

Electrochemical properties evaluation of multi-layered thermal spray coatings for Solid Oxide Fuel Cells (SOFCs)

Introduction

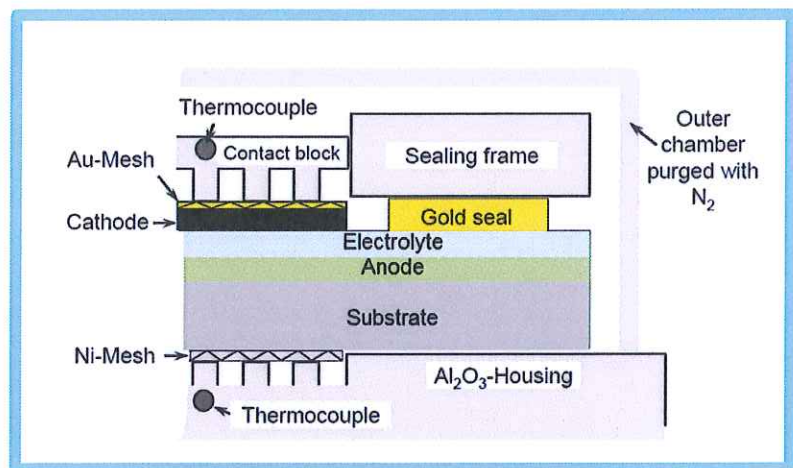
This application is related to a project carried out at University West that focuses on the development of new SOFCs which outperform (lower cost and better durability) and are better suited for large scale production than the current state-of-the-art. This will be mainly achieved by developing multilayered coating systems with nano-structured morphology using emerging thermal spray methods such as Plasma Spray - Thin Film (PS-TF) and Axial Suspension Plasma Spraying (A-SPS). Development of thin and dense electrolyte layers together with highly porous anode layers with a high density of triple boundary phases, sprayed on thin metallic substrates, are the main goals of our project.

Objective

- to test the functional performance of the developed single cells
- to study the degradation mechanism of the cells under high temperature and current loads

Current work

- Evaluate electrochemical performance of half-cells produced by thermal spraying - Durability test
- Identify areas which need further improvements



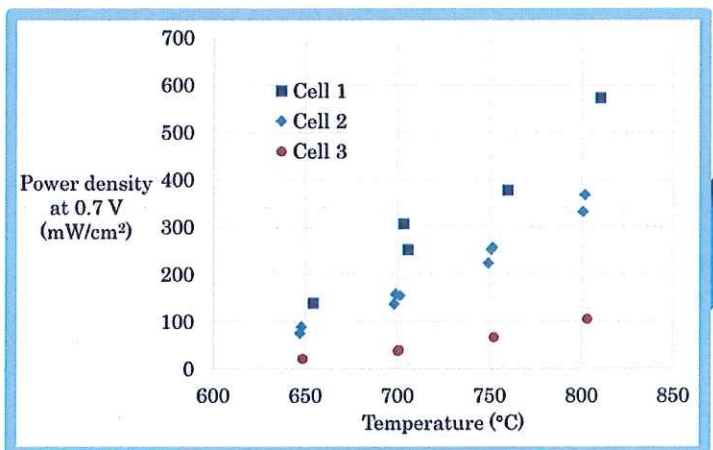
A schematic of a SOFC testing set-up

Current results

- Half-cells produced by thermal spraying
- Dense electrolytes achieved by PS-TF technology
- Good power density and short term durability achieved (despite of the missing barrier layer)
- Effect of electrolyte thickness and material observed

Next steps

- Application of a ceria based interdiffusion barrier layer onto the electrolyte to prevent the formation of strontium zirconate
- Further improvement of the electrolyte with respect to gas tightness
- Reduction of the electrolyte thickness (as the samples with the thinner electrolytes showed a higher performance)



First cell testing results

Researchers involved

User group – University West

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