Synthesis of organic/inorganic nanostructured colloids by RAFT-mediated emulsion polymerization

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In the last decade, interest in colloidal particles with complex shapes that combine organic and inorganic parts has increased considerably due to the potential benefits of these nano-objects in multiple areas of material science. Among the various approaches, polymerization in aqueous dispersed media such as emulsion polymerization has emerged as a method of choice for the preparation of composite colloids [1]. However, the currently available strategies still have limitations that make them ineffective to encapsulate a variety of inorganic particles, especially those with shape anisotropy. With the recent developments in controlled radical polymerization techniques in aqueous medium, new approaches to obtain hybrid latexes with different particle morphologies are possible, opening new and promising directions for the synthesis of colloidal nanocomposites [2].

This presentation describes the synthesis of organic/inorganic nanostructured colloids based on various types of inorganic particles such as cerium oxide [3], silica [4] or iron oxide particles, Imogolite nanotubes, and Laponite, Montmorillonite or layered double hydroxide clay platelets using an innovative waterborne surfactant-free emulsion polymerization process. This process relies on the use of physically adsorbed macromolecular control agents (macroRAFTs) to promote the growth of a hydrophobic polymer shell or of discrete polymer nodules on the inorganic surface, through controlled radical polymerization via *in situ* formation of block copolymers (*Figure 1*). This method not only affords an effective means for the synthesis of composite latexes free of molecular surfactant, but also opens up new opportunities for the rational design of nanocomposite materials with spatially arranged inorganic inclusions.

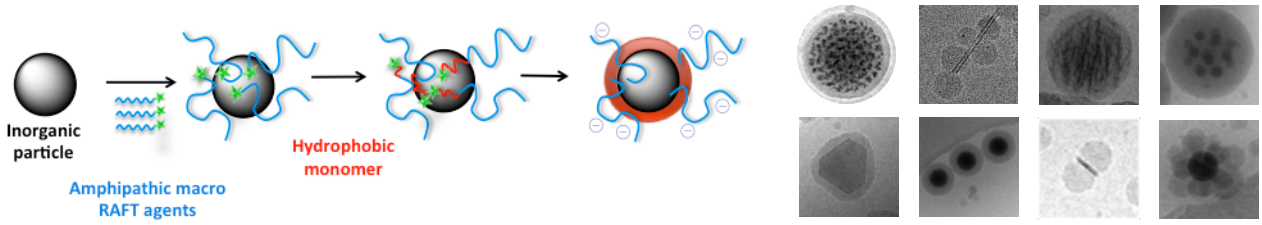

Figure 1 Scheme illustrating the process used to synthesize organic/inorganic composite particles via macroRAFT-mediated emulsion polymerization (RAFT stands for Reversible Addition-Fragmentation chain Transfer).

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