Can liquid crystallinity increase photovoltaic efficiency? Kalman Toth,* Daniel Guillon,* Delphine Felder-Flesch* Email: Kalman.Toth@ipcms.u-strasbg.fr, Delphine.Felder@ipcms.u-strasbg.fr

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Since the discovery of Buckminster fullerene great attention has been paid to its functionalization in the interest of modifying the surface, avoiding aggregation, enhancing solubility, promoting self-organization, energy- and charge-transfer. Anisotropic moieties grafted onto the perfectly isotropic fullerene surface can enforce ordered self-assembly, thus fullerene-containing liquid crystals (LC)1 can be obtained. If the grafted moiety is a chromophore then photoactive dyads can be obtained due to the photo-induced electron transfer from the donor-type conjugated systems (or other molecular subunits) to the acceptor-type fullerene molecules.

A complete series of methanofullerene-based photoactive liquid crystal dyads have been synthesized and characterized. One of those structures is depicted on Figure 1. The Bingel2 type cyclopropanation reaction with side-on connected (asymmetric or symmetric) malonates is a suitable method for obtaining the designed topology and incorporating the desired properties (i.e. light induced charge-transport, liquid crystalinity and amphiphilicity). The amphiphilic structure of the molecule allows us to produce extremely thin films of the Langmuir or Langmuir-Blodgett type, with high degree of structural order; furthermore the macroscopic alignment can be modified by the LC behavior. The recorded intramolecular fluorescence quenching suggests that very efficient electron or energy transfer occurs between the fullerene and the conjugated π-system (Figure 2).

Polarized optical microscopy (POM), differential scanning calorimetry (DSC) and small angle X-Ray investigations were used and will be detailed for the determination of molecular organization (Figure 3).

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REFERENCES