatment and water quality monitoring approaches. I will then discuss a relatively new approach for making precise nanomaterials called molecular layer deposition, along with my work to create new chemistries and study the fundamental growth behavior of this process. Lastly, I will describe how molecular layer deposition can be used to grow catalysts for water-to-fuels reactions, highlighting how this tool can open the door to many future improvements in water and energy technologies.

Educational Development and training: This talk will further highlight the importance of collaboration in scientific research, the power of well-designed simple experiments for gaining insight, and the impact of re-framing negative results into new insights.

Biosketch: David Bergsman is a postdoctoral associate in materials science and engineering at the Massachusetts Institute of Technology. He completed his undergraduate studies in chemical engineering at the University of Washington and his PhD in chemical engineering at Stanford University, which was funded by an NSF GRFP fellowship and the Stanford Gerald J. Lieberman award.

His PhD research with Professor Stacey F. Bent focused on the development of molecular layer deposition, a layer-by-layer vapor-phase tool for creating ultrathin organic and hybrid organic-inorganic films with sub-nanometer compositional control. His postdoctoral work with Professor Jeffrey C. Grossman aims to make cheap, conductive membranes out of existing polymer membranes, that can be used for advanced water treatment processes, separations, and sensors.