Synthesis and characterization of copper complexes as redox mediators in DSSCs

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Over the years, many new redox mediators have been introduced to overcome the limitation of the classical I^-/I_3^- couple in dye-sensitized solar cells (DSSCs). Metal complexes have been identified as potential replacement due to the straightforward tuning of their electrochemical properties in response to structural variations [1]. Co(II)/Co(III) complexes have been reported to be the most performing and providing the best result in DSSC [2]. Nevertheless, these complexes are affected by high metal cost and toxicity which hamper their application on large scale. Copper complexes offer an interesting alternative to overcome the abovementioned limitations, despite a larger visible absorption and a slow the redox processes kinetic.

In this work, three copper complexes-based redox couples have been synthetized and characterized. Sterically hindered ligands allow the preparation of copper complexes with high redox potential but challenging synthesis. We speculate that ligands bearing substituents like methoxy or similar groups in size could be promising redox mediators, combining electrochemical and stability properties, in the preparation of efficient DSSC.

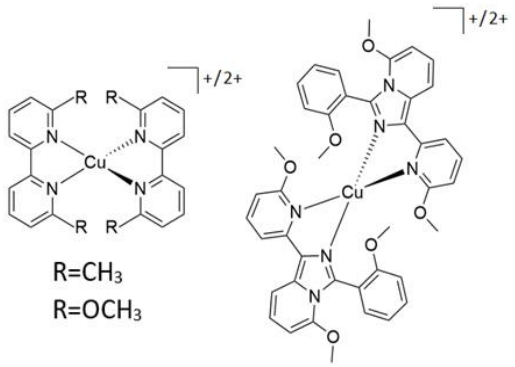

Figure 1: Copper complexes synthesided

[1] M. Wang, C. Grätzel, Shaik M. Zakeeruddin, and M. Grätzel, *Energy Environ. Sci.* **5** (2012) 9394–9405.
[2] K. Kakiage, Y. Aoyama, T. Yano, K. Oya, J. Fujisawab, and M. Hanaya, *Chem. Commun*. **51** (2015) 15894–15897.
[3] Y. Saygili, M. Söderberg, N. Pellet, F. Giordano, Y. Cao, A.B. Munoz-García, Shaik M. Zakeeruddin, N. Vlachopoulos, M. Pavone, G. Boschloo, L. Kavan, J.E. Moser, M. Grätzel, A. Hagfeldt, and M. Freitag, *J. Am. Chem. Soc.* **138** (2016) 15087–15096.