

Functional organometallic complexes for solar cell and photo-electrochemical cell applications

Céline Olivier, Siliu Lyu, Camille Bertrand and Thierry Toupance

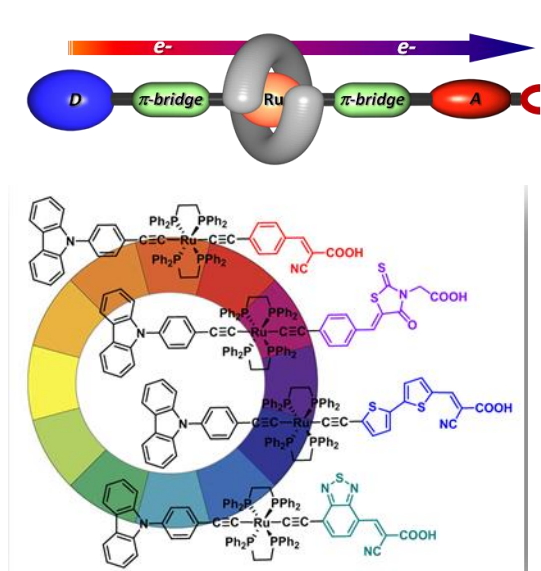
¹ ISM, Institut des Sciences Moléculaires, Université de Bordeaux.

Julien Massin, Murielle Chavarot-Kerlidou and Vincent Artero

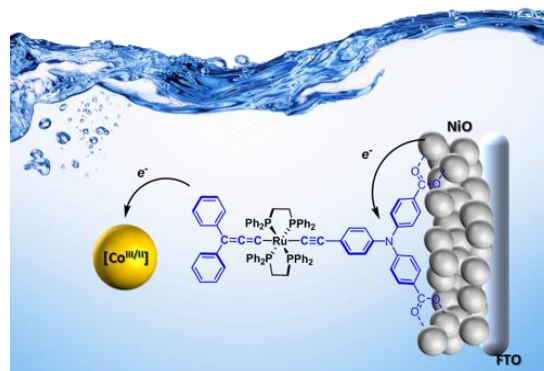
² LCBM, Laboratoire de Chimie Biologie des Métaux, CEA-Université Grenoble Alpes.

This presentation will give an overview our recent efforts in the design and synthesis of new π -conjugated organometallic complexes as next-generation dyes for photovoltaic and photo-electrochemical applications. In this context we have developed new materials based on functionalized Ru-acetylide complexes that represent extended π -conjugated photoactive systems able to harvest a large part of the solar spectrum due to strong intramolecular charge transfers.

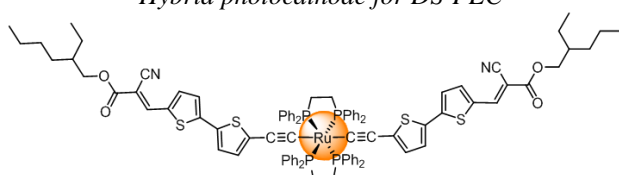
The new dyes were further embedded in different types of hybrid devices such as dye-sensitized solar cells (n-type and p-type DSSCs), dye-sensitized photo-electrochemical cells designed for H₂ evolution from water (DS-PECs) and also in small molecule bulk-heterojunction solar cells (OPV). The attractive optoelectronic properties of the new π -conjugated systems will be highlighted and their performance in the different kind of devices will be presented.



Design of colorful push-pull dyes for DSSCs



Hybrid photocathode for DS-PEC



New donor material for small molecule BHJ solar cells

References

- [1] De Sousa S., Ducasse L., Kauffmann B., Toupance T. and Olivier C. "Functionalization of a ruthenium-diacetylide organometallic complex as next-generation push-pull chromophore" *Chem. Eur. J.* **2014**, 20, 7017.
- [2] De Sousa S., Lyu S., Ducasse L., Toupance T. and Olivier C. "Tuning visible-light absorption properties of Ru-diacetylide complexes: a simple access to colorful efficient dyes for DSSC." *J. Mater. Chem. A* **2015**, 3, 18256.
- [3] Massin J., Lyu S., Pavone M., Muñoz-García A. B., Kauffmann B., Toupance T., Chavarot-Kerlidou M., Artero V. and Olivier C. "Design and synthesis of novel organometallic dyes for NiO sensitization and photo-electrochemical applications" *Dalton Trans.* **2016**, 45, 12539.
- [4] Lyu S., Hamamura T., Bertrand C., Ducasse L., Toupance T. and Olivier C. "Molecular engineering of Ruthenium-diacetylide organometallic complexes towards efficient green dye for DSSC" *Dyes and Pigments* **2018**, 158, 326.