CHEMISTRY & BIOCHEMISTRY COLLOQUIUM:
Protein Cages as Platforms for Bioinspired Materials Synthesis Across Multiple Length Scale

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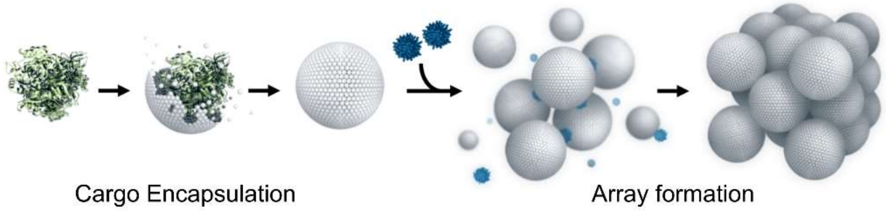
Time:
1:30 PM-2:50 PM

Link:
COB1 267

About the Speaker:

Dr. Uchida received a Ph.D. in Materials Chemistry from Kyoto University, Japan, where he studied inorganic materials for bone substitutes under the guidance of Professor Tadashi Kokubo.

He was then awarded a post-doctoral fellowship of the Japan Society for the Promotion of Science to research biomimetic synthesis of hydroxyapatite-protein composites in the laboratory of Dr. Atsuo Ito at the National Institute of Advanced Industrial Science and Technology, Japan. He subsequently joined the laboratory of Professor Trevor Douglas at Montana State University, where he studied the use of cage-like proteins as supramolecular templates for nanomaterials synthesis. Prior to joining California State University, Fresno in 2018, he was an Associate Scientist at Indiana University.s of new materials synthesis accomplished by using protein cages as nanoscale platforms.



Abstract:

Biology provides much inspiration to develop advanced materials with properties beyond those currently available. Biomineralization is one example from which we can draw inspiration to develop inorganic-organic hybrid materials with unique chemical, physical and mechanical properties under mild synthetic conditions. An example is the biomineralization of iron oxides in the cage-like protein ferritin and a range of biomimetic nanoparticle syntheses using ferritin as a template. Virus capsids can also be exploited as versatile nanoscale platforms for materials synthesis. Protein cages conceptually have two surfaces that are synthetically useful: the interior and the exterior of the cage. For example, these protein cages can be used as size-constrained nanoscale reaction vessels to synthesize and accumulate nanoparticles inside of the cages. They can also accommodate the introduction of functionality such as cell-targeting capability, either chemically or genetically, on their exterior surface. Incorporation of multiple functionalities within these protein architectures has demonstrated their potential to serve as functional nanomaterials with various applications including in medical imaging and therapy. Furthermore, protein cages are ideal building blocks with which to construct higher-order assemblies (i.e. 3D arrays) with potential collective behavior and properties arising from the interaction between the individual building blocks. This is, in part, because the size and morphology of the protein cages nanoparticles are very homogeneous and a wide range of functionalities can be imparted into the cages. Directed assembly of protein cage nanoparticles into array materials has recently been demonstrated. I will present some representative examples of new materials synthesis accomplished by using protein cages as nanoscale platforms.

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