Minicolloque n°CPR8  □Oral □ Poster
Charge-transfer chemical reactions in nanofluidic Fabry-Pérot cavities

L. Mauro,1,* K. Caicedo,2 G. Jonusauskas,1 and R. Avriller1

1Univ. Bordeaux, CNRS, LOMA, UMR 5798, F-33400 Talence, France
2Univ. Bordeaux, CNRS, LP2N, UMR 5298, F-33400 Talence, France

Abstract

We investigate the chemical reactivity of molecular populations confined inside a nanofluidic Fabry-Pérot cavity1 (see Figure 1). Due to strong light-matter interactions developing between a resonant electromagnetic cavity-mode and the electric dipole moment of the confined molecules, a polariton is formed2. The former gets dressed by environmental vibrational and rotational degrees of freedom of the solvent3. We call the resulting polariton dressed by its cloud of environmental excitation a “reacton”, since it further undergoes chemical reactions. We characterize how the reacton formation modifies the kinetics of a photoisomerization chemical reaction involving an elementary charge-transfer process. We show that the reaction driving-force and reorganization energy are both modulated optically by the reactant concentration, the vacuum Rabi splitting and the detuning between the Fabry-Pérot cavity frequency and targeted electronic transition. Finally, we compute the ultrafast picosecond dynamics of the whole photochemical reaction. We predict that despite optical cavity losses and solvent-mediated non-radiative relaxation, measurable signatures of the reacton formation can be found in state-of-the-art pump-probe experiments.

![Figure 1: Pictorial representation of molecules of (E)-4-[2-(1-methylpyridin-1-ium-4-yl)vinyl]phenolate, in solution inside a nanofluidic Fabry-Pérot cavity.](image)

* lorenzo.mauro@u-bordeaux.fr