

Preparation and characterization of bismuth-niobium oxide ion conductors

ABSTRACT

Oxide ion conductors have been attracting considerable attention for many years due to their application in technological devices such as solid oxide fuel cells, oxygen sensors and many more. In this study, material with desirable electrical properties in the Bi₂O₃- Nb₂O₅ binary system was studied. Bismuth-niobium oxide has been prepared by solid state reaction. Powder X-ray diffraction (XRD) analysis showed that single-phase materials were formed with a general formula of Bi_xNbO_δ: $2.5 \leq x \leq 6$. Electrical properties of the single-phase materials in these solid solution series were studied by a.c. impedance spectroscopy. Conductivity measurements were also carried out in dry oxygen free nitrogen (OFN) in order to confirm the conduction species of the materials. Results showed that these materials appeared to be oxide ion conductors. Further characterizations of the materials using thermal analysis (DTA), thermogravimetric analysis (TGA) and the results showed that there were no thermal changes and phase transitions were observed and all the materials were thermally stable. Scanning electron microscopy (SEM) has been carried out to study the morphology of the materials and all the grain size of the samples were in micrometers.

Keyword: Bismuth; Niobium; Oxide ion conductors