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S E M I N A R
aus
Halbleiterphysik und Nanotechnologie

Mo, 14.1.2019, 11:15 Uhr, Hörsaal für Physik

"Tailoring biomolecular interactions of core-shell nanoparticles and their application to magnetically controlled vesicles"

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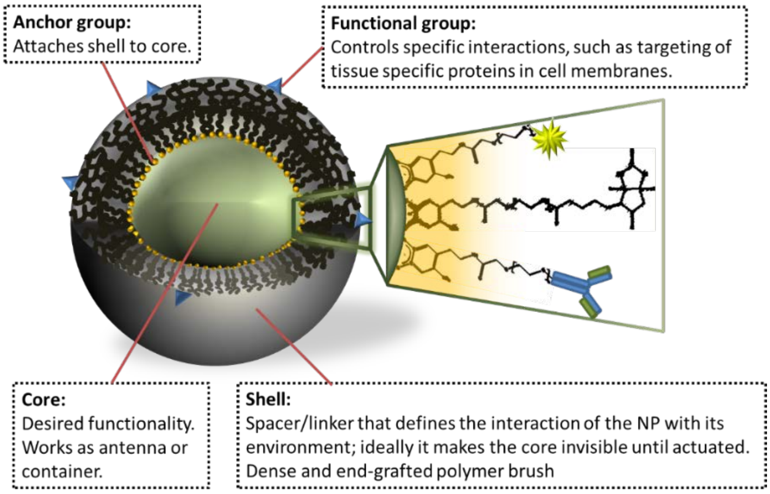
Core-shell nanoparticles can be used in biomedical applications, e.g., for biomedical imaging, hyperthermia and in drug delivery, as well as for biotechnological applications such as separation and purification of proteins and cells. Unique functions can be achieved by using nanoscale inorganic cores; superparamagnetic iron oxide nanocrystals (SPION) is a prime example, which allows control of interactions with magnetic fields. These functions for SPION include contrast enhancement in magnetic resonance imaging, guided and controlled drug delivery responding to external magnetic fields that harmlessly penetrate the body. The colloidal interactions between nanoparticles and biological colloids, from proteins to cells, must be controlled to enable these functions in a biological environment.



We will present our recent work on the design of monodisperse superparamagnetic iron oxide nanoparticles grafted with various sorts of polymer brushes. We will describe the influence of design parameters such as grafting, polymer chemistry, core size, molecular weight and polymer topology on nanoparticle performance. In particular, we will link the properties of the nanoparticle polymer shell to protein interactions and uptake by phagocytic cells.

Detailed control of the physical and chemical properties of the nanoparticle shell also makes it possible to structure them into amphiphile and polymer assemblies of higher order. Such assemblies, e.g. drug delivery vehicles incorporating superparamagnetic nanoparticles, can exploit magnetic fields to control release of compounds stored in the vesicle lumen. We will describe developments from our lab regarding the experimental design and characterization of such hierarchically structured nanomaterials for magnetically controlled release from vesicles that exploits phase transitions in the vesicle membrane.