POLYMER/INORGANIC CORE-SATELLITE NANOCLUSTERS AS MODEL SYSTEMS TO UNDERSTAND THE FATE OF NANOHYBRID MATERIALS IN BIOLOGICAL MEDIA

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Key message 1. Structurally precise nanoarchitectures with specific functionalities are represented by core–satellite polymer-inorganic nanohybrids[1]. The inorganic components of the nanohybrids contribute distinct size, shape, and composition-dependent properties such as optical effects[2], while soft polymeric component is responsible for structural flexibility and facilitates interactions with the surrounding environment. These properties combined enable the generation of nanotheranostic agents[3]. Here, we integrate distinct patterns of behavior into those polymer-inorganic nanoclusters to generate model system for establishing the fate of such nanomaterials in biological environments.

Key message 2. The NIPAM-co-DMAM (poly(*N*-isopropylacrylamide-co-*N*,*N*-dimethylacrylamide)) random copolymers with lower critical solution temperature (LCST) close to the normal human body temperature were synthesized *via* reversible Addition-Fragmentation chain Transfer (RAFT) polymerization using difunctional pH-labile RAFT agent bearing ketal moiety. Hybrid AuNP-core/random-copolymer-shell particles were obtained according to a “grafting-to” approach. The study of colloidal stability in a buffer solution (0.1 M PBS) of gold nanoparticles was carried out using light scattering techniques. Core–satellite nanostructures were assembled by adding smaller AuNPs to the precursor core–shell particles.

Key message 3. This work highlights the versatility of the RAFT polymerization technique in constructing hierarchical nanostructures with tunable degradation profiles that can adapt to various physiological conditions, such as lysosomal pH. Observation of aggregation due to the detachment of polymer chains from the surface of modified gold nanoparticles in a buffer solution, as evidenced by a gradual increase in the hydrodynamic volume, is also of particular importance to establish the stability under biologically relevant conditions. The reported modular assembly strategy toward stimulus-responsive clusters opens up systematic investigations of structure-effect relationships for assessing toxicity, biodistribution, and ultimately optimized design criteria toward a new generation of nanotheranostic agents.

References are mandatory:
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