Postdoctoral Scholar in Molecular and Supramolecular Chemistry applied to the Recycling of Strategic Metals

General

The Institute of Molecular and Supramolecular Chemistry and Biochemistry (ICBMS) of the University Lyon 1 (UCBL) in collaboration with MeCaWaRe SAS, MTB Recycling and the Department of Chemical Engineering of the Massachusetts Institute of Technology (MIT-CE, T. A. Hatton group), is seeking to fill an opening for a post-doctoral scholar in chemical separations of critical and strategic metals, within the framework of the collaborative project *BlackCO2Met*, funded by the Auvergne-Rhone Alpes Area (starting June 2022).

The successful candidate will join a diverse team of experts in chemistry and engineering from the academic and private sector to address challenging, fundamental questions about chemical separations applied to critical and strategic metals, the answers to which will enable the development of an innovative recycling process of lithium-ion batteries. The candidate will also have the opportunity to work with the advanced instrumentation available at various research and technology platforms (https://www.icbms.fr/) and other facilities across campus.

Position Description:

The position will investigate the coordination chemistry (kinetics and thermodynamics) of metal cations found in the electrodes of lithium-ion batteries with CO_2-based ligands (carbamates, carbonates and amines) and the physical properties of the corresponding salts and complexes. The final goal of the study is to extend the scope of metals, which will be processed and recovered by the eco²-efficient technology developed by the consortium, from five to eight, starting from a validated proof of feasibility. The position requires a strong background in molecular, physical and supramolecular chemistry, good understanding of and experience with hydrometallurgy, sustainable chemistry, analytical techniques such as nuclear magnetic resonance, inductive coupled plasma-mass spectrometry (ICP-OES) and titration methods. Familiarity with mechanochemistry, electrochemistry and redox reactions of critical and strategic elements is also desirable. This position will also involve coordination of efforts between researchers at two universities and two private companies, preparation of reports and proposals, and travel to conferences or professional meetings to present research results. As a contributor to a group effort, the candidate will have the opportunity to lead studies, including the preparation of manuscripts, and contribute to tangential research efforts.

Preferred Experience & Skills:

The preferred candidate should have:

- Demonstrated experience with physical chemistry techniques (thermodynamic and kinetics monitoring of species in solution, analysis of equilibria within complex/multiphasic systems)
- Experience with solid characterization techniques / Mechanochemistry
- The ability to design and conduct research addressing fundamental scientific questions
- Expertise in characterization techniques, including ICP-OES, UV-VIS/NMR and potentiometric titration
- Knowledge in molecular organic chemistry, theory of solid-liquid-gas phase equilibria, coordination chemistry, supramolecular chemistry, physical chemistry and electrochemistry
- Experience in structural characterization of solutions and solids, including e.g. FTIR, UV-VIS, ssNMR,
- Familiarity with data processing and design of experiments approach
- Excellent analytical problem-solving skills
- Excellent oral and written communication skills

- Experience with proposal writing, technical writing, and presentations

Two or more scientific journal publications demonstrating applications of the above experience and skills is a plus.

Requirements

A Ph.D. in molecular chemistry is required by the start date of employment.

Appointment and Application

The initial term of the appointment is 20 months from the date of hire and possibility of recruitment by MeCaWaRe SAS pending available funding and satisfactory performance.

For full consideration, applicants must upload the following materials with their application: 1) a cover letter (one page or less) summarizing their qualifications and research interests, 2) a complete academic CV, and 3) the names and contact information for at least 2 references.
Application review will begin immediately and will continue until the position is filled. Research will be conducted at the DOUA Campus of the University Claude Bernard, Villeurbanne FR in the Applied Supramolecular Chemistry group of the ICBMS.

Questions about this opportunity and application material may be emailed to Prof. Julien Leclaire at julien.leclaire@univ-lyon1.fr.

References :

1. J. Leclaire, G Canard, F Fotiadu, G Poisson Method for Detecting Capturing and/or releasing Chemical Elements, *PCT Int. Appl.* **2014,** WO 2014188115 *A1 20141127. US Patent* **20,160,097,755**
2. G. Poisson, G. Germain, J. Septavaux, J. Leclaire. Straightforward and selective metal capture through CO_2-induced self-assembling, *Green Chem.* **2016,** *18*, 6436 - 6444
3. J. Leclaire, G. Poisson, R. Philippe, J. Septavaux, L. Vanoye Process of capture and/or detection of chemical element and installation related to the process. C. de Bellefon, *WO patent* **2017**, PCT EP 2017060166.
4. J. Leclaire, T-X. Metro, J. Septavaux, Selective Metal Extraction by Mechanically assisted leaching, *WO patent* **2018,** PCT EP 2018 074789
5. J. Septavaux, C. Tosi, P. Jame, C. Nervi, R. Gobetto & J.Leclaire, Simultaneous CO_2 capture and metal purification from waste streams using triple-level dynamic combinatorial chemistry. *Nature Chem.* **2020**, *12*, 202–212.