Short Communication

Design and Study of Ta/P co-doped $\text{SrFeO}_{3-\delta}$ as Cathode for Solid Oxide Fuel Cells

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As a new type of energy conversion device with high efficiency and environmental protection, SOFC (Solid Oxide Fuel Cell) is a very attractive energy conversion device. However, the most important factor limiting the development of SOFC is its high operating temperature, which affects its commercial development. Therefore, optimizing the internal structure of the electrode and developing low temperature cathode materials are also important directions for the future development of solid oxide fuel cells. Due to the different metal and nonmetal doping will have different effects on the performance of SOFC. In this experiment, we have synthesized the Ta/P co-doped $\text{SrFeO}_{3-\delta}$ based cathode material $\text{Sr}(\text{Fe}_{0.9}\text{Ta}_{0.1})_{0.95}\text{P}_{0.05}\text{O}_{3-\delta}$ (STFP) by solid phase method. The feasibility of the cathode material was verified by XRD imaging analysis, oxygen non-stoichiometric ratio analysis, conductivity test, symmetrical cell impedance test, single cell output power test and SEM electron microscope analysis. According to the conductivity test, the maximum of STFP at 690 °C is 43.3 S cm^{-1} . Symmetrical cells were sintered at 1000 °C, 900 °C and 800 °C respectively, the area specific resistance (ASR) results showed that the best sintered performance is at 800 °C and the minimum ASR at 750 °C is $0.092 \Omega \text{ cm}^2$ for STFP cathode based on $\text{Sm}_{0.2}\text{Ce}_{0.8}\text{O}_{1.9}$ (SDC) electrolyte. Meanwhile, at 700 °C the maximum power density of single cell sintered at 800 °C is 694 mW cm^{-2} . The results show that STFP can be used as a candidate cathode material.

Keyword: solid oxide fuel cell; co-doped; strontium ferrite cathode.

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