MATERIALS SCIENCE AND TECHNOLOGY

DISAT - Materials and processes for the preparation of potassium batteries electrodes

Funded By	Dipartimento DISAT
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Context of the research activity	This PhD position concerns the design of active materials for potassium batteries, with a special focus on production as well as surface treatment processes. The growing demand for sustainable and low-cost energy storage systems is driving the development of alternative battery chemistries beyond lithium. Among these, potassium-ion batteries are gaining increasing attention due to the abundance and wide geographical distribution of potassium resources, along with promising electrochemical properties. However, the advancement of this technology requires significant progress in electrode materials and fabrication processes. The PhD activity will be embedded in an interdisciplinary research environment focusing on innovative materials and scalable processes for next-generation batteries. The activity is granted by the project GREEN2MOVE [Bando FISA 2022, Progetto FISA-2022-00983, CUP E13C24000310001], dealing with industrial and fundamental research activities.
Objectives	The PhD student will focus on the development of advanced active materials for potassium-ion batteries, aiming to improve their electrochemical performance, cycling stability, and scalability. The research will include the chemical synthesis and characterization of new active materials, with particular attention to structural stability and ion transport mechanisms. A key objective will be the application of laser treatment techniques on both current collectors and electrodes to optimize surface morphology, adhesion, and electronic conductivity. The candidate will investigate the correlation between laser processing parameters and the resulting battery performance, employing a combination of electrochemical testing, microscopy, and spectroscopy. Another goal will be to assess the compatibility of the developed materials and treatments with industrially relevant processes. The expected outcome is the demonstration of high-performing, stable, and processable electrodes, contributing to the practical realization of potassium-based energy storage technologies at a pilot-line level.
	The following skills and competencies are requested for the development of the activity:

Skills and competencies 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.