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Polyelectrolyte-modified Template Phases for the Nanoparticle Formation

Due to their extraordinary magnetic and optical properties semiconducting (i.e. quantum dots) and noble metal (e.g. gold) nanoparticles have received much attention in the field of biomedical applications. Non-toxic and biologically inactive quantum dots and gold nanoparticles have shown great promise for example in biolabeling of DNA, proteins and cells, tumor targeting, and lymph node imaging.

Key parameters in such applications are the particle size and particle size distribution on the one hand and the shape of the particles on the other hand. In addition the requirements of biocompatibility must be fulfilled. Therefore, biodecorated nanoparticles are of special interest.

For controlling the particle size and shape during the particle synthesis template phases can be very helpful. For example microemulsions, i.e. thermodynamically stable nanostructured systems, can be successfully used for producing spherical particles inside of the droplets, and vesicular structures for producing asymmetric particles outside of the vesicles.

It is shown that polyelectrolytes (PEL) can modify the template phase and control the particle growing process. In microemulsions the surfactant film stability can be tuned for example in presence of polyampholytes by changing the pH [1].

The fluorescence behavior of the finally obtained CdS quantum dots mainly depends on the type of polyelectrolyte used.

In vesicular template phases the PEL can induce a morphological transformation of the template phase [2], opening the possibility to form rod-like and triangular gold nanoparticles.

Biography

Joachim Koetz studied chemistry at the Martin-Luther University Halle/Wittenberg and obtained his PhD in 1986 from the Academy of Science. He worked in the Institute of Polymer Chemistry in Teltow-Seehof, and since 1994 he has been Professor of Colloid Chemistry at the University of Potsdam. His main interests are polyelectrolytes, liquid crystalline systems and microemulsions as template phases for the nanoparticle formation. He published above 140 papers (including 2 books and above 10 book chapters), and gave more than 100 lectures at national and international conferences.