Photoinduced Electron Transfer in Porphyrin-Fullerene Dyad at a liquid interface

Jihad Sissaoui , Alexander Efimov ,Tatu Kumpulainen , Eric Vauthey

Physical Chemistry Department, University of Geneva, 30 Quai Ernest Ansermet 1211, Geneva, Switzerland
Jihad.Sissaoui@unige.ch

Organic Photovoltaics (OPVs) have gained increasing attention during the past decades as an alternative energy source. These devices rely on absorption of photons by small organic molecules followed by charge transfer at the interface in the donor and acceptor materials. Therefore, understanding the charge-separation process at interface of two materials with different dielectric properties is of paramount importance for the future development of superior devices.

We approach this problem using the excited-state properties of an amphiphilic porphyrin-fullerene dyad and of its porphyrin analogue adsorbed at water/dodecane interface using second harmonic generation (SHG). The Polarized SHG experiments confirm the results of MD simulations. The interfacial orientation of the porphyrin subunit is different for the dyad and the porphyrin analogue. Time-resolved SHG measurements reveal a concentration dependence of the excited state dynamics of both compounds upon Q-band excitation implying the occurrence of intermolecular quenching processes. A significantly slower ground-state recovery of the dyad compared to the porphyrin analogue is observed, in agreement with the population of a longer-lived state, most probably a charge separated state.