UW Chemical Engineering

Fall 2013 Seminar Series

Date: Monday, November 18
Time: 4:00 - 5:00 p.m.
Place: PAA A114
Topic: *Understanding and Exploiting Proteins in Unusual Places*

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Biography

Joel Kaar is an Assistant Professor in the Chemical and Biological Engineering Department at the University of Colorado Boulder. He received his BS and PhD in chemical engineering from the University of Pittsburgh and was postdoctoral fellow at the Medical Research Council Centre for Protein Engineering in Cambridge, England, in Professor Sir Alan Fersht's group. His group's interests cover a variety of topics in protein engineering, including protein folding, structure-activity relationships of proteins in extreme environments, and protein design for rational incorporation into polymeric materials. Joel has received several awards, including the 2012 US Army Research Office Young Investigator Award.

Abstract

A major area of interest in our group is the use of enzymes in neat ionic liquids, a unique class of reaction solvents with attractive environmental and chemical processing properties. The overall aim of our work in this area has been to elucidate how the solvent environment of ionic liquids impacts enzyme structure and activity. While investigating this impact, we have developed a novel approach to rationally improve enzyme stability in ionic liquids via charge engineering. Moreover, we have also developed a novel approach to directly probe the impact of near-surface environments on protein conformation using dynamic single-molecule microscopy. This approach exploits high-throughput FRET tracking to elucidate structural changes in proteins at the single molecule level. Using this approach, such changes, may, in turn, be connected with interfacial dynamic measurements, offering unprecedented insight into surface-induced effects on protein function. Application of this approach will ultimately lead to a profound understanding of the dominant physico-chemical factors associated with the inactivation of proteins on material surfaces. More broadly, this approach, which is widely applicable to virtually any protein, provides the framework to develop surfaces and surface modifications with improved biocompatability.