DOESMORE : Dual **O**pto-**E**lectrochemical **S**ingle **MO**lecule **RE**activity : a microfabrication approach

V. Brasiliense, PPSM, CNRS, C. Lafargue, LuMiN

How to track individual reacting molecules during a complex chemical mechanism? In spite of the development of several single molecule detection techniques, flexibly tracking reactivity at single molecule level remains a challenge. For systems such as photocatalytic reactions, a single observable is often insufficient to fully describe the system, and interpretation of results often relies on ex-situ or indirect data. Within this context, combining single molecules techniques of different nature offer an interesting perspective to reveal different aspects of complex reactivity simultaneously, and thus thoroughly analyze more complex reactions. This project concerns the implementation and demonstration of a new approach for dual (optical and electrochemical) tracking of the activity of photocatalysts at single molecule level. Combining a controlled microfabrication technique with structured light excitation, micro/nano cavities will be prepared (typically 1-3µm wide 20-50 nm deep) between two electrodes, and used to trap a single photocatalyst molecule, creating a convenient and reversible platform for opto-electrochemical monitoring of its reactivity. Analysis of the correlation between these two orthogonal single molecule signals supported by stochastic modeling can then be used to reveal individual chemical events taking place inside the cavity.