Evaluation of sulfur poisoning and carbon deposition on Co-infiltrated SOFCs $\text{La}_{0.4}\text{Sr}_{0.6}\text{TiO}_3\text{--Gd}_{0.2}\text{Ce}_{0.8}\text{O}_{1.9}$ Composite Anodes

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This paper presents H_2S and CH_4 tolerance of Co or Ni infiltration into porous nanofiber-based $\text{La}_{0.4}\text{Sr}_{0.6}\text{TiO}_3\text{--Gd}_{0.2}\text{Ce}_{0.8}\text{O}_{1.9}$ (LST–GDC) on yttria stabilized zirconia (YSZ) electrolyte disks. Over long-term stability tests performed on the nanofiber-based LST–GDC–Ni and LST–GDC–Co composite anodes in 512 ppm H_2S – H_2 (i.e. 512 ppm H_2S in H_2 atmosphere), the electrochemical performance and the porosity of the LST–GDC–Ni composite anode evolve to reduce significantly. Whereas, the LST–GDC–Co composite anodes exhibit a strong resistance to sulfur poisoning and then when exposed to humidified CH_4 , show a good electrochemical performance, and the polarization resistance (R_p) of $2.96\ \Omega\ \text{cm}^2$ and the maximum power density (P_{max}) of $53.7\ \text{mW}\ \text{cm}^{-2}$ are achieved at $800\ ^\circ\text{C}$. The LST–GDC–Co composite anodes demonstrate excellent long-term stability and outstanding resistance to carbon deposition. The LST–GDC–Co composite anodes are a promising electrode material for sulfur-resistant and carbon tolerant solid oxide fuel cells.

Keywords: Carbon Deposition; Cobalt; Fuel Cell; Nanofiber-based Composite Anode; Sulfur Poisoning

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