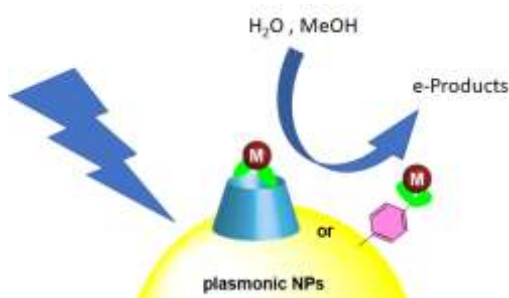


## PhD position Institut des Sciences Chimiques de Rennes.

**Duration:** 36 months – **Starting:** September or October 2025

**Key words:** nanoparticles, plasmonics, molecular catalyst, electrocatalysis

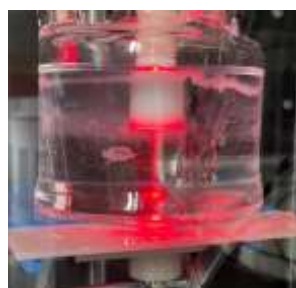
### Plasmonic metal-molecular complex hybrids for HER, OER and MOR electrocatalysis



The objective of **the PhD** is to develop an original concept of plasmon-assisted electrocatalysis by merging the efficiency of plasmonic nanoparticles for absorbing light and the versatility of molecular catalysts. Such a concept is fully innovative because plasmon-assisted electrocatalysis generally uses the plasmonic nanostructures both as light-harvester and electrocatalysts. In contrast, herein, a molecular catalyst that will be grafted onto the plasmonic nanoparticles'

surface will be used. The idea is to take benefit from the advantages of molecular catalysts (higher selectivity, true control of the catalytic sites) and of the plasmonic nanostructures (gold or silver spherical nanoparticles, gold nanorods) as light harvesting materials. The resulting hybrids should activate small fuel molecules through a plasmonically-mediated electrocatalysis.

As electrocatalytic processes, we will focus on water splitting (HER and OER) and methanol oxidation (MOR) in aqueous media, which are important reactions in green energy conversion technologies i.e. for H<sub>2</sub> production and in fuel cells, respectively.



The work will consist in **i)** the synthesis of graftable molecular catalysts useful for MOR and water splitting, **ii)** their chemical grafting onto plasmonic gold and silver nanoparticles through diazonium grafting in order to allow a strong metal-organic moiety coupling, **iii)** the evaluation of the electrocatalytic performances of the resulting metal-molecular complex hybrids in HER, OER and MOR processes. A rationalization of the influence of the plasmonic effects in the electrocatalytic processes will be targeted in the course of the PhD project.

The work will be carried out at the Institut des Sciences Chimiques de Rennes (ISCR, UMR 6226, Rennes) and at CEISAM (UMR 6230, Nantes) under the supervision of C. Lagrost (Rennes) and C. Queffelec (Nantes). Plasmon-driven catalysis is currently considered as hot topic both in photocatalysis and in electrocatalysis, although being more recently considered for the latter.

#### Skills

The candidate will have a keen scientific curiosity and a real motivation to develop robust expertise in the fields of molecular electrocatalysis. The PhD candidate will be responsible for the synthesis of the graftable molecular complexes, the synthesis and characterization of the resulting grafted nanomaterials (TEM, X-ray photoelectron spectroscopy, TGA, Raman /IR/UV-Vis absorption spectroscopy) for the evaluation of the electrocatalytic performance using the state-of-art electrochemical techniques. Rationalization will be carried out with the support of computational calculations under the supervision of A. Fihey (ISCR, Rennes). He or she will also be responsible for analyzing the results, formatting them and keeping abreast of the literature.



ISCR, Univ Rennes - CNRS, UMR 6226, Equipe MaCSE,  
Campus de Beaulieu- 35042 Rennes, France



## PhD position Institut des Sciences Chimiques de Rennes.

**Duration:** 36 months – **Starting:** September or October 2025

Key words: nanoparticles, plasmonics, molecular catalyst, electrocatalysis

With a Master's degree or equivalent in chemistry, the candidate should have a solid background in electrochemistry and/or molecular chemistry and/or nanomaterials chemistry. He or she will participate in the activities of the research teams, and will be required to present his or her work at national and international conferences. A good level of English is then required.



**Funding:** fixed-term contract (36 months), The PhD is granted by the EUR LUMOMAT and will be accredited by LUMOMAT

**Should you need more information, please contact: Corinne Lagrost** [corinne.lagrost@univ-rennes.fr](mailto:corinne.lagrost@univ-rennes.fr),

**To apply :** <https://amethis.doctorat.org/amethis-client/prd/consulter>

Use keywords or name of research director (LAGROST) to find the offer.



ISCR, Univ Rennes - CNRS, UMR 6226, Equipe MaCSE,  
Campus de Beaulieu- 35042 Rennes, France

