UNIVERSITY OF LOUISVILLE

COLLEGE OF ARTS & SCIENCES

Department of Chemistry

Brown and Williamson Series
September 23, 2022
@2:30 pm
CB LL16

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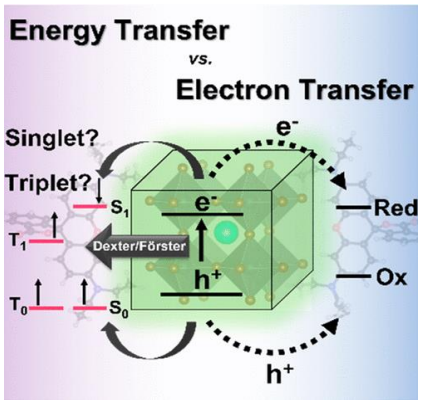
Light Energy Harvesting with Halide Perovskite-Molecular Hybrids

ABSTRACT:
The flow of energy and electron transfer processes in semiconductor nanocrystal based light harvesting assemblies is dictated by the nature of the excited state interactions, energetics and redox potentials. In particular, surface interactions of chromophore or redox active molecule with semiconductor nanocrystals which dictate the efficiency of energy/electron transfer thus plays an important role in realizing their photocatalytic and optoelectronic applications. The presentation will focus on two specific scenarios of the flow of energy and electron processes in $CsPbBr_3$ nanocrystal-molecular hybrids. In the first case, the excited state interactions in the $CsPbBr_3$-Rhodamine B (RhB) hybrid assembly are probed using photoluminescence (PL) and transient absorption measurements. PL studies reveal quenching of the $CsPbBr_3$ emission with a concomitant enhancement of the fluorescence of RhB, indicating a singlet energy transfer mechanism. In the second case we will discuss the factors dictating the electron transfer between $CsPbBr_3$ and surface bound viologen. The implications of electron transfer in photocatalytic applications will be discussed.



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Prashant V. Kamat is a Rev. John A. Zahm, C.S.C., Professor of Science in the Department of Chemistry and Biochemistry and Radiation Laboratory at the University of Notre Dame. He is also a Concurrent Professor in the Department of Chemical and Biomolecular Engineering. He earned his doctoral degree (1979) in Physical Chemistry from the Bombay University, and postdoctoral research at Boston University (1979-1981) and University of Texas at Austin (1981-1983). He joined Notre Dame in 1983. Professor Kamat has for nearly four decades worked to build bridges between physical chemistry and material science to develop advanced nanomaterials that promise cleaner and more efficient light energy conversion.