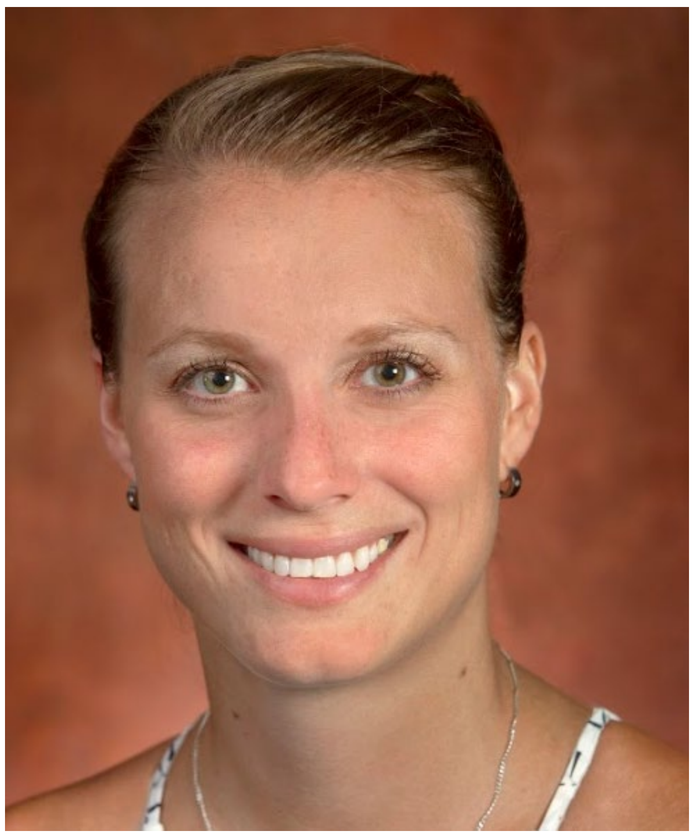
UCLA College | Physical Sciences Chemistry & Biochemistry

PHYSICAL CHEMISTRY SEMINAR



Prof. Lea Nienhaus

Department of Chemistry and Biochemistry
Florida State University

Monday, April 24, 2023

4:00 PM | YH 4222

Mani L. Bhaumik Collaboratory -

Dongwon Yoo Seminar & Conference Hall

Photon Transformers: Effect of Material Dimensionality on Photon Upconversion

Abstract: Triplet generation at a hybrid inorganic/organic semiconductor interface is a very promising approach to increase the (photo-)excited state recombination lifetime, and thus, can facilitate energy harvesting. One of the possible applications for the generated spin-triplet excitons is photon upconversion. Photon upconversion describes the process of shortening the wavelength of the light emitted upon irradiation, resulting in a net gain in photon energy. To comply with energy conservation laws, triplet-triplet annihilation upconversion occurs by combining two or more low energy photons. Since direct optical excitation of triplet states is ‘spin-forbidden’, so-called sensitizers are required to indirectly populate the triplet state by energy or charge transfer. Triplet sensitizers span a broad range of material classes including metal-organic complexes, nanomaterials, and bulk perovskite films. Understanding the fundamental energy transfer mechanism is crucial for the advancement of optoelectronic devices based on this process.

The exact triplet sensitization mechanism varies depending on several factors including: (i) the absolute alignments of the sensitizer and acceptor energy levels. (ii) The exciton binding energy in the sensitizer, resulting in excited states in form of excitons or free carriers. (iii) Energetic polydispersity of a sample, which varies the energetic driving force for triplet transfer. Here, I will present the current understanding of the triplet sensitization mechanism based on sensitizer materials with different dimensionalities ranging from 0D-3D and highlight the differences of each upconversion system.

Please contact isaiahgtz@chem.ucla.edu for additional information.