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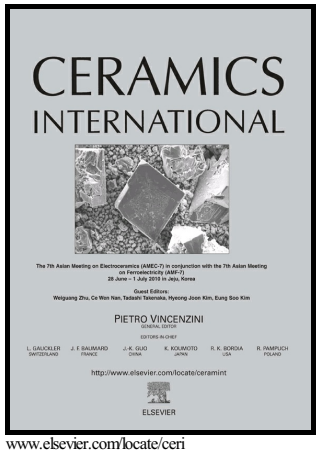

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Development of solid oxide cells by co-sintering of GDC diffusion barriers with LSCF air electrode

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Abstract

The effects of a Cu-based additive and nano-Gd-doped ceria (GDC) sol on the sintering temperature for the construction of solid oxide cells (SOCs) were investigated. A GDC buffer layer with 0.25–2 mol% CuO as a sintering aid was prepared by reacting GDC powder and a CuN_2O_6 solution, followed by heating at 600 °C. The sintering of the CuO-added GDC powder was optimized by investigating linear shrinkage, microstructure, grain size, ionic conductivity, and activation energy at temperatures ranging from 1000 to 1400 °C. The sintering temperature of the CuO–GDC buffer layer was decreased from 1400 °C to 1100 °C by adding the CuO sintering aid at levels exceeding 0.25 mol%. The ionic conductivity of the CuO–GDC electrolyte was maximized at 0.5 mol% CuO. However, the addition of CuO did not significantly affect the activation energy of the GDC buffer layer. Buffer layers with CuO-added GDC or nano-GDC sol-infiltrated GDC were fabricated and tested in co-sintering (1050 ^{o}C, air) with $La_{0.6}Sr_{0.4}Co_{0.2}Fe_{0.8}O_{3-\delta}$ (LSCF). In addition, SOC tests were performed using button cells (active area: 1 cm^2) and five-cell (active area: 30 cm^2/cell) stacks. The