Correlating Oxygen Electrode Degradation to Cr Vaporization from Metallic Interconnects in Solid Oxide Cell Stacks

Talic, Belma; Hendriksen, Peter Vang

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TITLE: Correlating Oxygen Electrode Degradation to Cr Vaporization from Metallic Interconnects in Solid Oxide Cell Stacks

AUTHORS (LAST NAME, FIRST NAME): Talic, Belma[1]; Hendriksen, Peter Vang[1]

INSTITUTIONS (ALL): 1. Energy Conversion and Storage, Technical University of Denmark, Roskilde, Denmark.

ABSTRACT BODY:

Abstract Body: Volatile Cr species released from stainless steel interconnects in solid oxide cell stacks lead to rapid degradation of the oxygen electrode. Many studies have been devoted to elucidate the oxygen electrode degradation mechanism and methods are available to accurately measure the Cr vaporization rate of stainless steel interconnect materials. Coating the interconnect with $MnCo_2O_4$ has been shown to greatly reduce the Cr vaporization rate, but it is difficult to determine whether this coating material is protective enough as there are no reports of a clear correlation between the interconnect Cr vaporization rate and the oxygen electrode degradation rate. The aim of this work is to investigate if such a correlation can be found. Symmetrical cell consisting of $La_{0.58}Sr_{0.4}Co_{0.2}Fe_{0.8}O_{3-\delta}$ (LSCF) oxygen electrodes screen printed on $Ce_{0.9}Gd_{0.1}O_{2-\delta}$ (CGO) electrolyte were tested at 800 °C while exposed to Crofer 22 APU alloy that was either pre-oxidized or coated with $MnCo_2O_4$. The $MnCo_2O_4$ coating was heat treated to produce different levels of porosity, resulting in different Cr vaporization rates. Degradation of the symmetrical cells was monitored by electrochemical impedance spectroscopy measurements and post-mortem SEM and EDS analysis was used to examine Cr deposition on the oxygen electrodes.

KEYWORDS: SOFC, Interconnect, Cr poisoning, Protective coating, Oxygen electrode, Cr evaporation.

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PROFESSIONAL/ACADEMIC STATUS:

Belma Talic : Faculty

Peter Vang Hendriksen : Faculty