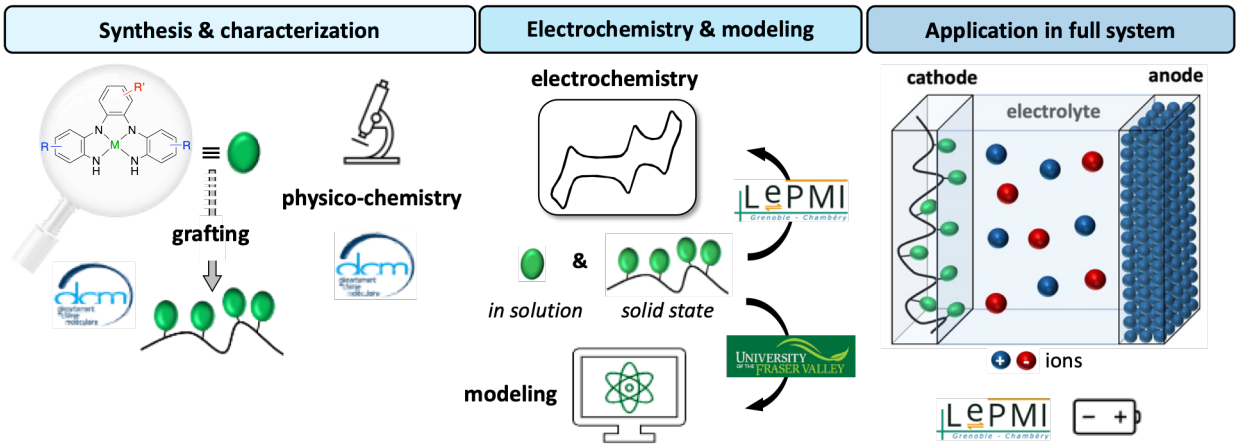
Earth-abundant metal complexes of redox-active ligands for battery electrode materials

PhD position - Supervisors: Dr. Lauréline LECARME & Dr. Nicolas LECONTE

Project description. Today, two main types of active electrode materials are used in Li-ion battery (LiB) systems: metal oxides and organic compounds. Combining the advantages of both technologies within a single framework—where electron transfers occur on both the metal center and the organic moieties—has drawn our attention to coordination complexes made of redox-active ligands. Mostly studied as structural or functional models of metalloenzymes, redox-active ligands act as electron reservoirs and can exchange electrons in synergy with the metal center or independently. Beyond bio-inspired chemistry, the design of redox architectures that undergo multiple electron transfers, with tunable redox properties, is foreseen to bring a breakthrough in energy storage. Indeed, electrode materials that would integrate coordination compounds have emerged as promising candidates for next generation Li-ion batteries (including K- and Na-ion). Their multiple reversible electron-transfer processes enable high specific capacities, while their adjustable redox behavior allows control over the electrochemical potential window and solubility. In the current project we will design, characterize and evaluate (up to the coin cell!) new positive electrode materials made of earth-abundant-metal coordination complexes grafted on a polymer backbone. Our work will focus on compounds combining eco-compatible transition metals (Ni, Cu...) and redox-active ligands derived of a tetradentate bis(o-phenylenediamine) pattern. Supported by our ongoing collaboration and the encouraging preliminary results achieved so far, the project explores a new class of high-capacity, environmentally-friendly active materials for electrochemical energy storage devices.



Funding. Labex Arcane PhD grant.

Starting date. October, 1st 2026.

Location. DCM and LEPMI labs, Univ. Grenoble Alpes, Grenoble, France

Candidate profile. The applicant should hold a Master's degree in chemistry at the starting date. Molecular chemistry and electrochemistry are the core of the project. Consequently, a will to develop skills at the interface of organic synthesis, coordination chemistry and physical chemistry, applied to electrochemistry, is mandatory. Rigorous, meticulous and curious, the candidate can adapt to a multi-disciplinary environment and has good communication skills (writing and speaking) to interact with scientists from different fields.

For **more info**, contact nicolas.leconte@univ-grenoble-alpes.fr and laureline.lecarme@grenoble-inp.fr

Applications on the CSV doctoral school website before April, 9th 2026**.**