UC MERCED | CHEMISTRY & BIOCHEMISTRY

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CHEMISTRY & BIOCHEMISTRY SEMINAR SERIES:

Resonance Raman polarization and high-energy excitonic states in CdSe colloidal nanocrystals

Fernanda Pilla Bardela

Graduate Student, Chemistry & Biochemistry
UC Merced

Abstract:

Colloidal quantum dots (CQDs) are nanometer-sized crystalline semiconductors passivated with ligands and dispersed in a solvent. Their small size causes them to exhibit quantum confinement effects allowing for a tunable range of absorption and emission wavelengths. A wide range of potential II-VI and III-V elements can be used in the formation of a QD. This work focuses on CdSe nanorods and QDs with zincblende and wurtzite crystal structures. Many theories and methods impose arbitrarily high degrees of idealized symmetry upon systems in an attempt to explain their overall behavior. However, this is not realistic, and it is of interest to evaluate the relative significance of symmetry-breaking mechanisms caused by size, shape, and surface chemistry in the QDs.

We utilize the polarization of resonance Raman scattering as a tool to investigate the symmetries of excitons within II-VI semiconductor nanocrystals, particularly focusing on higher-energy excitons that are challenging to probe using conventional techniques. We plan to quantify the anisotropy of electronic wavefunctions contributing to Raman enhancement while systematically manipulating each symmetry-breaking mechanism's contribution. This research will deepen our understanding of NC optical properties and provide insights on synthesis of tailored nanomaterials for diverse applications.

About the Speaker:

Fernanda is a third year Ph.D. candidate in Anne Kelley’s lab working on synthesis and resonance Raman polarization on high-energy excitonic states in CdSe colloidal nanocrystals.