Colloquium

Dr. Trung Dac Nguyen

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"Engineering materials from bottom up for bioremediation applications"

Monday, February 25, 2019

4:00pm—5:15pm

190 Goodwin Hall

The accumulation of mismanaged organic waste and toxins in insecticides and warfare agents poses serious environmental threats to the ecosystem and human health. Bioremediation provides an effective means to address these issues, for instance, by using cleaning agents containing enzymes that break down the pollutants into more bio-friendly products. The ability to maximize the catalytic activity of those enzymes out of their native media will enable industry-scale bioremediation applications for a wider variety of pollutants. In this talk, I will discuss a recently proposed bottom-up approach for stabilizing enzymes in organic solvents, where the enzymes are mixed with copolymers that are composed of hydrophobic and hydrophilic monomers arranged in disordered sequences. These so-called random heteropolymers possess a rich diversity in monomer sequences, which plays a vital role in reducing the enzymes' exposure the unfavorable solvent. This helps explain why the proposed approach is superior to the often-used reverse-micelle techniques in retaining the activity of numerous types of enzymes in toluene. Furthermore, the collectivity in the interaction between the polymers and enzymes upon assembly is predicted to lead to the uniform size of the assembled complexes, which is important for their solubility and delivery. These outstanding features of the random heteropolymer approach suggests new possibilities for engineering protein-based materials for applications much beyond bioremediation.

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