

Preparation of Multifunctional Colloidal Fluids using Layer-by-Layer Assembly

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We prepared multifunctional solvent-free colloidal fluids with magnetic, electric, and optical properties using layer-by-layer (LbL) assembly. In organic media, amine-functionalized dendrimer and oleic acid-Fe₃O₄ nanoparticles (OA-MP) were alternately adsorbed onto SiO₂ colloids using in-situ ligand exchange-induced LbL assembly. And then, PSS and QDs stabilized by thiol-functionalized imidazolium-type ionic liquids were coated onto the OA-MP-coated colloids by electrostatic interaction in aqueous solution. These colloidal fluids show superparamagnetism, photoluminescence, ionic conduction, and liquid-like behavior without addition of any solvent. Furthermore, mixtures of photoluminescent colloidal fluids with and without OA-MP behaved as magneto-optically separable colloidal fluids. Because various functionalities can be controlled into colloids via LbL-assembly, our approach can provide a basis for multifunctional colloidal fluids with liquid-like behavior at room temperature.