DEFECT STRUCTURE OF BZCYYb17 AND THEORETICAL BEHAVIOR AND PERFORMANCE OF SOFC’s With BZCYYb17 ELECTROLYTE

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In this work, maximum power density of SOFC with BZCYYb17(BaZr_{0.1}Ce_{0.7}Y_{0.1}Yb_{0.1}O_{3-d}) electrolyte as the function of thickness was calculated by integrating partial conductivities of charge carriers under various DC bias conditions at a fixed oxygen chemical potential gradient at both sides of the electrolyte. The partial conductivities were calculated by fitting various total conductivities in diverse thermodynamic conditions (temperature, partial pressure of oxygen and partial pressure of vapor) using equations from defect model. From the fitting, not only we can get the partial conductivities as a function of temperature, oxygen partial pressure and hydrogen partial pressure but also mobility of each carriers and reaction constant of oxidation and hydration. Spatial distribution of oxygen chemical potential and hydrogen chemical potential across the electrolyte were calculated based on Choudhury and Patterson’s model by considering zero electrode polarization. At positive voltage conditions corresponding to SOFC and SOEC, the high conductivity region near n-type to p-type transition was expanded, but ad negative cell voltage conditions, the low conductivity region near n-type to p-type transition was expanded. The current- voltage characteristics in different conditions with temperature and thickness dependence were calculated with vapor partial pressure of each electrode is 0.03, oxygen partial pressure of the cathode 0.21 and hydrogen partial pressure of the anode 0.97.