

## Conférence - CEISAM - UMR CNRS 6230

23 septembre 2016  
10h30 - Amphi Marie Curie

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### “Molecular catalysis of the reduction of CO<sub>2</sub> with iron complexes”

Recent attention aroused by the reduction of carbon dioxide has as main objective the production of useful products – the “solar fuels” – in which solar energy would be stored. One route to this goal consists in first converting sunlight energy into electricity than could be further used to reduce CO<sub>2</sub> electrochemically. Conversion of carbon dioxide into carbon monoxide is a key-step through the classical dihydrogen-reductive Fischer-Tropsch chemistry. We will describe our work in this field using various iron tetraphenylporphyrin derivatives, that prove to be remarkable catalysts of the reduction of CO<sub>2</sub> to CO when generated electrochemically or photochemically at the Fe(0) oxidation state, both in terms of selectivity, durability, overpotential and turnover frequency. [1-6] Understanding the molecular mechanisms for catalysis allows identifying the main factors that control the process and optimizing the catalyst structure. [7]

Extending these studies, we recently discovered that it was possible, with a water-soluble Fe porphyrin, to catalyze the electrochemical conversion of carbon dioxide into carbon monoxide in pure water [8] as well as to transfer catalytic activity to solid surfaces by grafting of the molecular catalysts [9]. Finally, and based on these advances, we very recently designed an efficient electrolyzer for CO<sub>2</sub> splitting in neutral water using only earth abundant materials. [10]

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