Extreme Photonics Seminar

No. 4

Language: Japanese

Date : Nov.20(Thu), 2014, 10:00–12:00

Location : Cooperation Center, 5F Meeting Room, W524

(研究交流棟5階会議室W524)

Title : Artificial Photosynthesis Producing Solar Fuels

太陽光燃料（Solar Fuel）を生成する人工光合成

Speaker : **Prof. Hideki HASHIMOTO** (Osaka City Univ.)

橋本 秀樹　教授　（大阪市立大学）

Mankind is facing a major challenge to find new ways of creating clean, renewable fuels. One potentially abundant source of energy is solar radiation. The problem is how to harness such an abundant yet diffuse source of energy. Photosynthesis has evolved mechanisms to achieve this. Any proposed strategies that set out to mimic this process in order to make solar fuels must begin with a light-harvesting or light-concentration step. Photosynthetic antenna complexes are organized on the nano-scale and a major question is how to translate this information into the design of meso- to macro-scale light-harvesting devices. This lecture will outline how photosynthesis achieves ‘Solar to Fuels’ conversion. Recent progress on understating the molecular details of the key reactions in the photosynthetic process has been remarkable. We are now at the stage where it is realistic to start to use this ‘biological blueprint’ to begin to construct devices that have the capability to mimic the key steps in the natural process. This is one of the grand scientific challenges of our time.

Title : Nonequiriblium state driven by 1.5-cycle, 7 fs infrared pulse in strongly correlated organic metal

1.5サイクル、7 fs赤外パルスで創る･ 覗く強相関電子系の非平衡状態

Speaker : **Prof. Shinichiro IWAI** (Tohoku Univ.)

岩井 伸一郎　教授　（東北大学）

Dynamical localization, i.e., the reduction of the intersite electronic transfer integral t induced by an AC electric field , is a promising strategy for controlling strongly correlated systems with a competing energy balance between t and the Coulomb repulsion energy. Here, we describe a metal to insulator transition induced by the 9.3 MV/cm instantaneous electric field of a 1.5 cycle (7 fs) infrared pulse in an organic conductor α-(BEDT-TTF)_2I_3. A large reflectivity change of > 25% and a coherent charge oscillation along the time axis, reflecting the opening of the charge ordering (CO) gap, demonstrate the generation of a photoinduced CO insulator in the metallic phase. This optical freezing of charges, which is the reverse of the photoinduced melting of electronic ordering, is attributable to the 10% reduction of t driven by the strong, high frequency electric field.

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