NANOSCIENCE COLLOQUIUM

Thursday June 4th 2015 at 15:15, K-space, Fysicum

Space–Time-Resolved Spectroscopy and Control of Nanostructured Materials

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Functional materials often rely on a complex interplay of dynamic processes that are difficult to disentangle with conventional spectroscopic methods. Overlapping signal contributions and spatial heterogeneity pose the main challenges. In this talk, several new approaches will be presented that tackle these issues.

The first technique, “spectral-interference microscopy”, provides direct spatial-temporal information for analyzing nanostructured materials. Thus we can measure, for example, group velocities and dispersion properties and use the information to control plasmon propagation through optical “nanocircuits”.

In the second technique, we use coherent control to localize electromagnetic fields on a subdiffraction length scale and simultaneously on a femtosecond time scale. In “spatiotemporally resolved spectroscopy” the interaction occurs with the pump pulse in one location and with the probe pulse at some later time in another location. This has the potential to visualize transport processes directly in space and time with subdiffraction resolution.

In the third technique, “2D nanoscopy”, we combine coherent 2D spectroscopy with time-resolved photoemission electron microscopy (PEEM) to obtain 2D spectra with sub-50 nm spatial resolution. We applied this technique recently to investigate nanostructured thin-film solar cells. Our results show that light localization, rather than scattering off nanocorrugations, is responsible for their enhanced efficiency. Further applications of the technique will be presented.

Host: Donatas Zigmantas (Chemical Physics)

This is one in a regular series of Nanoscience Colloquia, aimed at all researchers and students with an interest in nanoscience. The series is arranged by the Strategic Research Environment “The Nanometer Structure Consortium at Lund University” (nmC@LU) and by the Linnaeus environment “Nanoscience and Quantum Engineering”, funded by the Swedish Research Council (VR).

Vetenskapsrådet