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Effects of SO2 on MCFC

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The group “Funcionalización, Degradación y Reciclaje de Materiales Poliméricos” (DREMAP) from the Techological Institute of Materials of the Universitat Politècnica de València (Spain) has been working on the topic of fuel cells (FCs) for over 10 years. Their studies have been mainly focused on low temperatures Proton Exchange Membrane Fuel Cells (PEMFCs) and the development of new liquid crystal based membranes acting as electrolytes to diminish the so called effect of crossover. The group also possess a Dielectric Thermal Analyser (DETA): the measures of parametres such as electric and protonic conductivity of membranes provide valuable information regarding the design and dimensioning of fuel cells.

In the framework of a codirected thesis, as a result of the collaboration with the Università di Genova, new research in the field of biomass gasification is being carried out and the possibility of using the produced syngas as feed for FCs has suggested the application of high temperature fuel cells, which allow the use of non-noble catalysts more resistant to contaminants. This has resulted in increasing attention of the group to this technology and in the study of innovative applications of high temperature fuel cells such as the use of MCFCs as CO2 segregators. In this scenario, the analysis of the effects of contaminants on FC performances is fundamental, in particular concerning sulphur compounds.

With the aim of a preliminary feasibility analysis, in this collaboration project with the “Fuel Cell Laboratory” of the University of Perugia, it is proposed an experimental study of the effects of SO2 when fed to MCFC cathode, so that effects of contaminated oxidant and fuel can be investigated, as SO2 in the oxidant transfers thought the electrolyte from the cathode to the anode to form H2S in the fuel.

Tests consist of polarisation curves, and related internal resistance measurements, in the following operating conditions: for the anode H2, CO2 and H2O in a 64:16:20 mole ratio and with a 14.5 Nl/h total flow rate; for the cathode N2, H2O, O2 and CO2 in an 73:9:12:6 mole and with a 139.30 Nl/h total flow rate; SO2 content at the cathode should be varied in the range from few ppm up to the maximum value allowing a working point at 100 mA/m2 with a cell voltage higher than 0.6 V. For each SO2 content value at least three different operating temperatures should be tested in order to evaluate the effect on the poisoning mechanism.