KANSAS STATE UNIVERSITY

Department of Chemistry

King Hall 04
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1:30pm
Coffee and Cookies provided @ 1:15pm

Modular Self-Assembly to Develop Protein-Engineered Nanomaterials

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Departmental Seminar

Abstract

Proteins are biological polymers that fold and bind to each other through specific interactions. This unique property of proteins makes themselves attractive as molecular "building blocks" that self-assemble into sophisticated nanoscale structures. The exceptional structural features at the nanoscale as well as remarkable biocompatibility and biological functionalities of proteins offers great potential to engineer protein nanomaterials for innovative technological advances in biotechnology. However, the complexity that arises from understanding and manipulation of protein folding or protein-protein interactions has significantly limited the capability to design protein nanomaterials. In this talk, I will present a rational approach to developing protein nanomaterials through modular self-assembly of recombinant protein building blocks. The recombinant fusion proteins were designed by modular combination of well-characterized protein motifs and domains into building blocks. Upon precise controls over the self-assembly processes, the protein building blocks self-assembled into designed nanoscale supramolecular structures. Specific interactions between protein modules and their arrangement within designed fusion proteins are important design parameters, which dictate the dimension, morphology, and properties of self-assembled supramolecular nanostructures. In examples exploiting different protein modules, the modular self-assembly approach was successful to create nanostructures with various structural features. I will discuss two special structures, nanoscale triangles and hollow cages. Future work will be focused on development of next-generation protein nanomaterials that present novel properties for applications in advanced biotechnology.