

MATERIALS SCIENCE AND TECHNOLOGY

UFI Hydrogen S.p.A. - Design, Development and Characterization of Advanced Electrocatalysts for High-Temperature Fuel Cells

Funded By	UFI Hydrogen S.p.A. [P.iva/CF:01978250221]
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Context of the research activity	The PhD project will focus on the design, synthesis, characterization and validation of advanced electrocatalysts and carbon-based supports for high-temperature fuel cells. Research activities will address catalyst development, structure-property relationships, electrochemical performance towards the oxygen reduction reaction (ORR), and long-term stability under realistic operating conditions, with the aim of developing durable and efficient materials for energy conversion applications.
Objectives	This PhD project is carried out within the framework of an industrial collaboration between Politecnico di Torino and UFI Hydrogen, aimed at developing next-generation electrocatalysts for high-temperature fuel cell applications. The research activity will focus on the design, synthesis, optimization and characterization of advanced Pt-based and PtM electrocatalysts supported on innovative carbon materials for the oxygen reduction reaction (ORR). Particular attention will be devoted to improving catalyst activity, durability and stability under harsh operating conditions relevant to high-temperature fuel cells. The project will investigate the relationship between catalyst composition, morphology, support properties and electrochemical performance. Advanced carbon supports, including nitrogen-doped graphitic materials and graphene-derived structures, will be developed and optimized to enhance catalyst dispersion, electrical conductivity and long-term stability. The research will include catalyst synthesis, structural and morphological characterization using advanced analytical techniques, and electrochemical evaluation through ORR activity measurements and accelerated stress tests. Selected materials will be further validated under realistic fuel cell operating conditions in collaboration with UFI Hydrogen. The final objective is to identify highly active and durable electrocatalyst formulations suitable for high-temperature fuel cell technologies, contributing to the development of efficient and sustainable energy conversion systems. The project will provide the PhD candidate with interdisciplinary expertise in

materials science, electrochemistry, catalyst development and fuel cell technologies, while fostering strong interaction between academic research and industrial innovation.

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

The ideal candidate should have a background in Chemistry, Materials Science, Chemical Engineering, Physics or related disciplines. Knowledge of heterogeneous catalysis, electrochemistry, fuel cells, nanomaterials synthesis and characterization will be considered an advantage. Experience with electrochemical techniques and materials characterization methods is desirable. The candidate should demonstrate strong analytical skills, scientific curiosity, and the ability to work in an interdisciplinary academic-industrial research environment.