

## One-step Synthesis of Various Metal Nanoparticles in Lipid Bilayer Vesicles

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Metal nanoparticle–lipid bilayer vesicle hybrid nanoparticles have attracted much attention in a variety of biomedical fields ranging from diagnosis to therapy owing to their improved physicochemical properties, compared to metal nanoparticles alone. However, low selectivity for such hybrid structures still remains challenging issue. Here we propose one-step synthesis of metal nanoparticles in lipid bilayer vesicles with higher selectivity. Our proposed method utilizes the spontaneous diffusion of metal complexes into the lipid bilayer vesicles where a reducing agent is loaded in advance, followed by the growth of metal nanoparticles via the reduction of the metal complex inside the vesicle. The size of the hybrid nanoparticle is as small as 30 nm and can be increased up to 200 nm, depending on the size of the vesicle. Based on our method, we also tried to synthesize various metal nanoparticles in the vesicle. The as-synthesized hybrid nanoparticles are well characterized by TEM, UV-vis spectrophotometer. In addition, colloidal stability under biologically relevant solutions and endocytosis efficiency of the nanoparticle are systematically investigated.