SYSM 1: Single Molecule Spectroscopy of Nanoobjects I

Zeit: Donnerstag 10:30–12:30 Raum: VMP 8 HS

Hauptvortrag SYSM 1.1 Do 10:30 VMP 8 HS

Dynamics of Semiconductor Nanocrystals and Quantum dot-Dye Assemblies — •Christian von Borczyskowski — Center for Nanostructured Materials and Analytics (nanoMA), Chemnitz University of Technology, Chemnitz, Germany

Semiconductor quantum dots such as silicon or CdSe show rich dynamics of exciton formation and relaxation which can be investigated by single molecule techniques. Dynamics are controlled by electron-phonon coupling and photo-induced charge (blinking) and/or energy transfer (FRET). In this contribution we will concentrate on the interplay of these processes. In general, this interplay can only be described properly by taking into account the spatial distribution of the exciton wave function. Moreover, we will show that the wave function can be probed by single dye molecules attached to the surface of a single quantum dot.

Hauptvortrag SYSM 1.2 Do 11:10 VMP 8 HS

Ultrafast spectroscopy of nanoplasmonic systems — •Markus Lippitz — 4th Physics Institute, University of Stuttgart, Stuttgart — Max-Planck-Institute for Solid State Research, Stuttgart

The strong interaction of a metal nanoparticle's free electrons with light –the particle plasmon resonance– allows us ultrafast experiments on single metal nanoobjects. In this talk, some examples of such experiments will be presented.

A pump pulse heats the electron gas in a thin silver film. When being arranged in a Bragg structure, such films make it possible to switch the transmission of a probe pulse on a picosecond timescale.

The pump pulse also triggers mechanical oscillations of the whole metal nanostructure. As the Mie resonance depends on particle size, elastic properties of single nanoparticles can be probed all optical.

Already the presence of a plasmonic nanowire modifies the local optical density of states. This is found back in the luminescence lifetime and intensity of selfassembled GaAs quantum dots depending on the distance to the wire.

Hauptvortrag SYSM 1.3 Do 11:50 VMP 8 HS

Hot Brownian Motion and Photothermal Correlation Spectroscopy — •Romy Radünz[1], Daniel Rings[2], Klaus Kroy[2], and Frank Cichos[1] — [1]Molecular Nanophotonics Group, Institute of Experimental Physics I, University Leipzig, Linnestra\sse 5, 04107 Leipzig, GERMANY — [2]Soft Condensed Matter Theory, Institute of Theoretical Physics, University Leipzig, Vor dem Hospitaltore 1, 04103 Leipzig, GERMANY

We introduce a new technique for the measurement of tracer dynamics, called photothermal correlation spectroscopy, which is sensitive to single metal nanoparticles down to a radius of 2.5 nm with a time resolution of a few microseconds. The method is based on a fluctuation analysis of a heterodyne photothermal scattering signal, which is recorded in a simple confocal microscopy setup. It exploits the same principles as fluorescence correlation spectroscopy but targets the use of extremely photostable, non-fluorescent, nano-sized tracers as a replacement of fluorescent probes. To validate our approach, we verify that the Stokes-Einstein relation holds for heated diffusing gold nanoparticles, with an effective viscosity and temperature predicted by a semi-quantitative analytical model. This example of hot Brownian motion promises to shine new light into diffusion problems under thermal non-equilibrium as it is important for the heat conduction in nano-fluids. In summary, the presented method together with the photostability and the low size dispersion of gold nanoparticles provides large potential for broad applications especially in the field of high throughput biological screening.