Preparation of porous Ni-$BaZr(Y)O_3$ anode cermet for high temperature proton-conducting oxide fuel cell

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Introduction

Recently, ceramic-metal composites (cermets) based on nickel and zirconia are intensively studied due to have their potential applications in sensors, electrolysis, hydrogen separation, and anodes for solid oxide fuel cell [1]. The Ni-BZY cermet would be one of the promising anode electrode with a high performance and multifunctional properties. The yittrium doped $BaZrO_3$ was used to electrolyte materials as a proton conducting oxide for high temperature fuel cell [2]. The fabrication process of Ni-BZY cermet significantly affects the microstructure and performance [3]. The Ni-BZY anode substrate structure has a pores, so the gas channels or flow fields may be incorporated into the electrodes.

In this study, we synthesized the Ni-$BaZr(Y)O_3$ (Ni-BZY) porous membrane and investigated the single-cell performance using this nickel cermet as anode electrode for proton conducting oxide fuel cells at elevated temperatures.

Experimental

Ni-BZY composite powder were prepared by the combustion method and reduction by hydrogen at 500□. The nickel composite powder was mixed with carbon black as a pore-former and compacted under uni-axial pressure to form a disc. The $BaZr(Y)O_3$ electrolyte thin film was prepared by chemical solution deposition methode for several times repeatedly[4]. The morphology the materials were analyzed by X-ray diffractiometry. The microstructure was estimated by gas permeation tests and scanning electronic microscopy. The single cell performances were evaluated at various temperatures under humidity condition.

Result & Discussion

The green NiO-$BaZr(Y)O_3$ composite membrane was about 10 mm in diameter and about 1 mm in thickness after sintering at 1400 □ for 3 hours. The prepared Ni-BZY porous substrate have a sufficient gas permeability as shown in Fig. 1. It is considered that the Ni-cermet synthesized from the starting solution is available for anode substrate of high temperature proton condcuting oxide fuel cell.

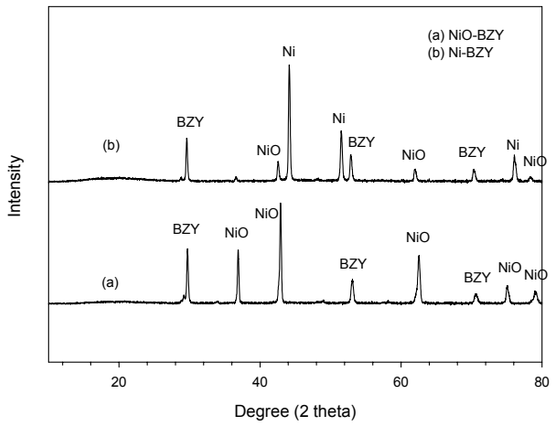

Fig. 1. XRD of NiO-BZY and Ni-BZY porous membranes.

References

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