

Long-term performance and sulfur-poisoning of methane pre-reforming catalysts

Context:

The direct conversion of biogas to electricity and heat with Solid Oxide Fuel Cells (SOFC) is an attractive usage strategy of this indigenous energy source. SOFCs are solid-state electrochemical cells that operate at temperature ranging from 600 °C to 1000 °C. Their main advantages lay in their fuel flexibility and high electrical efficiency (up to 65 %). When the gaseous fuel is oxidized at the nickel anode/solid electrolyte interface, excess energy is released as heat. To maximize the system efficiency, it is therefore crucial to optimize the thermal integration of the device. Redirecting this thermal energy for powering the endothermal reforming of methane into hydrogen and carbon monoxide is one interesting approach.

Objectives:

In this project, the student will take part in an exciting European project that aims at integrated SOFC technology in biogas plants. The master student will focus on biogas upgrading. In particular, she/he will lead experimental work for assessing the performance and durability of several state-of-the-art reforming catalysts. Quantifying the tolerance of active materials towards traces of contaminants and understanding deactivation mechanisms will be one of the main objectives. The focus is currently set on sulfur-containing molecules such as H₂S and DMS.

To reach her/his objectives, the student will excel in analytical chemistry (gas chromatography, mass spectrometry) and material characterization (diffraction, microscopy, surface-sensitive spectroscopy). This research project is therefore an exciting opportunity that will offer an introduction to research strategies and methodologies as well as hands-on experience with a variety of analytical techniques.

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