Oriented Assembly of Functional Mesoporous Materials with Multi-Level Architectures

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Functional mesoporous materials with multi-level architectures possess both unique properties of high surface area, large pore channels and volume based on mesostructures, and abundant optical, electrical, magnetic properties based on inorganic nanomaterials, showing great potential applications on catalysis, adsorption, separation, biomedicines and so on. Here we present the development and progress for the synthesis of the functional mesoporous nanoparticles from novel "oriented assembly" strategy by interfacial control. A series of new synthesis approaches have been developed based on the oriented assembly strategy in my group, including the confined micro-emulsion self-assembly, liquid-liquid bi-phase synthesis, evaporation-driven oriented/aggregation assembly, anisotropic growth of mesoporous, interface driven orientation arrangement, interfacial dynamic migration strategy *etc.* Novel mesoporous nanomaterials with one-level and multi-level architectures can be well synthesized, such as core-shell, yolk-shell, multi-shell, film structures for silica, TiO_2, carbon spheres, 3D mesoporous bouquet-posy-like TiO_2 multi-level superstructures and asymmetric Janus, single-hole hollow structure, nano-thermometer, multipods nanostructure, hemispheres, streamlined nanotadpoles *etc.* The obtained functional mesoporous nanomaterials with regularly multi-level architectures possess uniform and controllable mesopore channels, high surface area, large pore volume, open frameworks and unique fluid mechanics showing great potential applications on catalysis, adsorption & separation, biomedicines and energy conversion & storage.

References:

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