エクストリームフォトニクスセミナー

Extreme Photonics Seminar

No. 5

Date: July 14 (Thu), 2011, 15:00 〜 17:30

Location: Cooperation Center, 5F Meeting Room, W524
(研究交流棟5階会議室 W524)

Language: English

Title: Polar molecules in femto- and attosecond pulses

Speaker: **Prof.** Lars Bojer Madsen
(Department of Physics and Astronomy, Aarhus University)

Polar molecules are interesting for controlled studies with femtosecond, attosecond and free-electron laser sources. The permanent dipole of the molecule allows it to be oriented with respect to the laboratory frame. I will discuss molecular frame photoelectron angular distributions. These spectra carry more information than if the molecular axis is at random: the spectra carry direct information about the molecular dipole and nodal structures in the molecular orbital. I will also discuss the challenges of the spatial symmetry breaking introduced by the dipole in oriented polar molecules in the case of high-order harmonic generation.

Title: High-harmonic spectroscopy: From microscopic to macroscopic world

Speaker: **Prof.** Anh Thu Le
(Kansas State University)

I will report recent progress in theoretical understanding of high harmonic generation (HHG) from atoms and molecules, including aligned molecules. New theoretical simulations, which combine single-atom/molecule response with the macroscopic propagation of harmonic field in the medium, compare remarkably well with current experimental data. This provides foundation for ultrafast dynamic imaging of chemical processes with few-cycle laser pulses.

Language: Japanese

Title: 10 fs dynamics of complex chemical systems: molecular crystals and oxide surfaces

Speaker: **Prof. Ken Onda**
(Tokyo Institute of Technology)

Chemical properties and reactions are governed by valence electrons. The energy range of valence electrons is around 1 eV so dynamics at around 10 fs is crucial to understand chemical systems. Thus, we have been studying complex but chemically important systems using a 10 fs laser pulse. Molecular crystals are widely used for organic electronic devices and their excited states determine their performance. We studied ultrafast photoinduced dynamics of strongly correlated molecular crystals, and revealed the lifetime of electronic coherence and found the transfer of electronic coherence to photoinduced phase. This result shows a possibility of coherent control of macroscopic physical properties. Chemical dynamics of molecules adsorbed on an oxide surface is important for understanding photo-catalytic reactions. Using interferometric two-photon photoemission spectroscopy, we studied dynamics of fundamental molecules, water and methanol, adsorbed on well-characterized TiO_2(110) surfaces under ultra-high vacuum condition. We found a two dimensionally solvated electron named wet electron under UV light irradiation. This high-energetic but long-lived electron is probably involved in photo-chemical reaction on oxide surfaces including photo-catalytic reactions.

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