pH-responsive hollow polymeric capsules

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Hollow polymer capsules have stimulated increasing scientific and technological interest in the field of materials science and engineering because of their numerous potential applications in drug delivery, catalysis, paints and electronic materials. [1] Their preparation has been reported using different methods such as the layer-by-layer assembly of oppositively charged polyelectrolytes onto inorganic nanoparticles or the use of a polymerization process to form a polymer shell onto organic or inorganic nanoparticles, followed by the selective degradation of the nanoparticle core. [2] The synthesis of hollow capsules that respond to changes of external stimuli, i.e. solution temperature and pH [3], electric or magnetic field, etc, by altering the size and permeability of the capsule wall, is particularly attractive.

In this work, we report the synthesis of ionizable hollow capsules based on a cross-linked polyacid, poly(methacrylic acid) P(MAA), or polybase, poly(2-(diethylamino)ethyl methacrylate) (PDEA), shell, which respond to changes of the solution pH. The preparation of the ionizable hollow capsules involved first the synthesis of polymer microgels particles with a core-shell topology, using a two-step emulsion polymerization process, followed by the selective removal of the microgels' cores. The latter was achieved by either using an acid labile cross-linker in the core or the synthesis of non-cross-linked latex core particles surrounded by a cross-linked shell using a non-degradable cross-linker. [4] After synthesis, the core was removed by washing in a common solvent for the core and the shell of the particles.

Finally, the hollow capsules were characterized by dynamic light scattering, potentiometric titrations and electron microscopy in order to confirm their hollow structure and verify their responsive behaviour.

References

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