
Postdoctoral positions

Field	Electrocatalytic conversion of CO₂ into chemical fuels
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Key words: CO₂ reduction, flow electrocatalysis

Project description:

Two postdoctoral research positions are available in the group of Dr. Damien Voiry at the University of Montpellier in France. Our research aims at understanding of the electrocatalytic properties of nanomaterials toward the reduction of CO₂. The projects are supported by the European Research Council under the ERC Starting Grant program and the SATT AxLR. The term will be 1 year, with the possibility of renewal. The positions are available as early as January 2022. To obtain more information about our research, please visit our website (<https://lowdimensional-materials.net/>).

General context:

The rapid increase in the atmospheric carbon dioxide (CO₂) levels has motivated the development of carbon capture, utilization and storage (CCUS) technologies. In this context, the development of technology for converting CO₂ to chemical fuels provides a route to close the carbon cycle. Because multicarbon (C₂₊) products possess higher market values and are more energy concentrated, intensive efforts have been devoted to improve the reaction selectivity towards the production of C₂ and C₂₊ molecules. The modest energy efficiency and selectivity towards the production of multicarbon molecules at industrially-relevant current densities however limit the development of the CO₂RR technology. In this context, our team has recently developed an efficiency strategy to control the selectivity of the CO₂RR by modifying the surface of copper-based electrodes with a thin organic layer. The Cu-based electrodes have been successfully tested in flow electrolyzers under continuous operation for 100 hours.

Available positions: Two positions are currently available in our group.

Position #1: Electrochemical reduction of CO₂ under continuous flow process

Position #1 deals with the preparation of new electrode architectures for the electrochemical conversion of CO₂. The aim is to design innovative electrode materials and integrate them into flow cells and / or membrane electrode assembly (MEA) devices. The successful candidate will also be responsible for studying the fundamental challenges associated with CO₂RR, including carbonate precipitation, control of the local pH and the CO₂ utilization efficiency.

Position #2: Development of pilot-scale flow electrolyzer for the conversion of CO₂ to ethylene

The aim of this postdoctoral position will be to bring this technology towards industrial development by tackling the following important challenges: 1) scalability of the electrochemical reduction system, 2) achieving ultra-long stability. The successful candidate will be in charge of scaling up the CO₂RR technology developed in our group towards pilot-scale. The specific goal is to realize and validate a prototype of MEA cell for the conversion of CO₂ to ethylene. The person will be in charge of:

- 1) preparing the electrodes,
- 2) testing the catalysts in flow electrolyser,
- 3) developing a prototype demonstrator,
- 4) providing techno-economic analyses of the technology based on the experimental progress

Requirements:

We seek highly motivated candidates with documented academic backgrounds and lab experience in electro-catalysis, fuel cells or batteries. Experience in the field of reduction of CO₂ is strongly desired. We also welcome applications with background in chemical engineering for Position #2. The candidate should be self-motivated and able to conduct fast paced research and work independently in a team-oriented environment.

Interested individuals should submit a brief cover letter, CV, and the names and the contact information of three referees to Dr. Voiry by email: damien.voiry@umontpellier.fr.

Our laboratory:

The research will be carried at the European Institute of Membranes (Institut Européen des Membranes, IEM, CNRS UMR5635, UM, ENSCM) at the University of Montpellier. Our group is equipped with dedicated state-of-the-art facilities, notably with dedicated *ex-situ* and *in-situ* characterization techniques to successfully lead the projects. IEM is a world-leading institute in the field of membrane science with excellent technical support and in-house facilities for the fabrication and characterization of membranes. The institute is affiliated to the University of Montpellier, and member of the Pôle Chimie Balard, institut Carnot Chimie Balard and Labex CheMiSyst.

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