METAL COOPERATIVITY FOR VISIBLE-LIGHT DRIVEN CO_2 REDUCTION WITH HOMOBIMETALLIC MOLECULAR CATALYSTS

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Photocatalytic CO_2 reduction is a promising approach for the conversion of solar energy into chemical fuels, providing an alternative to conventional carbon-based energy sources. Efficient solar fuel production processes relies on the design of catalysts that could be inspired by natural enzymes such as CO-dehydrogenases (CODH), which catalyze the reversible conversion of CO_2 to CO via metal cooperativity. In this spirit, we have developed a series of bimetallic quaterpyridine molecular complexes, using non noble metals including copper, nickel, and iron. These complexes exhibit high activity in the reduction of CO_2 under solar irradiation, yielding formate and CO as products with high turnover number. Likewise, the selectivity of the copper and iron catalysts can be fine-tuned to favor formate or CO, respectively. Remarkably, the bimetallic quaterpyridine complexes retain their catalytic activity over long reaction times. Our main results and the mechanism for CO_2 reduction with metal cooperativity will be discussed.

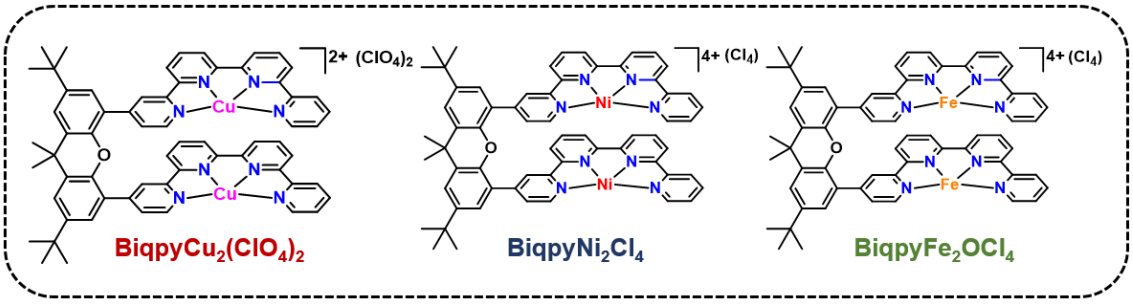

Figure 1. Structures of the Cu, Ni and Fe bimetallic quaterpyridine catalysts.

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[2] Z. Guo, C. Cometto, G. Chen, L. Chen, B. Ma, H. Fan, T. Groizard, W-L. Man, S-M. Yiu, K-C. Lau, T-C. Lau, M. Robert, *Nat. Catal.* 2019, 2, 801-808.

[3] J. Bharti, M. Robert et al., manuscript under preparation.