

**EVALUATION OF NiO-BCZY|BCZY| Ni-BSCF
PERFORMANCE AT DIFFERENT HYDROGEN**

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ABSTRACT

EVALUATION OF NiO-BCZY|BCZY|Ni-BSCF PERFORMANCE AT DIFFERENT HYDROGEN

This study evaluates the performance of a NiO-BCZY|BCZY|Ni-BSCF proton ceramic fuel cell (PCFC) under different hydrogen environments. The cell was tested using Electrochemical Impedance Spectroscopy (EIS) in both wet and standard hydrogen conditions across a temperature range of 750°C to 450°C. Results show that the wet hydrogen condition significantly improves electrochemical performance by reducing polarization resistance (R_p), with the lowest value recorded at 13.58 $\Omega \cdot \text{cm}^2$ at 750°C. In contrast, standard hydrogen caused R_p to rise drastically, reaching over 8000 $\Omega \cdot \text{cm}^2$ at 600°C. The absence of water vapor led to poor proton conductivity and eventually caused the cell to crack at 550°C, resulting in incomplete data. The findings confirm that wet hydrogen not only improves performance but also enhances structural stability. This research identifies wet hydrogen as the optimal environment and highlights the importance of operating temperature in sustaining high efficiency and long-term durability in PCFC systems.

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