Abstract Submitted
for the BPNMC18 Meeting of
The American Physical Society

One-dimensional carrier confinement in excitonic nanoshells LUIS ROYO ROMERO, MIKHAIL ZAMKOV[1], Bowling Green State University, Bowling Green, OH — We report on the synthesis and spectroscopy of energy-gradient nanostructures that support the formation of two-dimensional excitons in the shell domain. The developed geometry places a wide-gap semiconductor (CdS) at the core of the composite nanoparticle in order to funnel the photoinduced energy into the low-gap CdSe surface layer. As a result, the quantum confinement is achieved in nanoparticles which total size exceeds the exciton Bohr radius. The formation of excitons in the CdSe shell layer was manifested through a size-tunable emission and the characteristic step-like absorption profile. Transient absorption measurements further elucidate the dynamics of the photoinduced energy relaxation in CdS/CdSe nanoshells providing evidence that excitations of the bulk-like core domain result in a rapid, ˜2-ps recovery of the CdS bleach attributed to electron cooling. The charge transport characteristics of nanoshell assemblies were evaluated through a side-by-side comparison with CdSe quantum dot solids. We expect that the developed nanoshell architecture could potentially be extended to a broader range of semiconductors (e.g. CdS/PbS, ZnS/CdS) facilitating the development of quantum confined solids offering improved charge transport characteristics.

[1]Principle Investigator

Luis Royo Romero
Bowling Green State University, Bowling Green, OH

Date submitted: 17 Oct 2018 Electronic form version 1.4