Electrodeposited Mn-Co Alloy Coating For SOFC Interconnects

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The decrease in the SOFC operating temperatures from 1000 ºC to between 650 and 850 ºC has enabled the use of chromia-forming ferritic stainless steels as interconnects instead of $LaCrO_3$ ceramic. However, even newly developed ferritic alloys such as SS441 and Crofer 22 APU, cannot completely eliminate the chromia scale growth and chromium evaporation into cells that can cause unacceptable degradation in the SOFC electrochemical performance. One attractive method to resolve the chromia scale growth and diffusion issues is to electrodeposit a Mn-Co alloy coating onto the interconnect surface and subsequently convert it to a $(Mn,Co)_3O_4$ spinel.

Under funding from the Department of Energy, Faraday Technology and WVU demonstrated that the electrodeposition process can produce uniform dense, crack-free, well-adhered Mn-Co alloy coatings of various composition on a 2”x2” 441 stainless steel interconnect surface. A post-deposition thermal treatment converted the Mn-Co alloy coatings to $(Mn,Co)_3O_4$ spinels. A preliminary economic analysis, based on a batch manufacturing electrodeposition process, demonstrated that the innovative coating technology can meet Department of Energy’s high volume target of 1,600,000 plates per annum at a cost of ~$1.87 per 25 cm x 25 cm coated interconnect. The poster will present the results obtained to date and provide a path forward for the technology.