Effect of cobalt on the activity of dual phase \((\text{Gd0.6Sr0.4})0.99\text{Fe1-xCoxO3-δ}\) SOFC cathodes - DTU Orbit (14/03/2019)

The effect of the amount of cobalt in \((\text{Gd0.6Sr0.4})0.99\text{Fe1-xCoxO3-δ}\) solid oxide fuel cell (SOFC) cathodes \((x = 0.00, 0.05, 0.10, 0.15, 0.20\) and \(0.25\)) was studied by powder X-ray diffraction (XRD), scanning electron microscopy (SEM), dilatometry, four-point DC conductivity measurements, cone-shaped electrodes, and electrochemical impedance spectroscopy (EIS). XRD and scanning electron microscopy revealed two phases: a cubic phase and an orthorhombic phase. One phase has a small particle size (cubic phase), and the other phase (orthorhombic) has a larger particle size. Dilatometry indicated that the thermal expansion coefficient increased with increasing Co content. The electrical conductivity maximum for the Co-rich compound was found to have a value of 82 S cm\(^{-1}\) at approximately 300 °C. It was shown that the activity of the cathodes was strongly dependent on the amount of cobalt. The highest activity was found for the cobalt-rich compound \((\text{Gd0.6Sr0.4})0.99\text{Fe0.75Cox0.25O3-δ}\) with an area-specific resistance of 0.9 Ωcm\(^2\) at 600 °C, measured on a cone-shaped electrode in air.

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