CHARACTERIZATION OF RELAXATION TIME DISTRIBUTION IN LSCF SYMMETRICAL CELL

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ABSTRACT

Characterization Of Relaxation Time Distribution In LSCF Symmetrical Cell

High operating temperatures, ranging from 800°C up to 1000°C, in solid oxide fuel cells (SOFCs) often lead to material degradation. This problem has led to the invention of proton conducting fuel cells (PCFCs) that operate at intermediate temperatures. This study investigates the electrical performance of symmetrical cell using Lanthanum Strontium Cobalt Ferrite (LSCF) as the cathode and Barium Zirconate Yttrium (BCZY) as the electrolyte. The objectives were to analyze the resistive processes within the cell at operating temperature of 800°C. To evaluate the cell, Electrochemical Impedance Spectroscopy (EIS) and the Distribution of Relaxation Time (DRT) were used. While EIS is a standard method, it often faces difficulties with overlapping signals. So, DRT was employed to separate these signals and identify specific electrochemical processes. The results obtained inidicated that the polarisation resistance (R_p) actually increased when the temperature increases from 750°C to 800°C. The resistance measured by EIS at 800°C was 1.2 Ω while DRT analysis provided a more precise value of 0.7835 Ω. This increase in resistance at higher temperatures may show the sign of degradation of the material, such as Sr segregation. Furthermore, the DRT analysis successfully identified five distinct peaks Each peaks representing different processes such as gas diffusion and charge transfer. In short, this study shows that combining EIS with DRT analysis provides a detailed understanding of the factors affecting fuel cell performance. The findings suggest that future work should focus on improving the thermal stability of LSCF electrodes to reduce resistance at high temperatures.

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