SOFC anode for direct oxidation of CH_4 at intermediate temperatures.

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Abstract

A fuel cell device consisting of a $Ce_{0.90}Gd_{0.10}O_{1.95}$ (CGO) as a membrane electrolyte and anodic $Ni_{0.52}Cu_{0.48}$ alloy/CGO cermet has been investigated. An appropriate synthesis procedure has been developed to obtain optimal electrochemical properties. Suitable catalytic activity was observed for the cermet in presence of dry methane as fuel (Fig.1). No significant carbon deposition after ~ 40 hrs of operation was observed at 800° and 700°C (Fig.2). Therefore, this fact could be the proof-of-principle that the Ni-Cu alloy, obtained by appropriate preparation procedure, acts as a good methane activation catalyst with a suitable tolerance towards carbon deposition. More work is currently done in this direction varying the morphology and composition of the cermet.

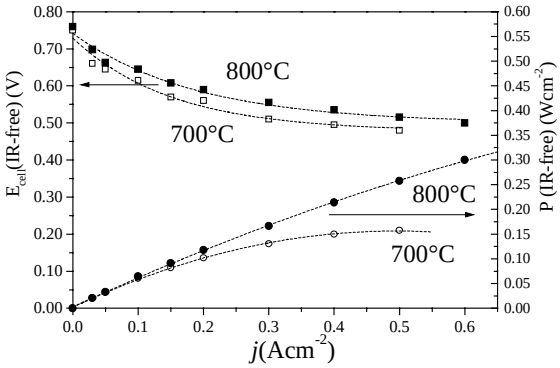

Fig.1 Polarisation and power curves of the cell at 700 and 800°C corrected by the ohmic losses (IR-free).

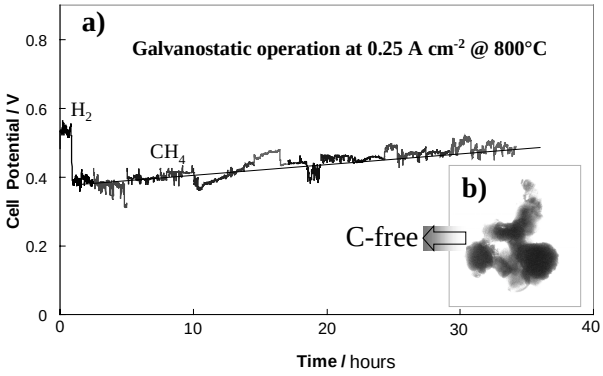

Fig.2 a) Lifetime measurement at 800°C using dry CH_4. b) TEM image of the CGO/Ni-Cu anode after 35 h of working time in which it is shown the absence of carbon deposition.