BaCe_{0.9}Er_{0.1}O_{3-α}-NaCl-KCl Composite As Electrolyte for Intermediate Temperature Solid Oxide Fuel Cells

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In this study, BaCe_{0.9}Er_{0.1}O_{3-α} (BCEr10) powders were synthesized by the microemulsion method using anhydrous alcohol and PEG as the cosurfactant and surfactant, respectively. BaCe_{0.9}Er_{0.1}O_{3-α}-20 wt%NaCl-KCl (BCEr10-NaCl-KCl) composite was also synthesized by heating the BCFer10 with binary NaCl-KCl. The physical chemistry changes in crystal phase formation and the microstructure of BCFer10 were determined by thermal gravimetry analysis-differential scanning calorimetry (TGA-DSC) and transmission electron microscopy (TEM). The BCFer10 and BCFer10-NaCl-KCl were characterized by XRD and SEM. The results revealed that the dense BCFer10-NaCl-KCl composite electrolyte was formed at a low temperature of 800 °C. The electrical conductivity was calculated from the AC impedance result. The $\log \sigma \sim \log (pO_2)$ plot result indicated that the composite is almost a pure ionic conductor. Finally, the optimum performance of BCFer10-NaCl-KCl was obtained with a highest power density of 413 mW·cm⁻² at 700 °C.

Keywords: Composite electrolyte; BaCeO₃; Molten salt; Fuel cell; Conductivity

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