

Postdoctoral Position at Department of Chemistry and CERMAV-CNRS, Grenoble, France:
"Molecular sieve biomembranes derived from polysaccharides and MOFs for bioelectrochemical sensors"

Position :

Date of publication	March 15, 2024
Contract	Full-time, 18 months
Expected employment date	From 1 st October 2024
Desired level of education	PhD
Experience required	1 to 4 years
Project PI	Dr Andrew J. GROSS (CNRS researcher); andrew.gross@univ-grenoble-alpes.fr
Project co-PI	Dr Rachel Auzély (Professor); rachel.auzely@cermav.cnrs.fr

Workplace: Bâtiment Nanobio, 570 rue de la Chimie, 38610, Gières, France

Language: The work will be performed in international laboratories in french and/or English

Candidature: Candidates should provide a CV, letter(s) of motivation, and contact details of at least 2 referees

Please send applications to andrew.gross@univ-grenoble-alpes.fr, rachel.auzely@cermav.cnrs.fr, anna.szarpak@cermav.cnrs.fr before the date limit: **30 April 2024**

Mission

Within the framework of Labex ARCANE (laboratoire d'excellence) - University of Grenoble funding, we are looking for a post-doctoral researcher to develop polysaccharide-based membranes incorporating metal organic frameworks (MOFs) and their application for electroenzymatic biosensing. Labex ARCANE is a consortium of scientists from the University of Grenoble whose common scientific objective is biomotivated chemistry: <https://arcane.univ-grenoble-alpes.fr/arcane>.

Background

Enzyme-based electrochemical biosensors have revolutionised diabetes care and offer considerable promise for monitoring of biomarkers to improve human health. State-of-the-art devices combining robust enzymes with petroleum-based polymers are limited to the monitoring of glucose over short periods of time. The development of biosensors beyond glucose is challenging due to factors such as enzyme and sensor fragility, selectivity and specificity. In this project, we propose to develop a new class of porous and biocompatible polysaccharide-based membranes to modulate the selectivity and reactivity of electrochemical biosensors to enable reliable monitoring of alternative biomarkers in biofluids. Metal organic frameworks, highly porous "sponge-like" materials formed via the self-assembly of metal ions and organic linkers, are being widely explored for gas adsorption and separation as well as catalytic reactions. Here we will push their development in combination with polysaccharides to obtain new materials for the niche application of electrochemical biosensing.

Activities

The main responsibilities of the candidate:

- Synthesis and characterisation of polysaccharide hydrogels
- Synthesis and characterisation of polysaccharide-MOF hydrogels via different cross-linking strategies
- Assembly and characterisation of polysaccharide and polysaccharide-MOF bioelectrodes
- Bioelectrocatalysis including the evaluation and optimisation of electrochemical biosensors

The chemical and mechanical properties of the hydrogels including swelling and mechanical properties will be studied via CERMAV, European leader in glycosciences. The MOF materials will be characterised using techniques including powder XRD, FTIR, Raman and electron microscopy. Membrane properties including charge and diffusional properties are of interest. Electrochemistry (cyclic voltammetry and chronoamperometry) will be used for simple characterisation and evaluation of sensor performance.

Characterisation techniques: Electrochemistry, pXRD, Raman, SEM-EDX, TEM, UV-vis, IR, conductivity, zeta potential, BET analysis

General responsibilities: Preparation of reports for meetings, preparation of articles, dissemination of results at conferences, assisting supervision of Master's students

Skills

The candidate has a Ph.D. in chemistry or related field and is seeking to develop a multi-skilled profile. A strong competence is required in **at least one of the three core subjects** (chemistry of (bio)polymers, electrochemistry, MOF chemistry) **with motivation/experience in a secondary subject**. The candidate should possess skills in synthetic chemistry to obtain materials (biopolymers/polysaccharides and inorganic) and physical chemistry (electrochemical sensors for health).

In addition, we are looking for:

- Excellent experimental skills.
- Excellent writing abilities, aptitude for reporting, publishing, and promoting results.
- Ability to work independently and in a team with autonomy on highly multidisciplinary topics.
- Excellent communication and organizational skills.
- Ability to solve complex problems.
- Critical and curious mindset.
- Initiative and rigor.

We also expect the candidate to have a well-thought-out future vision. The candidate may be working their profile towards a future application to become a permanent CNRS researcher, or perhaps a lecturer, or CEO.

Work Context

This position is financed by Labex – University Grenoble Alpes and will be realised at the Dept. of Molecular Chemistry (DCM, BIOECEN team) and the CERMAV institute (SMP team) on the university campus in Grenoble, in the heart of the French alps. The funding is subject to the candidate being auditioned and validated by the Labex committee before June 2024.

The BIOECEN team is based in the state-of-the-art Nanobio complex with direct access by foot to the Chimie Nanobio ICMG platform as well as the CERMAV institution. BioECEN's activity is focused on molecular electrochemistry and bioelectrochemistry, including the development of electrode materials whose applications include analytical chemistry with biological sensors (enzyme electrodes, immunosensors, aptasensors and DNA sensors), bioreactors and electrochemical biomimetic systems, energy conversion, biofuel cells and abiotic fuel cells. BIOECEN is a leading European research team in enzymatic biofuel cells and biosensors. The team comprises 3 permanent CNRS researchers, 1 emeritus CNRS researcher, 1 professor, 2 lecturers, and 2 CNRS engineers. Dr Gross is a specialist in molecular surface chemistry, electrochemistry, and nanostructured (bio)materials for sensing and energy (44 publications, 9 patents, co-founder of BeFC SAS on paper-based biofuel cells).

The research activities of the SMP team are focused on the chemistry and physicochemistry of polysaccharides. Polysaccharides are bio-based polymers, derived from renewable resources, that are generally biocompatible and biodegradable. We develop methods for chemically modifying these biopolymers and exploit their new properties to design functional, stimuli-responsive biomaterials for advanced applications in healthcare. Prof R. Auzély, SMP team leader (CERMAV), is an expert in modification and characterization of polysaccharides for the development of smart biomaterials (110 publications, 14 patents). D A. Szarpak (AS), MCF / lecturer in the SMP team, strengthens the consortium relating to the modification and characterization of polysaccharides and composites.

References

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