

Final Report

Concerning: short-term visit of Omar F. M. Abdelasboor (Max-Born Institute, Berlin, Germany) to Dr. A. Douhal (Toledo, Spain).

The purpose of the visit

The hydrogen/proton transfer can be induced by electronic excitation of the molecules that undergo a large change in the charge density distribution upon photoexcitation. In this work we try to investigate the real time dynamic of the hydrogen/proton transfer of 1,8-dihydroxyanthraquinones (1,8-DHAQ) in different solvent polarity, e.g. tetrachloroethylene, methanol, acetonitrile, DMSO and DMF after excitation at 400 nm (close to the electronic origin of DHAQ around 420 nm) by using femtosecond time-resolved mid-Infrared spectroscopy and femtosecond fluorescence up-conversion techniques. We measured this molecule here in Berlin with femtosecond infrared spectroscopic technique and we aim to measure this molecule with fluorescence upconversion in the same solvents. The advantage of the upconversion technique lies in fact that the measured signals are likely due to the specific excited states only, and not corrupted by other contributions.

The description the results and the outcome of the visit

(1) From femtosecond fluorescence up-conversion, we reported the hydrogen/proton transfer as faster than 50 fs (enol-keto phototautomerization) to form the keto form. With long time scale the population relaxation from excited state keto-tautomer to its ground state takes place on hundreds of picosecond time constant.

(2) We estimated by using picosecond time-correlated single photon counting, the excited state lifetimes of 1,8-dihydroxyanthraquinone (1,8-DHAQ) to be 300 ps in tetrachloroethylene, methanol, acetonitrile, 200 ps in DMF and 100 ps in DMSO.

(3) The steady state emission spectra of (1,8-DHAQ) in the four solvents exhibits a weak fluorescence around 570 nm, more than 8000 cm^{-1} red shifted from the absorption band.

Concerning future Collaborations with the host institution

It has been explicitly planned a series of meetings in the next months to share more information. In particular Dr. A. Douhal is planning to visit us in Berlin in two weeks to meet together to discuss what we have and what we have to do with our results. Indeed, we have a very good story to tell and a nice article is expected to result from this grant in the next few months.