MATERIALS SCIENCE AND TECHNOLOGY

DISAT - Next-generation binder for electrochemical energy storage devices

Funded By	Dipartimento DISAT
Supervisor	BELLA FEDERICO - federico.bella@polito.it
Contact	VERSACI DANIELE - daniele.versaci@polito.it BELLA FEDERICO - federico.bella@polito.it
Context of the research activity	This PhD position concerns the design of novel polymeric binders to be applied in cutting-edge energy storage-related technologies, i.e. Li-N2, Li-S, and K-ion batteries. The activity concerns the development of these polymeric materials, their physico-chemical characterization, as well as integration in lab-scale prototype for the subsequent electrochemical testing. “Funded by: From M1 to M15: SuN2rise project [European Research Council (ERC), under the European Union's Horizon 2020 research and innovation program (grant agreement No. 948769, project title: SuN2rise)] From M16 to M24: LOTUS project [Bando Fare - 1215/2022, LOTUS - Lithium prOtecTion for robUst and Safe batteries (codice ugov 54_RID22_BEF01) CUP E13C22002510005] From M25 to M36: FISA-2022-00983 - GREEN2MOVE-Green potassium batteries manufacturing processes: towards sustainable gigafactories [Bando FISA 2022, Progetto FISA-2022-00983, CUP E13C24000310001]”
Objectives	The research activity focuses on electrochemistry-based technologies for the energy and ecological transition. In particular, the activity of the PhD student will be based on designing new polymeric materials for binders to be used in energy storage devices. The activity is granted by three research projects: - From M1 to M15: SuN2rise project [European Research Council (ERC), under the European Union's Horizon 2020 research and innovation program (grant agreement No. 948769, project title: SuN2rise)] - From M16 to M24: LOTUS project [Bando Fare - 1215/2022, LOTUS - Lithium prOtecTion for robUst and Safe batteries (codice ugov 54_RID22_BEF01) CUP E13C22002510005] - From M25 to M36: FISA-2022-00983 - GREEN2MOVE-Green potassium batteries manufacturing processes: towards sustainable gigafactories [Bando FISA 2022, Progetto FISA-2022-00983, CUP E13C24000310001]

	The activity will be based on the definition of synthetic strategies for preparing binders and electrode formulations. An extensive physico-chemical characterisation will also be conducted, enabling the fine-tuning of electrode formulations through the definition of structure-property relationships. From M1 to M15, the activity will be addressed towards systems for Li-N2 batteries, i.e. emerging energy technologies aimed at converting nitrogen into ammonia, to be used as fuel for chemical storage (SuN2rise project). From M16 to M24, the binder-related activity will be shifted towards Li-S batteries, which represents the core of LOTUS project. The last PhD year focused on GREEN2MOVE will be fully addressed to potassium-based batteries, where the PhD student will work at a pilot-line level on this post-Li ion technology of cutting-edge interest within the large-scale energy storage scenario.

Skills and competencies for the development of the activity	Candidates are required to have defended a MSc Thesis in: Chemical Engineering, Material 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 constitute a preferential skill for the selection process. Capacity to work in a multidisciplinary team and to prioritize the own work for accomplishing deadlines.