

MATERIALS SCIENCE AND TECHNOLOGY

DISAT - Next-generation materials and processes for industrial-scale rechargeable batteries

Funded By	Dipartimento DISAT
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Context of the research activity	<p>The PhD project will be carried out within the framework of two cutting-edge initiatives: the NEXTCELL project, funded under the European Union's Horizon Europe programme, and GREEN2MOVE, a national industrial research project. Both initiatives focus on the development of innovative materials and chemistries for sustainable energy storage systems. NEXTCELL is devoted to realizing a new generation Li-ion cell for both high capacity and high voltage applications by developing a ground-breaking gellified cell concept; GREEN2MOVE, on the other hand, targets the development of a new generation of potassium-ion batteries through green manufacturing processes and the use of biosourced materials.</p> <p>The candidate will contribute to the advancement of alternative chemistries and materials platforms that respond to the critical challenges of cost, raw material availability, safety, and sustainability in electrochemical storage. The research will combine fundamental materials science with application-oriented cell engineering, positioning the candidate at the intersection of academia and industry, within a dynamic and international research environment.</p> <p>The activity is granted by the projects NEXTCELL [CUP E13C22003100006] and GREEN2MOVE [Bando FISA 2022, Progetto FISA-2022-00983, CUP E13C24000310001], dealing with industrial and fundamental research activities.</p>
Objectives	<p>The PhD research will be structured around two complementary work packages, corresponding to the two funding projects. Under NEXTCELL, the candidate will work on the electrochemical characterization of jellified high voltage cathodes based on LNMO active material along with high capacity jellified Si/C anodes according to the required specification defined within the project. The project will also explore the safety of the jellified full system in terms of thermal runaway through accelerating rate calorimeter tests. The research will be carried out in collaboration with European partners and the candidate will be involved in all the activities of the various work packages.</p> <p>In GREEN2MOVE, the focus will shift toward potassium-ion batteries, with activities ranging from the formulation of biosourced electrodes and polymer electrolytes to the assembly and testing of coin and pouch cells. The</p>

candidate will contribute to the development of green synthesis methods, perform advanced physicochemical and electrochemical characterization, and support the implementation of safety and abuse tests. The research will involve close collaboration with industrial partners, offering the opportunity to translate lab-scale innovations into pre-industrial demonstrators. The PhD candidate will be expected to publish results in international journals, present at conferences, and take an active role in collaborative tasks across both projects.

**Skills and
competencies
for the
development of
the activity**

The following skills and competencies are requested for the development of the activity:

- Candidates are required to have defended a MSc Thesis in: Chemical Engineering, Materials Engineering; Industrial Chemistry; Chemistry; Materials Science; Energy Engineering; Industrial Biotechnologies.
- Previous activities of the candidates in the field of battery materials design and/or related materials chemistry methodologies or synthetic approaches constitute a preferential skill for the selection process.
- Capacity to work in a multidisciplinary team and to organize the own work for accomplishing deadlines.
- Regularly write project reports and papers in agreement with supervisors' schedule.