CARBON NANOSTRUCTURES IN SOLAR ENERGY CONVERSION SCHEMES

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Combining the rapidly evolving fields of nanostructured materials and supramolecular chemistry is an attractive strategy for constructing large and complex, yet highly ordered, molecular and supramolecular entities, with specific functions. We develop novel super- and supramolecular donor-acceptor architectures through careful design, and probe them in condensed media and organized thin films at semiconductor surfaces as viable tools for efficient conversion of solar energy.

Carbon nanostructures (i.e., fullerenes and carbon nanotubes) and porphyrins / phthalocyanines are molecular architectures ideally suited for devising integrated, multicomponent model systems to transmit and process solar energy. Implementation of C_{60} as a 3-dimensional electron acceptor holds great promise on account of its small reorganization energy in electron transfer reactions and has exerted noteworthy impact on the improvement of light-induced charge-separation.

I will discuss recent developments in exploring molecular donor-acceptor arrays based on empty fullerenes as well as on endohedral metallofullerenes, in which key features, such as donor-acceptor composition, donor-acceptor distance, electronic coupling, etc., are systematically altered to achieve charge separation quantum yields and lifetimes that closely resemble those seen in the natural photosynthetic reaction center.