

From nanoparticles to complex nanocapsules

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Functionalized nanoparticles and complex nanocapsules are of high interest in materials and biomedical applications. The miniemulsion technique is a convenient and powerful tool for the preparation of the specified polymeric particles or capsules with sizes ranging from 50 to 300 nm. The basic step for the particle preparation is the formation of a stable miniemulsion with narrowly distributed droplets of the monomer. The particles are subsequently formed by polymerization of the respective monomer. Functionalized particles with different encapsulated materials were synthesized through a radical, anionic, enzymatic, or oxidative polymerization process. Also polyaddition or polycondensation processes for the formation of nanoparticles can be performed. Different materials ranging from solid materials like pigments or dyes to liquids like perfumes or drugs can be encapsulated. Such capsules give the possibility to protect the encapsulated material from the influence of the environment. A functionalization of the nanoparticles and nanocapsules allow one a very specific interaction with or binding with surfaces and interfaces. A release of the nanocapsules can be obtained either by diffusion processes, degradation of the shell material or by smart switches inside the nanocapsules which can be activated by a temperature, pH change, by light or enzymes.