

Application 2036



Operate SOFC with Bio-Gas

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Motivation

Solid Oxide Fuel Cell (SOFC) can give a strong contribution to the widespread employment of bio-syngas as energy source. The main problem of the bio-syngas energy chain is related to low efficiency and high costs for small-scale plants. In addition to that, during gasification process, a significant amount of tar is produced and a clean-up phase is necessary to avoid tar condensation in cold parts of internal combustion engines, the most usual end-use devices. If clean-up is not efficient, irreparable damages may occur and system operation is compromised. Conversely, SOFCs are able to tolerate higher tar loads in respect to internal combustion engines (ICE), because electrode materials and high operative temperature allow internal tar processing, mostly via reforming. Moreover, SOFC potentialities in terms of efficiency are higher if compared to ICEs. When a SOFC is fed by bio-syngas, efficiency is expected to be in the range 30%-50%, while ICEs suffer from a strongly reduction in their efficiency in this application (??15%).

Task Description and Objectives

The open issue regarding the introduction of bio-syngas in a SOFC is related to potential pollutant effect of tar on the anode. However, the anode acts also as catalyst for the transformation of tar. Scientific literature offers several experiences strongly dependent on bio-syngas composition and tar quality and concentration, in addition to cell material and operative conditions. This project aims to give a contribution to this topic with an experimental test to evaluate the resistance of a commercial cell supplied by HTceramix. The pollutant test will be realized introducing toluene as a model tar into a commercial anode supported SOFC button cell (ASC-SOFC).

The experimental plan is divided in following parts:

- Cell start-up
- Polarization curve = validation
- Pollutant procedure using toluene
- Periodical check of cell state via polarization curve to evaluate degradation
- Shut down
- Post analysis via SEM and EDS.

Test results will be analyzed and main conclusion shared with the user and will be published in agreement with HTceramix.