Fullerene-Donor Dyads with Photoswitchable Dithienylethene Molecular Wires

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Molecular circuits are considered as one of the promising ways of miniaturizing electronic circuits. In order to build up a molecular circuit many molecular components such as wires, switches and transistors are needed to be developed. As a result, various types of molecular wires have been studied so far. A molecular wire has been defined as "a molecule that conduct(s) electrical current between two electrodes.[1] Donor-Bridge-Acceptor (D-B-A) systems represent excellent models for the study of charge transfer processes that are fundamental for the design of new devices with different applications in the field of molecular electronics.[2]

As important as a high conductance is the control of the charge transfer properties through an external stimulus. The charge transfer properties of a molecular wire can be modified by changing the level of π-conjugation through the bridge, thus varying the electronic coupling between the donor and acceptor moieties.

In this context, we decided to introduce a dithienylethene (DTE) entity as a molecular switch connecting [60]fullerene as electron acceptor unit and 4,4',5-trimethyltetrathiafulvalene (TTF) and 9,10-bis(1,3-dithiol-2-ylidene)-9,10-dihydroanthracene (exTTF) as electron donor units. These compounds exhibit a reversible interconversion electrocyclic reaction that can be controlled by irradiation of light of different wavelengths.[3] Furthermore, the influence of perfluoro- or perhydro-cyclopentene rings in photoinduced electron transfer processes has also been undertaken (**Figure 1**).

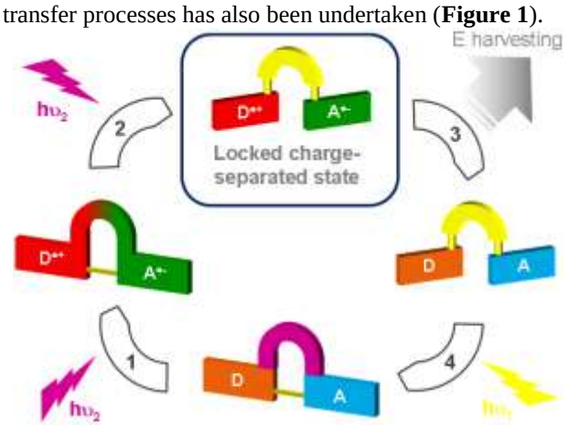

Figure 1. Proposed study for molecular switches.

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References: [1] A. Nitzan, M. A. Ratner, Science, **2003**, 300, 1382; [2] J. R. Pinzón, A. Villalta-Cerdas, L. Echegoyen, Top. Curr. Chem., **2012**, 312, 127; [3] M. Irie, Chem. Rev., **2000**, 100, 1685.