Harvesting solar energy via artificial photosynthesis

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Photosynthesis is nature's efficient way of converting available solar energy into usable chemical energy. In photosynthesis, cascades of short-range energy transfer, between well-organized pigments, followed by electron transfer to the photosynthetic reaction center containing non-covalently linked donor acceptor systems take place with an efficiency of unity. Owing to the importance of natural photosynthesis, design and synthesis of artificial systems that can trap solar energy and mimic the natural processes with high efficiency are of major importance in the field of photovoltaics. In this regard, porphyrins appended with benzo-[18-crown-6] moieties and fullerenes with alkyl ammonium cations and a pyridine or phenyl entities were synthesized and donor-acceptor dyads, with well-defined distance and orientation, were formed *via* crown ether-ammonium cation complexation and zinc pyridine coordination or pi-pi interactions. These complexes were characterized by ^{1}H NMR and evidence for these interactions was obtained from UV-Visible, fluorescence, and electrochemical studies.