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SEMINAR SERIES

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Unusual Solar Photoconversion: Sensitized Triplet Fusion

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OPEN TO ALL

abstract:
One focus of our research program involves the study of sensitized triplet fusion (TF) in solution using highly photostable metal-organic chromophores in conjunction with energetically appropriate organic molecules with large singlet-triplet gaps. Selective excitation of the long-wavelength absorbing sensitizer efficiently generates long-lived triplet states that serve as energy transfer donors. In the presence of appropriate molecular acceptors, diffusion controlled triplet-triplet energy transfer takes place, producing the excited triplet state of the acceptor while regenerating the ground state of the sensitizer. When sufficient numbers of the sensitized triplets are produced, TTA takes place which results in either frequency upconverted light or the formation of desired chemical products. Various combinations of donor and acceptor have been explored and data will be presented on a number of these systems spanning light conversions ranging from the near-visible to the near-IR. This presentation will also describe many examples of upconversion phenomena realized in solid-state polymeric materials along with emerging classes of acceptor/annihilator chromophores and materials. TF processes will be shown to operate at high efficiencies with concomitant linear incident power density response, demonstrated in both theory and experiment using non-coherent photons. Upconversion-based photoaction observed in water splitting photoelectrochemical cells and operational photovoltaics will also be discussed.

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