



IBS Center for Molecular Spectroscopy and Dynamics

Seminar

■ **SPEAKER**

Prof. Dong Hee Son (Texas A&M University)

■ **TITLE**

Excitons and hot electrons in strongly quantum confined perovskite nanostructures

■ **ABSTRACT**

Perovskite quantum dots (QDs) are emerging as an excellent source of photons and charge carriers for photonic and photovoltaic applications that are superior to many existing semiconductor quantum dots. In this presentation, I will discuss the energetics and relaxation dynamics of bright and dark excitons in strongly quantum confined cesium lead halide perovskite QDs that dictate various photophysical properties in this new family of QDs. For this purpose, we prepared the QDs with varying degree of confinement in non-interacting ensemble and electronically coupled arrays of QDs as well as in the magnetically doped non-interacting QDs. The effect of confinement-enhanced electron-hole exchange interaction in strongly confined QDs on bright-dark level splitting and the rates of bright and dark exciton emission were studied via time-resolved photoluminescence (PL) of exciton in the non-interacting ensemble. The effect of electronic coupling in the 2-dimensional QD arrays altering the electron-hole exchange interaction and the exciton fine structure was studied via the time-resolved exciton PL obtained at cryogenic temperatures. In addition, doping of strongly confined perovskite nanocrystals open a photophysical pathway that enables the generation of energetic hot electron via exciton-to-hot electron upconversion under weak cw excitation, which enables the photoemission of hot electrons above the vacuum level. The implication of these hot electrons for photocatalysis will also be discussed.

■ **DATE AND VENUE**

September 28, 2022 (Wednesday, 17:00 - 18:00)
Seminar Room A (116)

■ **LANGUAGE**

English

■ **INVITED BY**

Prof. Kyungwon Kwak