

# Molecular catalysts for the activation of CO<sub>2</sub> and derivatives: synthesis of transition metal complexes and characterization by spectroelectrochemistry

**Contract Type:** PhD Thesis

**Contact:**

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**Place:** The Laboratory of Molecular Chemistry, Electrochemistry and Analytical Chemistry (CEMCA) is a CNRS / Université de Bretagne Occidentale associated unit (UMR 6521 CNRS-UBO) based in Brest counting approximately 70 members (about 40 permanents and as many doctoral students and post-docs). The laboratory is a major player in the field of molecular chemistry and is especially present in national and European projects and networks (ANR, GDR Solar Fuels, COST). The PhD student will integrate the Inorganic Chemistry and Electrochemistry team. One of the thematic research concerns the study by electrochemical and spectroscopic methods of fundamental processes in electron transfer and reactivity of bio-inspired complexes, as well as their applications as efficient systems in the areas of catalysis for energy<sup>[1]</sup> and electrochemical sensors.<sup>[2]</sup>

**Mission:** The objective of the PhD Thesis is to develop and explore new molecular homogenous and heterogenous catalysts for the reduction of carbon dioxide and low-weight organic derivatives. The synthesized compounds will be characterized by various spectroscopic techniques. Special emphasis will be placed on the spectroelectrochemical characterization (IR, UV-Vis-NIR) of intermediates for full understanding of the mechanisms. Immobilization of the most promising molecular catalysts onto conductive support (electrode) will be also developed to perform heterogeneous catalysis.

**Collaborations:** This project will be carried out in collaboration with national (GDR CNRS Solar Fuel) and international partners (ITN EU Project 675020 – NoNoMeCat; Leibniz-Institut für Katalyse (LIKAT), Rostock, Allemagne) providing opportunities to student exchange.

**Contract period:** 1<sup>st</sup> October 2017 – 30<sup>th</sup> September 2020

**Net salary:** Approx. 16 k€ /year

**Candidate profile:** The candidate will lead the project from the synthesis of ligands and complexes to their spectroscopic and electrochemical analysis. A good knowledge in inorganic/bioinorganic chemistry is necessary. Additional skills in electrochemistry (molecular and/or surface modification) will be appreciated. The candidate must demonstrate enthusiasm, initiative and autonomy to manage the project and enjoy teamwork.

<sup>[1]</sup> F. Gloaguen, "Electrochemistry of simple organometallic models of iron-iron hydrogenases in organic solvent and water", *Inorg. Chem.* **2016**, *55*(2), 390-398.

<sup>[2]</sup> G. De Leener, F. Evoung-Evoung, A. Lascaux, J. Mertens, A. G. Porras-Gutierrez, N. Le Poul, C. Lagrost, D. Over, Y. R. Leroux, F. Reniers, P. Hapiot, Y. Le Mest, I. Jabin, O. Renaud, "Immobilization of monolayers incorporating Cu funnel complexes onto gold electrodes. Application to the selective electrochemical recognition of primary alkylamines in water", *J. Am. Chem. Soc.* **2016**, *138*(39), 12841-12853.