Stuttgarter Physikalisches Kolloquium

Max-Planck-Institut für Intelligente Systeme
Max-Planck-Institut für Festkörperforschung
Fachbereich Physik, Universität Stuttgart

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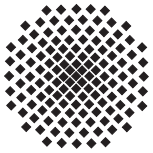

Dienstag, 25. April 2017	17.15 Uhr	Werner-Köster-Hörsaal 2R4

Stuttgarter Max-Planck-Institute, Heisenbergstraße 3, 70569 Stuttgart-Büsnau

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Nanoparticles in Fundamental and Applied Research

Eckart Rühl
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Abstract

Nanoparticles have gained recently substantial interest, since size effects of matter are not only of fundamental interest, but they also have the potential to be exploited for numerous applications. Size effects of matter are discussed which rely on the variable surface-to-bulk ratio of the constituents and there are changes in electronic and geometric structure as well as dynamical properties.
Nanoparticles containing inorganic constituents are most suitably prepared under well defined conditions by colloidal chemistry, so that their size and surface properties are fully controlled. The surface of nanoparticles is of crucial importance for their interactions with the environment. This concerns the aggregation of nanoparticles as well as their adsorption to surfaces and interfaces. Often, size-dependent properties of nanoparticles are either investigated in solution or the particles are dried on suitable substrates. However, these approaches often suffer from difficulties to separate the intrinsic properties of nanoparticles from their interactions with the surroundings. Furthermore, charging and radiation damage may occur, if ionizing radiation is used to investigate these samples. An alternative is offered by preparing isolated and size-selected nanoparticles in an aerodynamically focused beam. Experiments on free nanoparticles are reported including ultra-fast dynamical processes reaching from picosecond dynamics to the attosecond time regime. Nanoscopic matter is also of interest to life sciences. Nanoparticles are attempted to be used for diagnostics and therapy offering a wide range of possible applications. Specifically, the role of polymeric nanoparticles for drug delivery in the context of inflammatory skin diseases is discussed. Label free-approaches, such as X-ray microscopy and stimulated Raman scattering, are used to probe to location of drugs and nanocarriers in skin for deriving advanced strategies for drug delivery.