Supramolecular Porphyrin-Fullerene Systems: Synthesis and Physico-Chemical Studies

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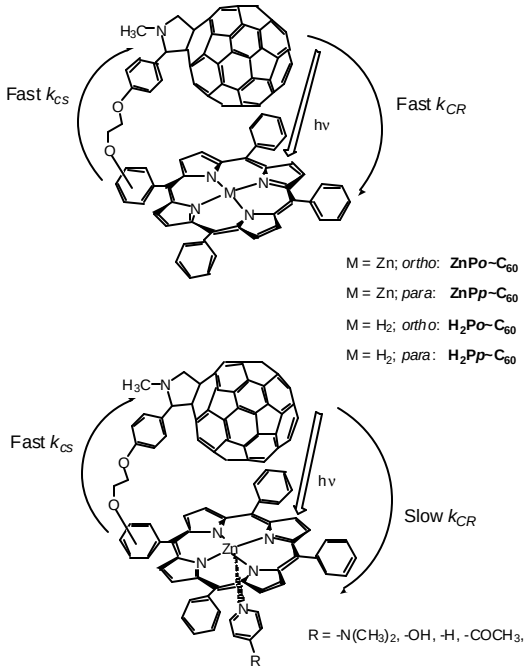
Porphyrins and metalloporphyrins are the frequently used components to build models to study photosynthetic electron transfer. Recent studies have demonstrated that the fullerenes behave as excellent electron acceptors and good energy traps useful for constructing artificial photosynthetic systems. In this regard, model systems, both covalently linked and self-assembled, have revealed rich electrochemistry corresponding to the different redox-active entities and interesting photochemistry originating from them. Such studies have also shown that fullerene bearing donor-acceptor supramolecules could be potential candidates to construct photovoltaic devices.

In the present contribution, we summarize results on our newly developed covalently linked (Scheme 1) as well as self-assembled porphyrin-fullerene supramolecular systems[1]. The electrochemical behavior of these dyads have been investigated in non aqueous solvent solutions and are modeled by using *ab initio* B3LYP/3-21G* methods. Multiple modes of binding involving axial coordination and hydrogen bonding have been introduced to form stable porphyrin-fullerene conjugates with defined distance and orientation. Both steady-state and time-resolved emission, as well as transient absorption studies have revealed efficient charge separation and relatively slow charge recombination in the studied supramolecular systems.

Scheme 1



1. D'Souza, F.; Gadde, S.; Zandler, M. E.; Arkady, K.; El-Khouly, M. E.; Fujitsuka, M.; Ito, O. *J. Phys. Chem. A* **2002**, *106*, 0000. (b) D'Souza, F.; Deviprasad, G. R.; Zandler, M. E.; Hoang, V. T.; Klykov, A.; VanStipdonk, M.; Perera, A.; El-Kouly, M. E.; Fujitsuka, M.; Ito, O. *J. Phys. Chem. A* **2002**, *106*, 3243.