

PhD position: Plasma treatment of materials for eco-friendly manufacturing of Li-ion positive electrodes

Context and goal

In the framework of the Win4Doc Program of the Walloon Region, ICS recruits a young researcher with a background in physics, chemistry and/or materials science to carry out a 4-year long PhD thesis. The project will be conducted in partnership with the Laboratory of Analysis by Nuclear Reactions (LARN) of the University of Namur (UNamur), Belgium, and the Department of Chemical Engineering of the University of Liège (ULiège), Belgium.

The project deals with the use of low-pressure plasma technologies for the modification of active materials and conductive additives involved in the formulation of positive electrodes of Li-ion batteries. The main objective is to make these materials compatible with water-based manufacturing processes that are cheaper, more efficient and more environmentally friendly than conventional solvent-based processes. To that aim, powders of commercial active materials and carbon conductive additives will be coated with a possibly doped protective carbon layer, to improve their conductivity, their resistance against water contact and their dispersibility in water-based slurries. Those materials will be used to manufacture Li-ion battery electrodes using a water-based process.

Role of the PhD student

First, the role of the PhD student will be to optimize and understand the properties and growth mechanisms of the plasma-deposited coating around battery electrode materials, keeping in mind that the final goal is to obtain the best final properties within the electrode. Second, he/she will produce complete battery electrodes composed of a current collector, active materials, conductive additives and a water-compatible binder. These electrodes will be characterized in Li-ion half-cells to determine the electrode specific capacity and conductivity, the SEI (Solid Electrolyte Interface) growth and stability, and the cycling behavior. The candidate will thus demonstrate the relationships between the plasma treatment and the final electrochemical properties.

Information

- *General:* The PhD student will be hired by ICS as a Trainee Researcher. The work will mainly take place in Namur (BE), with regular visits to the Department of Chemical Engineering in Liège. Other occasional visits to partner companies in Europe are expected.
- *Profile:* Master degree or equivalent in Physics, Chemistry, Materials Science and/or Engineering. Knowledge in plasma physics, thin film deposition techniques, surface analysis and/or electrochemistry are valued.
- *Language:* fluent English, a good level in French is an asset.
- *Duration:* 4 years
- *Start:* September-October 2022
- *Application:* please send a detailed CV and a cover letter highlighting your skills and interests for this specific project to Cédric Vandenabeele (R_D@incosol4u.com), with copy to Nathalie Job (Nathalie.Job@uliege.be) and Stéphane Lucas (SLU@incosol4u.com).
- *Application deadline:* August 15th 2022
- *Supervisors:* Prof. Nathalie Job (Department of Chemical Engineering – Nanomaterials, Catalysis, Electrochemistry, ULiège), Prof. Stéphane Lucas (LARN, UNamur), Dr. Cédric Vandenabeele (ICS)