

PhD - Centrale Lille Institut

INSTITUTION: Centrale Lille Institut

Scientific field : Chemistry and materials

Title of the thesis: Characterisation of solid oxide fuel cells and solid oxide electrolyser cells: performances, mechanisms and optimisation

Supervisor(s): Rose-Noëlle VANNIER, Aurélie ROLLE

Laboratory: Unit of Catalysis and Solid State Chemistry, CNRS UMR 8181

Related research project (national): Fédération de Recherche sur l'Hydrogène, FRH2

Expected funding: Région Hauts de France / Centrale lille Institut

ABSTRACT

In the context of energy transition to carbon neutrality by 2050, Solid Oxide Fuel Cells (SOFC) and Solid Oxide Electrolyser cells (SOEC) have real potential for use as an energy carrier. The objective of the proposed thesis is to precisely characterize the performance of complete cells in fuel cell mode, but also in electrolysis mode. This work will be carried out on a "Fiaxell" test bench, which has the advantage of allowing the characterization of cells without the need for sealing. The measurement conditions (flow rates, gas composition, reference electrode) will first be optimized on reference cells before considering cells based on innovative materials developed in the team. Particular emphasis will be placed on the quality of the electrochemical data collected by electrochemical impedance spectroscopy and on the interpretation of the data in order to identify the processes involved (diffusion of ionic species, charge transfer, adsorption / dissociation of oxygen, diffusion of molecular oxygen,...). Advanced microstructural characterizations will complete the understanding of the mechanisms involved with the aim of optimizing the cells and materials studied.

Planned recruitment date : 1st of October 2020

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Additional remarks/comments : Applications must be sent to Rose-Noëlle VANNOER by e-mail (CV, motivation letter, bachelor and master transcripts) before the 15th of May 2020.