CHEMICAL ENGINEERING

DISAT - DIGICELL post lithium ion cells manufacturing and deep characterization

Funded By	Dipartimento DISAT

Supervisor	VERSACI DANIELE - daniele.versaci@polito.it

Contact	BODOARDO SILVIA - silvia.bodoardo@polito.it

Context of the research activity	The production of lithium-based cells is a topic of fundamental importance in Europe and there are 38 gigafactories in the project, some of which are also in Italy. The sustainable production of batteries is the basis of the storage of energy from renewable sources and of enabling the use of electric cars in the perspective of the energy transition which has been accelerated by the National Plan for Recovery and Resilience PNRR and provides for research activities of importance strategic right on the batteries. It is therefore essential to study the best production methods to create cells with proper energy density tailored for the final application. According to European indications and in particular the innovations coming from Battery2030 coordinated supporting action, project of European importance (https://battery2030.eu/), the European battery cell has to be fully sustainable from the choice of materials to its production and final recyling. For this reason, the research of this PhD will be based on the study of post lithium ion cells containing no critical raw material as LiS and Kion

Objectives	Within DigiCell projects, it is provided a digitally integrated framework that improves reliability and quality in the manufacturing processes of high-performance Lithium-ion batteries (LIB) and beyond Lithium battery technologies through unified and adaptive models capturing the structure-property relationships in these complex energy materials. It is based on a toolset of innovative and state-of-the-art characterisation methods for multiscale materials, interoperable tests, and analytical models supported by and linked through machine learning. With this, the production costs, materials waste, and the CO_2 footprint in production lines will be reduced, while in parallel the battery electrochemical performance at the single cell level will be increased. This phd activity is in line with the topics of DIGICELL and the student will develop, optimize and deeply characterize post lithium ion cells for future applications.

Skills and competencies for the	The candidate must have proven skills in the chemical and production of new materials as well as, possibly, experience in electrochemical characterization procedures. In addition, the candidate must demonstrate adaptability in both

| **development of the activity** | academic and industrial research and a good knowledge of the English language. |