Post-doctoral position

Experimental Analysis of a PEMFC Composed of Innovative Oxide Catalysts

LEMTA Laboratoire Energie et Mécanique Théorique et Appliquée – Université de Lorraine – CNRS NANCY – France (https://lemta.univ-lorraine.fr)
Institut Pprime – Université de Poitiers – CNRS – POITIERS – France (https://pprime.fr)

Starting date: 1st October 2022 no later than 1st January 2023
Duration: 18 months
Location: LEMTA – 54000 Nancy

Net salary per month: 2100 €

Contact: Applications (CV, letter of motivation) should be sent by email to:
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Context

To prepare the next generation of proton exchange membrane fuel cell (PEMFC) for automotive applications, the question of substituting critical raw materials like Pt group metals (PGMs) is mandatory for many reasons. Among them, the cost and the availability of strategic raw materials such as PGMs only on restricted areas on earth make addressing their substitution very urgent. The project "InnOxiCat" (Innovative Oxide Catalysts for next PEMFC generation) address these issues with the objectives of (i) building knowledge on convenient structures and compositions of non-PGM materials for fuel cell cathode where the sluggish oxygen reduction reaction (ORR) occurs, (ii) synthesizing the materials and characterizing their physicochemical and electrochemical properties and (iii) for fuel cell, reaching higher performance than the state of the art of non-PGM materials.

Project

The objective of the post-doctoral project is to analyze the influence of the new electrode composition and architecture on the performances of a fuel cell, and to optimize the operating conditions. To reach this goal, the most promising catalytic compositions developed by the partners of the "InnOxiCat" project will be tested at the global and at the local scale to determine the more suitable gas flow rates, relative humidity and cell temperature to reach the best performances and longer lifetime. Membrane electrode assembly (MEA) will be built and tests will be conducted using a segmented and instrumented cell (25 cm^2). This cell will be used for global MEA characterizations, but the measurement of the local current densities and the local electrochemical characterizations (polarization curves and electrochemical impedance spectroscopy) will give a better understanding of the link of the electrochemical performances of the carbon-supported catalyst with the local mass transport limitations, and therefore with the operating conditions. By applying Accelerated Stress Tests (AST) and repeated start-up and shutdown tests, the local information collected using the segmented cell will be used to analyze the local degradations and therefore the durability of the new catalyst materials.

Skills recommended: The candidate should have knowledge of electrochemistry, if possible applied to the fuel cell field, and be comfortable with experimental studies. Knowledge of heat and material transfer would be a plus.