Hybrid Inorganic/Organic Systems for Opto-Electronics

Collaborative Research Centre 951

Colloquium Announcement

of the Collaborative Research Centre 951
"Hybrid Inorganic/Organic Systems for Opto-Electronics"

Claus Ropers

IV. Physical Institute, Georg-August-Universität Göttingen, Germany

Structural dynamics at surfaces and in thin films probed by ultrafast electron diffraction and microscopy

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Takashi Kumagai

Department of Physical Chemistry, Fritz-Haber-Institut der Max-Planck-Gesellschaft, Germany

Local geometric and electronic structure of a single naphthalocyanide molecule on ultrathin ZnO layers

Time: Thursday, January 25, 2018, 3 pm c.t.

Place: Erwin-Schrödinger-Zentrum, Rudower Chaussee 26, Room 0'119.

Collaborative Research Centre 951
Department of Physics
Humboldt-University of Berlin

Email: sfb951@physik.hu-berlin.de
Tel.: +49 30 2093 66374
www.physik.hu-berlin.de/sfb951

Partners

Structural dynamics at surfaces and in thin films probed by ultrafast electron diffraction and microscopy

Claus Ropers

University of Göttingen, Germany

Novel methods in time-resolved electron microscopy, diffraction and spectroscopy promise unprecedented insight into the dynamics of structural, electronic and magnetic processes on the nanoscale. A key to the realization of such technologies is the generation of high-quality beams of ultrashort electron pulses. In this talk, our recent development of diffraction, imaging and spectroscopy using localized electron emitters will be discussed. Specifically, two approaches employing high-coherence electron pulses from nanotips will be presented, namely Ultrafast Low-Energy Electron Diffraction (ULEED) and Ultrafast Transmission Electron Microscopy (UTEM). ULEED allows for the study of structural dynamics with high temporal resolution and ultimate surface sensitivity, while UTEM combines femtosecond resolution with the imaging and spectroscopy capabilities of an electron microscope.

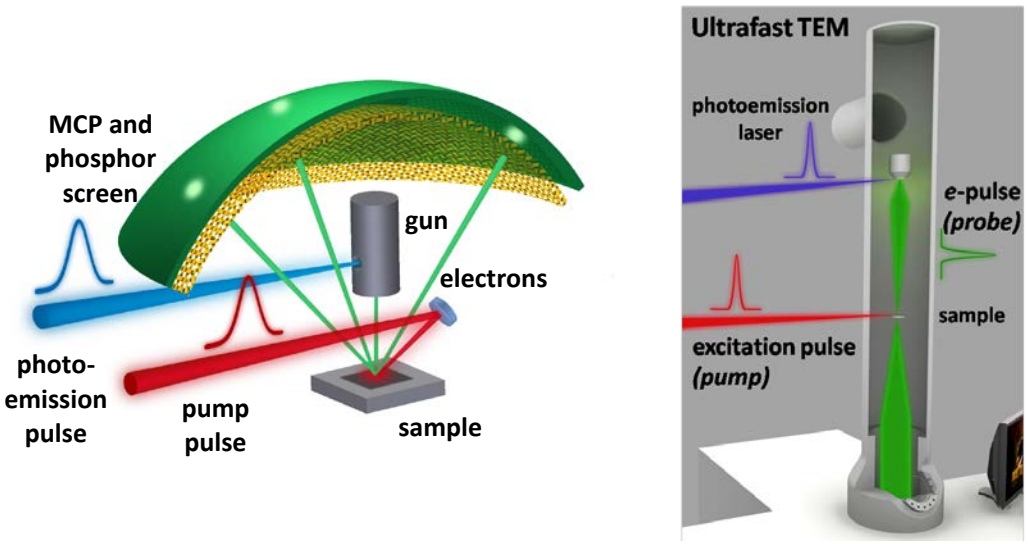

Figure: Two complementary approaches to the study of ultrafast dynamics in solids, at surfaces and nanostructures: Ultrafast Low-energy electron diffraction (ULEED, left) probes structural dynamics at surfaces with electron pulses at kinetic energies of 20-200 eV. Ultrafast transmission electron microscopy (UTEM, right) allows for ultrafast imaging, diffraction and spectroscopy of thin films and nanostructures using high-energy electron pulses (100-200 keV).

Local geometric and electronic structure of a single naphthalocyanine molecule on ultrathin ZnO layers

Takashi Kumagai

Fritz-Haber Institute of the Max-Planck Society

Local geometric and electronic structures of organic/inorganic interfaces are of fundamental importance for accurate control of opto-electronic properties. Low-temperature scanning tunneling microscopy (STM) enables us to directly access such information. I will discuss the characterization of single naphthalocyanine molecules on ultrathin ZnO layers epitaxially grown on a Ag(111) surface using a low-temperature STM. Atomic resolution imaging allows to determine the precise adsorption geometry and the molecular orbitals are directly resolved in the STM image. It is found that a characteristic hybridized state between the molecule and ZnO occurs upon adsorption. This hybridized state can be switched on and off in a controlled manner by the STM. We propose that the switching mechanism may be attributed to the change in the adsorption geometry of the molecule.