Infiltrated SrTiO₃:FeCr-based Anodes for Metal-Supported SOFC

The concept of using electronically conducting anode backbones with subsequent infiltration of electrocatalytic active materials has been used to develop an alternative solid oxide fuel cell (SOFC) design based on a ferritic stainless steel support. The anode backbone consists of a composite made of Nb-doped SrTiO₃ (STN) and FeCr stainless steel. A number of different experimental routes and analysis techniques have been used to evaluate the microstructural and chemical changes occurring in the composite anode layer during electrochemical testing at intermediate temperatures (650 °C). STN and FeCr stainless steel was found to be compatible on the macro-scale level, however, some micro-scale chemical interaction was observed. The composite anode backbone showed a promising corrosion resistance, with a decrease in formation of Cr₂O₃ on the FeCr particles, when exposed to SOFC operating conditions. The electronic conductivity of the infiltrated anode backbone furthermore showed good redox stability properties.

Electrochemical testing of metal-supported cells having the STN:FeCr composite anode backbone infiltrated with electrocatalysts showed comparable performance and promising durability properties compared with other metal-supported cell designs presented in the literature. This work illustrates the potential advantages and challenges when incorporating SrTiO₃-based materials into metal-supported cells based on ferritic stainless steel.

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