ELECTRICAL CONDUCTIVITY OF CR_2O_3-2MOL%M_XO_Y (M=GA, SC, RU, ZR)

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ABSTRACT

Fe-Cr based ferritic alloys show promise as metallic interconnect materials in Intermediate Temperature Solid Oxide Fuel Cells (ITSOFCs). The naturally forming chromium oxide scale provides high-temperature oxidation resistance and electrical conductivity better than other protective oxide scales such as alumina and silica. During ITSOFC operation, the growth of this native scale, as well as interactions between the interconnect and electrode layers, can lead to power losses from increased cell resistance and loss of catalytic surface area. Therefore, long-term terrestrial power generation requires discovery of better protective oxides and coatings to prolong the life of the interconnect and improve power output. The purpose of this work is to examine the structural and electrical properties of chromium oxide doped with gallium, scandium, ruthenium, and zirconium as a model of potential cathode-interconnect interactions present in a cell during operation. Results show that there is no appreciable change in conductivity upon addition of gallium, scandium, or zirconium. Ruthenium addition causes a change in conduction from p type to n type, markedly decreasing the conductivity at low temperature($\sim 1/10$ at 500 °C)