FUNCTIONAL HAIRY PARTICLES AND SURFACES VIA BLOCK COPOLYMER STABILIZED EMULSION POLYMERIZATION

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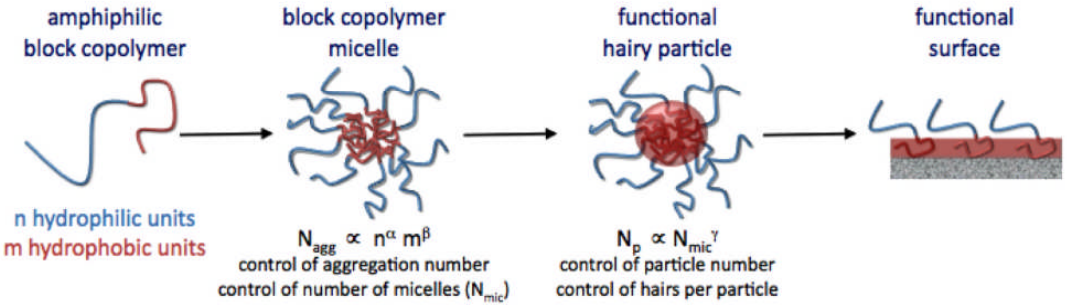
ABSTRACT

Polymer nanoparticles with functional groups on their outside are receiving an increasing research interest, especially for their potential use in biomedical applications. Instead of "clicking" functional chains onto the particle surface, a commonly used technique at present, we have chosen an *ab initio* approach in which we already introduce the functional groups at the beginning of the particle synthesis. We do this by using block copolymer surfactants as stabilizers in emulsion polymerization and so produce functional hairy particles. With the desired functionality present in the hydrophilic block, it will end up in the outer shell, i.e., the "hairy layer", of the particles.

Using this approach, it should also be possible to control the number of "hairs" per particle, as (depending on the respective block lengths) the block copolymer micelles can act as a polymer seed for emulsion polymerization, resulting in a one-to-one conversion of micelles into particles.[1] If, additionally, the aggregation number of block copolymers in the micelles is known (and controllable via scaling laws), then the number of blocks per particle is known. Finally, if the block copolymers show sufficient mobility during film formation of the functional latex, it should be possible to create functional surface coatings. This process, which we intend to control completely is schematically shown in Scheme 1.



Scheme 1

It is clear that the nature of the hydrophilic block will determine the surface properties of the functional polymer films. In the current presentation we will focus on the results we obtained using four different block copolymer surfactants:[2] one with a cationic hydrophilic block, one with a glycopolymer block, one with the hydrophilic block containing PEG-brushes and finally one that consists of two poly(oxazoline) blocks.

References:

[1] Burgière, C. *et al.*, *Polymer* **2003**, *44*, 509.
[2] (a) Muñoz-Bonilla, A. *et al.*, *Macromolecules* **2011**, *44*, 4282; (b) Muñoz-Bonilla, A. *et al.*, *Soft Matter* **2011**, *7*, 2493.