

ELECTROPHORETIC DEPOSITION OF ADVANCED CERAMIC COATINGS FOR HIGH TEMPERATURE CORROSION PROTECTION OF STEEL INTERCONNECTS FOR SOLID OXIDE CELLS

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Solid oxide cells are efficient energy conversion devices, which play an increasing role in the energy sector. An important issue with technology is its degradation over time due to the aging of materials. Among several processes contributing to the overall degradation, high-temperature corrosion of the steel interconnects and vaporization of chromium from the oxide scale are important ones. To minimize the degradation of the interconnects, ceramic protective coatings are being developed. Our groups have been using electrophoretic deposition (EPD) of ceramic powders to form 10-20 μm protective coatings on steel interconnects, followed by high-temperature sintering [1,2]. EPD offers many advantages, like good control over coating thickness, uniformity, surface coverage, the possibility of doping and others.

In this work we will present our recent results on developing advanced coating concepts for steel interconnects for solid oxide cell stacks. For example, by forming multi-layer structures (presented in Figure 1), high-quality electrical contact layers (current collectors) can be deposited on top of the protective coatings, instead of screen-printing them in a separate process.

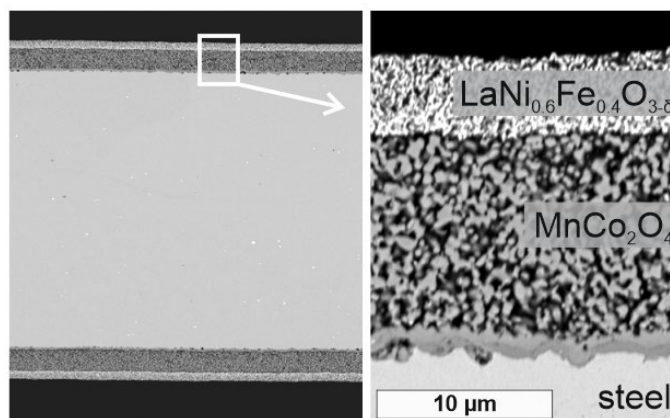


Figure 1. Scanning electron microscopy of a dual-layer coated Crofer 22 APU steel interconnect.

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References:

- [1] F. Smeacetto, A. De Miranda, S. Cabanas Polo, S. Molin, D. Boccaccini, M. Salvo, A.R. Boccaccini, Electrophoretic Deposition of $\text{Mn}_{1.5}\text{Co}_{1.5}\text{O}_4$ on Metallic Interconnect and Interaction with Glass-ceramic Sealant for Solid Oxide Fuel Cells Application, *J. Power Sources*. 280 (2015) 379–386.
- [2] M. Bobruk, S. Molin, M. Chen, T. Brylewski, P.V. Hendriksen, Sintering of MnCo_2O_4 coatings prepared by electrophoretic deposition, *Mater. Lett.* 213 (2018) 394–398.