Copper Complexes as Effective Competitors for Iodine-free Electrolytes in Dye-Sensitized Solar Cells

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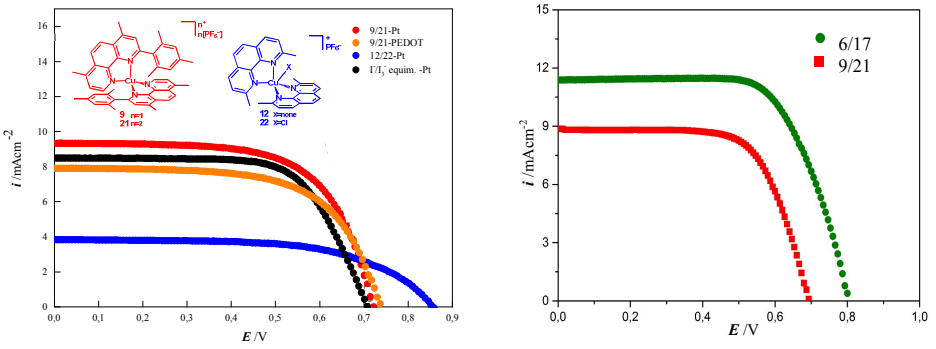
Dye-sensitized solar cells, DSSCs, are photoelectrochemical devices well contextualized within the global commitment for the progressive increase of the percentage of electric energy produced by renewable resources.
In the last decade the development of novel redox mediators alternative to the ubiquitous iodine-based electrolyte (identified as one of the principal causes of the stagnant PCE values in which the research got bogged down) has been one of the hottest topic of research. Efforts of many scientists have been catalyzed by metal complexes as promising single electron mediators characterized by an easy modulation of many electrochemical and optical features requested to ideal electron shuttles.
While tris(diimine) cobalt complexes largely monopolize recent literature, our group has focused on homoleptic 1,10-phenanthroline-based copper complexes [1,2] relying on the fact that their intrinsic limitations, if suitable tailored, could represent the turning point toward a new generation of electron shuttles. Starting from "structure *vs* activity maps" correlating ligand substitutions with the electrochemical features of this class of complexes [3], we have proposed convenient Cu-based redox couples based on bulky 2-substituted phenanthrolines that reached efficiency higher than 6%, more than doubling the PCE of cells filled with the unique benchmark copper-based redox shuttle (**12**/**22**, in figure below) and even exceeding performance of a control I^-/I_3^--based electrolyte.



References

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