Title:	Nanoparticle Fabrication on Bacterial Microcompartment Surface for the Development of Hybrid Enzyme-Inorganic Catalyst
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Abstract:	Bacterial microcompartments (MCPs) are polyhedral organelles containing an enzyme cluster wrapped inside a protein shell and carry out specific enzyme reactions in bacteria. These organelles have been explored meticulously using genetic, structural, and biochemical tools; however, their application in material science has not been explored much. In this study, we have used the external shell surface of MCP as a scaffold for the fabrication of gold nanoparticles displayed in 3D. This resulted in the formation of a protein scaffolded gold nanoparticle shell enclosing an active enzyme cluster. The surface scaffolded gold nanoparticles demonstrated standard catalysis, while the internal enzyme cluster of the MCPs demonstrated no loss in activity due to this fabrication. Under ambient conditions for in vitro inorganic reaction, the shell proteins sturdily maintain the barrier between the luminal enzyme and the surface inorganic catalysts and preserve the functionality of the core enzyme cluster. The MCP-AuNPs hybrid catalysts inspire a pristine class of resources that can be used in a chemical reaction condition without perturbing core biological environment for enzymatic activity. This system provides insight for fabricating uniform size nanoparticles in 3D for the development of orthogonal hybrid catalytic material.
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