A Tour Within the Bis-Phenanthroline Copper Complex Family: from Electrochemical Features to Application as Redox Mediators in DSSCs.

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Sustainable energy production is one of the more serious challenges facing humanity to reduced and minimize the anthropogenic impact on the Planet. The conversion of the abundant solar light into energy is a promising solution. In this view photoelectrochemical devices such as dye-sensitized solar cells, DSSCs, and perovskite-based devices are among the most studied architectures for a direct production of electricity.

The role of redox mediators in DSSCs was understated for at least a decade for the benefit of dye engineering resulting in a stagnation of cell conversion efficiency. The proposal of alternative redox couples to the classical I^-/I_3^- has opened the way towards new record performance (exceeding 14% at 1 sun, 1.5 AM). Electrochemistry could play a crucial role in the design of novel effective electron shuttles.

Our work is aimed to reveal the potentiality of substituted bis-phenanthroline copper complexes as redox mediators in DSSCs, starting from a rationalization of their electrochemical features (*i.e.* $E_{1/2}$ and k_{heter}) as a function of ligand substituents [1]. These structure *vs* activity relationships allowed to finely tune their electrochemical parameters to better fulfill features of ideal mediators. A tour around the electrochemical properties of these complexes will be presented together with results concerning formulation of efficient Cu-based electrolytes for DSSCs [2,3]. Special attention will be paid to discuss correlations useful to draw a guideline for the synthesis of always best mediators.

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References

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