Preparation and electrochemical characterization of Nd₀.₆Sr₀.₄Fe₀.₈Cu₀.₂O₃₋δ cathode material
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Abstract
Solid oxide fuel cell (SOFC) has attracted remarkable attention because it is considered as one of the promising green energy conversion devices with advantages of high energy conversion, low emission of pollutant, no need of scarcely available metal as electrocatalysts and the excellent ability of fuel flexibility.[1-3] Cobalt containing perovskites (ABO₃) have been found to be excellent cathodes for IT-SOFC but they suffer some problems like high thermal expansion coefficient (TEC), structure instability and performance degradation in long term test because of cobalt evaporation and reduction.[4,5] A cobalt-free material Nd₀.₆Sr₀.₄Fe₀.₈Cu₀.₂O₃₋δ as potential cathode for IT-SOFC has been successfully synthesized and characterized. It is found that the sample is cubic perovskite structure and its maximum electrical conductivity reaches 10³ S cm⁻¹ which is acceptable for application in SOFC. The polarization resistances of Nd₀.₆Sr₀.₄Fe₀.₈Cu₀.₂O₃₋δ are 0.871 Ω cm², 0.341 Ω cm², 0.138 Ω cm², 0.0554 Ω cm² and 0.0267 Ω cm² at 600 °C, 650 °C, 700 °C, 750 °C and 800°C, respectively, which is even lower than some cobalt-based cathodes. The single cell performance exhibits a maximum power densities of 179 mW cm⁻², 368 mW cm⁻², 460 mW cm⁻², 605 mW cm⁻², and 807 mW cm⁻² at 600 °C, 650 °C, 700 °C, 750 °C and 800°C, respectively. The testing results demonstrate Nd₀.₆Sr₀.₄Fe₀.₈Cu₀.₂O₃₋δ is a potential cathode material for IT-SOFC.

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