

Dynamic highly coloured Copper(I) – bis(diimine) coordination polymer: an efficient and innovative photocatalyst

Y. Pellegrin¹ J. Farjon¹ E. Blart¹

¹CEISAM - CNRS - Nantes University

Ruthenium polypyridine complexes epitomized by [Ru(bpy)₃]²⁺, feature well-known outstanding properties such as a strong absorption in the visible and long-lived excited states. As such, they dominate the world of coordination compounds photochemistry despite their toxicity and cost. Copper(I)-diimine complexes [Cu(L)₂]⁺ (L = diimine such as 1,10-phenanthroline) are very intriguing alternatives to ruthenium compounds. Indeed, they display very similar spectroscopic features to [Ru(bpy)₃]²⁺ (broad absorption band at ca. 460 nm, MLCT character). Importantly, they are a) luminescent and b) can drive photochemical reactions such as water reduction[1,2] or organic photochemical transformations[3]. The lability of the copper(I)-diimine coordination sphere is however a matter of concern: ligand scrambling is a rather favoured phenomenon with those complexes. They are thus easily degraded by de-coordination in presence of concurrent ligands, thus limiting the lifetime of the corresponding photosystems[4]. Aiming at stabilizing the latter, we propose to synthesize a dynamic coordination polymer CP1 and use the self-healing properties of such species to increase the stability of the rather fragile copper(I) chromophores in photocatalytic conditions. In this contribution, we will report the full characterization of the CP1 polymer based on a ditopic tetrapyridophenazine ligand, substituted by butyl chains in alpha of the chelating nitrogen atoms. We notably report its exceptional photochemical behaviour in presence of a variety of substrates.

[1] R. S. Khnayzer; C. E. Mccusker; B. S. Olaiya; F. N. Castellano, *J. Am. Chem. Soc.* **135**, 14068 (2013).

[2] S. Fischer; D. Hollmann; S. Tschierlei; M. Karnahl; N. Rockstroh; E. Barsch; P. Schwarzbach; S.-P. Luo; H. Junge; M. Beller; S. Lochbrunner; R. Ludwig; A. Brueckner, *ACS Catal.* **4**, 1845 (2014).

[3] A. C. Hernandez-Perez; S. K. Collins, *Acc. Chem. Res.* **49**, 1557 (2016).

[4] J. Windisch; M. Oraziatti; P. Hamm; R. Alberto; B. Probst, *ChemSusChem* **9**, 1719 (2016).