Oxidation behaviour and electrical properties of cobalt/cerium oxide composite coatings for solid oxide fuel cell interconnects

This work evaluates the performance of cobalt/cerium oxide (Co/CeO2) composite coatings and pure Co coatings to be used for solid oxide fuel cell (SOFC) interconnects. The coatings are electroplated on the ferritic stainless steels Crofer 22 APU and Crofer 22H. Coated and uncoated samples are exposed in air at 800 °C for 3000 h and oxidation rates are measured and oxide scale microstructures are investigated. Area-specific resistances (ASR) in air at 850 °C of coated and uncoated samples are also measured.

A dual layered oxide scale formed on all coated samples. The outer layer consisted of Co, Mn, Fe and Cr oxide and the inner layer consisted of Cr oxide. The CeO2 was present as discrete particles in the outer oxide layer after exposure. The Cr oxide layer thicknesses and oxidations rates were significantly reduced for Co/CeO2 coated samples compared to for Co coated and uncoated samples.

The ASR of all Crofer 22H samples increased significantly faster than of Crofer 22 APU samples which was likely due to the presence of SiO2 in the oxide/metal interface of Crofer 22H.