Cuprophilia: dye-sensitized solar cells with copper (I) dyes and copper(I)/(II) redox shuttles

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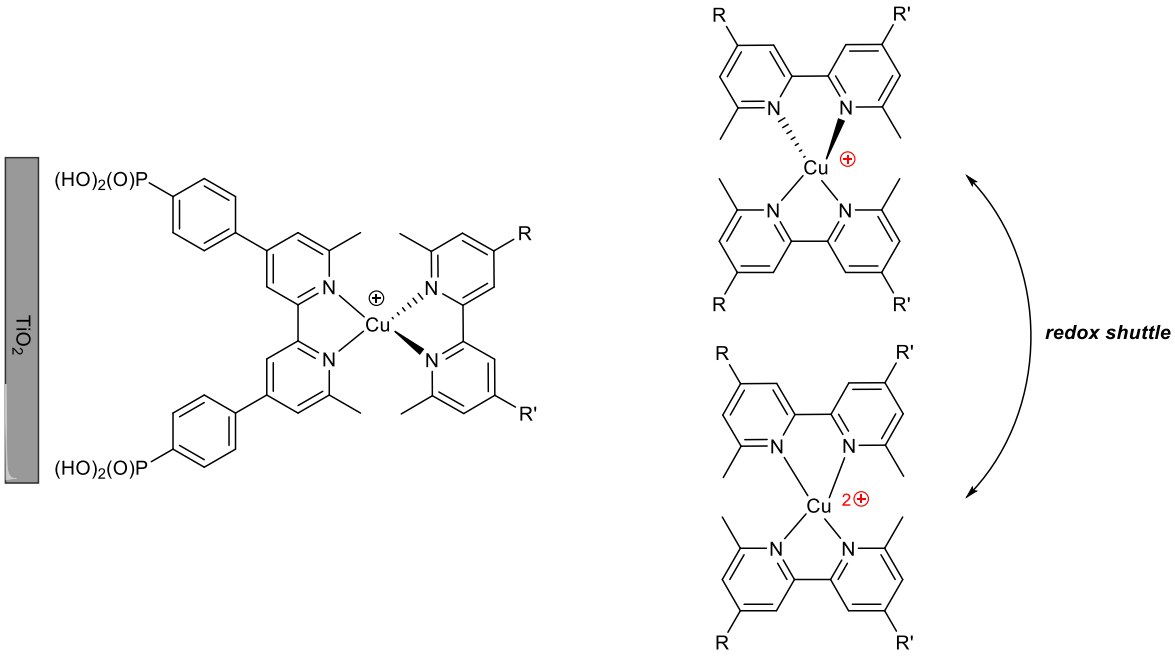
Today, the efficient and economic access to renewable energy sources is one of the fundamental challenges to every industrialized country. Besides the use of wind and water, the access to solar energy is of key importance, which is displayed by the broad scientific field of photovoltaics. Even though rare-metal containing solar cell systems have existed since 1993, they suffer from several drawbacks the most crucial of which is high cost and the use of a non-Earth abundant metal.

Our group focuses its research on n-type dye-sensitized solar cells (DSCs), which combine the use of Earth abundant metal complexes as dyes and electrolytes to address the current limitations of the known photovoltaic systems [1]. In one of the recent publications, DSCs with heteroleptic copper(I)-based dyes and homoleptic copper(I)/(II) redox shuttles have been investigated (Figure 1) [2].



In this work, new heteroleptic dyes based on the 6,6'-dimethyl-2,2'-bipyridine scaffold and with functionalizations in the 4,4'-positions have been developed. In combination with homoleptic copper complexes as electrolytes having the same scaffold, our DSCs showed promising performances (up to 2.06% photoconversion efficiency, 38.1% relative to N719 set at 100%).

[1] S. O. Fürer, B. Bozic-Weber, T. Schefer, C. Wobill, E. C. Constable, C. E. Housecroft, M. Willgert, *J. Mater. Chem.*, A, **2016**, *4*, 12995.
[2] M. Karpacheva, F. J. Malzner, C. Wobill, A. Büttner, E. C. Constable, C. E. Housecroft, *Dyes Pigm.*, **2018**, *156*, 410.