Light-harvesting in Metal–Organic Frameworks Relevant to Photo-driven Transformations

Dr. Pravas Deria, School of Chemical & Biomolecular Science, Southern Illinois Univ. Carbondale

The development of efficient heterogeneous photo(electro)catalysts requires ultrafast exciton migration to distal sites generating charge carriers with maximum potential. For such diffusion-limited molecular assemblies, triplet photosensitizers—with persistent exciton—are commonly used. However, they cannot be used in ambient conditions (for aerobic transformations) without a control over the singlet oxygen formation. On the other hand, the photophysical aspects established for solution-dissolved macromolecular photocatalysts are often non-translative to their solid-state aggregation without appropriate arrangements. It is, therefore, critical to understand the design principle and photophysics to develop efficient deployable photocatalytic materials. Metal−organic frameworks (MOFs) define highly accessible polymeric photocatalytic platforms –where the pigment (strut) assemblies around the well-defined pores characterize the evolution of unique yet intuitively predictable excitonic properties possible through structural, environmental, and dielectric modulation. The presentation will highlight MOFs as an artificial molecular light-harvesting system featuring antenna behavior to generate high-potential redox equivalents with control over the triplet populations.

Selected References:

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