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# Optical and Magneto-Optical Characterization of Colloidal Semiconductor Nanocrystals


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**Abstract**

Colloidal semiconductor nanostructures are of great interest due to their variation of electronic properties controlled by their size, shape, composition and surface quality, thus making them attractive for application in various opto-electronic and spin-based devices. This talk will discuss the critical factors that control or manipulate the photophysical properties of nanoscale semiconductors (quantum dots [QDs], nanoplatelets [NPLs]) and uncover the fundamental correlation between size, composition and morphology with the optical and magneto-optical properties of colloidal nanostructures from the II-VI and perovskite materials.

In II-VI QDs, the question was asked whether the bonding between QDs and their surface capping with organic surfactant influences the electronic properties of the structure. To examine it, we used a benchmark material, CdSe QDs capped by oleic acid molecules with and without a spacing barrier (e.g., inorganic shell) which regulates the strength of the coupling. The energy barrier was comprised of CdSeS alloyed shell with a variable thickness. Changes in electronic properties upon QD-surfactant coupling were followed using photoluminescence spectroscopy at various temperatures.

Exploring the role of doping in nanostructures and in particular the lead halide-perovskite, was verified in a project in which $Ni^{2+}$ ions were embedded into cesium lead halide-perovskite. For elucidating the role of dopants, unique spectroscopic means have been employed, such as steady-state and transient magneto photoluminescence (PL) spectroscopy which are recorded at various temperatures. The magneto-PL measurements unprecedentedly revealed the occurrence of three recombination events with different degree of circular polarization (DCP), with an obvious contrasting behavior in the undoped and doped samples. The PL decay curve showed evidence for charge carrier trapping. The results uncover spin properties in perovskite candidates for various spin-based applications.


**ההרצאה תתקיים ביום רביעי, ה-25.08.2021 בשעה 12:30**
**באודיטוריום המכון למצב מוצק, קומת כניסה**

**The lecture will take place on Wednesday, 25.08.2021 at 12:30**
**at the Solid State Institute auditorium, entrance floor**
**and via Zoom**

**Ph.D. Student of Professor Efrat Lifshitz**