MATERIALS SCIENCE AND TECHNOLOGY

DISAT - Sustainable materials and processes for emerging energy technologies

Funded By	Dipartimento DISAT
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Context of the research activity	This PhD position focuses on sustainable materials and processes for emerging energy technologies, with particular emphasis on electrochemical systems for energy storage and conversion. The transition towards low-carbon energy systems requires the development of abundant, cost-effective, and environmentally benign materials, as well as scalable manufacturing and processing strategies. In particular, electrochemical routes for energy conversion and chemical synthesis are gaining increasing relevance as key enablers of integrated, flexible, and sustainable energy infrastructures. The PhD research will be carried out in an interdisciplinary environment addressing the design, synthesis, and processing of functional materials for next-generation electrochemical devices, combining materials chemistry, surface engineering, and electrochemical characterization. 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 candidate will work on the development and optimization of advanced functional materials for electrochemical energy technologies. The research activities will include the synthesis, modification, and characterization of electrode and electrolyte materials, with the objective of improving their electrochemical performance, long-term stability, and compatibility with scalable and sustainable production processes. Particular attention will be devoted to understanding structure–property relationships, interfacial phenomena, and transport mechanisms governing electrochemical operation. The project will also investigate innovative processing and surface engineering strategies—such as physical, chemical, or laser-based treatments—to tailor electrode morphology, surface reactivity, and electronic/ionic conductivity. The candidate will apply a wide range of experimental techniques, including electrochemical testing, spectroscopic and microscopic analyses, and physicochemical characterization, to evaluate material behavior under relevant operating conditions. Within the broader context of emerging energy technologies, the PhD

	research will address materials and interfaces relevant to electrochemical energy storage and conversion (from electrocatalysis to batteries), contributing to the development of integrated and sustainable solutions. The expected outcome is the advancement of versatile, high-performance materials and processes that can be transferred across different electrochemical applications, bridging fundamental research and application-oriented development.

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 electrochemistry 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.