Biofabrication with Viral Nanotemplates for Nanocatalysts and Biosensing Platforms

Hyunmin Yi*
Department of Chemical and Biological Engineering, Tufts University
(hyunmin.yi@tufts.edu*)

Viral assemblies are attractive nanotemplates for materials synthesis due to their precisely controlled dimensions and the ability to confer additional functionalities via genetic modification. We exploit several unique properties of tobacco mosaic virus (TMV) for facile synthesis of catalytically active palladium (Pd) nanoparticles and fabrication of biosensing platforms. For nanocatalysis, we studied size-controlled synthesis, thermal stability and the TMV's fundamental role in the nanoparticle formation via small angle X-ray scattering. Two Pd-catalyzed reactions, dichromate reduction for environmental cleanup and Suzuki coupling reaction for efficient chemical synthesis, are enlisted to investigate the catalytic activity, stability, and reaction mechanisms. For biosensing, we utilize TMV's dual functionality along with simple replica molding to fabricate high-capacity biomolecular assembly platforms. In this presentation, our recent progress on the spontaneous Pd particle formation, integration of Pd-TMV complexes into microparticle scaffolds, and fabrication of chitosan-conjugated hybrid microparticles will be highlighted.