Host-guest engineered stimuli-responsive nanocapsules

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Abstract

The supramolecular self-assembly of materials through host-guest interactions is a powerful tool to create non-conventional materials. Thus, biodegradable nanocapsules with redox-/or light-responsibility were fabricated with non-covalent interactions between βCD and ferrocene (Fc)/or αCD and azobenzene (Azo) units. Different biocompatible polymers, dextran-βCD (βCD-Dex) and dextran-ferrocene (Fc-Dex), dextran-αCD (αCD-Dex) and dextran-azobenzene (Azo-Dex) were assembled in alternating way on gold nanoparticles of two different sizes (100 and 400 nm). The gold nanoparticles were removed by chemical degradation and rhodamine B (RhB) was encapsulated inside the carriers as a model drug. The encapsulation process of the dye molecules was accelerated by oxidation step or by UV-light of the nanocapsules wall, thus enabling easier and faster diffusion through the polymer layers. Confocal laser scanning microscopy (CLSM), scanning electron microscopy (SEM), atomic force microscopy (AFM), RAMAN spectroscopy, UV-spectroscopy and dynamic light scattering (DLS) measurements were employed for the characterization of the nanocapsules.

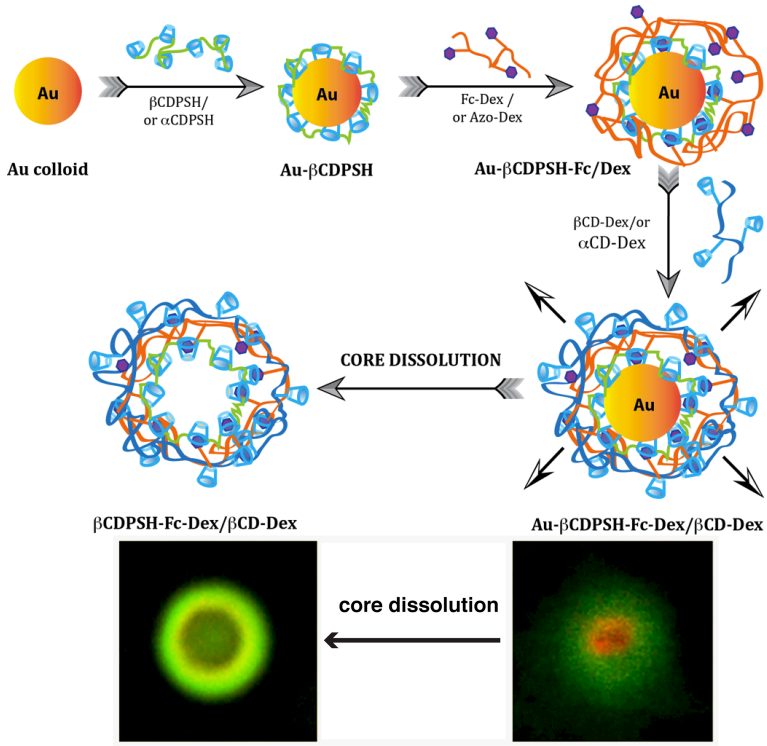

Figure 1. Schematic representation of the formation of LbL self-assembled nanocapsules via host-guest interactions between complementary βCD and Fc appended dextran polymers (the same methodology was applied for the αCD/Azo appended dextran polymers).

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