

INSd NanoScience Seminar (No.17)

Date and Time: **Thursday, July 28th, 2016, 16:20-17:50**

Place: **Room 305 INSd Seminar Room, Interdisciplinary Research Building 3rd floor, Toyonaka Campus**

Title: **EXCITONS IN COLLOIDAL
2D-CdSe NANOCRYSTALS**

Lecturer: Prof. Ulrike Woggon
*Technical University of Berlin,
Germany*



Two-dimensional II-VI semiconductor nanoplatelets (NPLs) gained increasing interest because of their unique electronic and optical properties, such as the Giant Oscillator Strength, strong electroabsorption response, low exciton-phonon interaction and high impact of dielectric confinement. The unusually small coupling to phonons makes NPLs potential candidates for materials with low dephasing rates, high lateral conductivity and control of both internal relaxation and energy transfer efficiencies. These platelets are of special importance since they combine large particle volumes with ultrastrong confinement. In this contribution we present a comprehensive study of the influence of dimensionality, size and shape on excitons in CdSe NPLs. CdSe NPLs are an attractive system allowing to control not only the exciton energy states by thickness (z-direction) but also with lateral size variation the LO-phonon coupling (x,y-direction) and this almost independently from each other [1].

The two-photon absorption cross sections of CdSe nano-platelets show ten times more efficient two-photon absorption than nanorods or dots per unit volume. The larger the particles' aspect ratio, the greater is the confinement related electronic contribution to the increased two-photon absorption. Both, electronic confinement and local field effects favor the platelets and make them unique two-photon absorbers with outstanding cross sections of up to 10^7 GM, the largest ever reported for (colloidal) semiconductor nanocrystals and ideally suited for two-photon imaging and non-linear opto-electronics.

[1] A.W. Achtstein, R. Scott et al. *Phys. Rev. Lett.* **116**, 116802 (2016)

Contact Person: Prof. T. Itoh, Institute for NanoScience Design,
E-mail: ito@insd.osaka-u.ac.jp