

Polymeric microspheres: morphologies and functions

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There is a growing interest in designing polymeric nano- and micro-particles. It is related with the recent trend to look forward to specialty particles in civic life and industry. Namely, advanced science and technology require sophisticated functions and performance of particles, which emerge from the particles with well-designed structures in terms of the nature of the polymer, the size and size distribution, shape and morphology. Here, “morphology” includes external its shape such as flat, needle, red cell-like, hemisphere, and dumbbells-shaped ones, and that of the inner structure such as core-shell, onion-like, hairy, brush, and microphase-separated structures. Organic/inorganic composite particles also belong to this category. This special issue of *Colloids and Polymer Science* on “Morphologies and Functions of Polymeric Microspheres” focuses on such morphologies.

Various methods were challenged to prepare morphologically unique particles in this issue. Most polymer particles are generally prepared by heterogeneous polymerization via radical chain reaction or ring-opening polymerization in water. These polymerizations result in the formation of spherical particles in most cases because the polymer-monomer/medium interfacial energy requires a minimum

of the surface area of each particle. This situation can be adjusted by changing the components such as the medium, co-monomers, and stabilizers or the reaction conditions such as monomer feed process and temperature and this often leads to form morphologically unique particles. Conjugation of inorganic materials with polymer particles could be done successfully by several methods. Phase separation in growing particles during the co-polymerization is a promising ways to obtain particles with non-spherical shape and heterogeneous inner structure.

Another method to prepare morphologically unique particles is modification of the surface of pre-existing particles. Seeded polymerization is a versatile method to obtain a variety of particles with unique inner structures as well as uneven-shaped particles. The non-spherical particles thus obtained exhibit unique rheology of the dispersion and characteristic optical function. Grafting-from and grafting-to methods became popular to prepare hairy or brushy particles. In addition to these methodologies, assembling of polymer molecules dissolved in solution contributes to formation of functional particles with designed morphology.

Thus, obtained particles were used for and in a variety of applications such as optoelectrical devices, coloring or fluorescent material, drug delivery, bio-sensors, bio-separators, lubricants, catalysts, etc.

This issue includes 24 selected papers dealing with the recent development in “Morphology and Functions of Polymeric Microspheres”. This issue would stimulate the researchers in this field and give many suggestions to the researches in interdisciplinary fields.

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