

INFLUENCE OF B-SITE STOICHIOMETRY ON THE (La_{0.6}Sr_{0.4})_{0.99}Co_{1-x}Ti_xO_{3-δ} SOFC OXYGEN ELECTRODE STABILITY

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Mixed ionic and electronic conducting (MIEC) oxides are being used as solid oxide fuel cell (SOFC) electrode materials [1, 2]. La_{1-x}Sr_xCoO_{3-δ} (LSC) oxygen electrode materials have good catalytic activity towards oxygen reduction reaction and oxide ion oxidation. However, they have limited chemical stability towards carbon dioxide and humidity, which are often present in the electrode gas compartment. Therefore, it is essential to increase the long-term stability of mentioned electrode materials for commercial systems, where gas from the external environment with micro-concentrations of impurities like H₂O and CO₂ has to be used (natural gas, etc.) [3, 4, 5].

The SOFC oxygen electrode powders with different stoichiometry ((La_{0.6}Sr_{0.4})_{0.99}Co_{1-x}Ti_xO_{3-δ}, x = 0, 0.02, 0.04, 0.06, 0.08, 0.10) were prepared by using the thermal combustion method [6]. X-ray diffraction (XRD) analysis was used to characterize the crystallographic structure of the synthesized powders. Symmetrical cells for Electrochemical Impedance Spectroscopy (EIS) and X-Ray Photoelectron Spectroscopy (XPS) were made using synthesized powders. Prepared symmetrical cells were characterized at different temperatures, potentials, gas compositions, i.e., conditions.

Systematic impedance analysis showed that materials with bigger cation (Ti⁴⁺), doped into the LSC B-site, increase the material's long-term stability against impurities like carbon dioxide and water.

References

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