7th African Conference on Non Destructive Testing (ACNDT) & the 5th International Conference on NDT and Materials Industry and Alloys (IC-WNDT-MI)

2016

The effect of Sintering condition on the microstructure and ElectricalConductivity of Apatite- type La9.33(SiO4)6O2ceramic

A. Saoudel, N. Azzouz, S. Boulfrad, J. T. Sirr Irvine

Abstract : Rare-earth apatite-type lanthanum silicates, La9.33(SiO4)6O2.is prepared in air by the conventional solid statereaction for solid oxide electrolyte. The microstructure and electrical properties of La2 ,9.33(SiOceramic areinvestigated by X-ray diffraction (XRD), scanning electron microscopy (SEM) and electrochemical impedancespectroscopy (EIS).The principal objective is the study of the effect of the sintering condition(time, temperature),on the morphology and the electrochemical properties of this phase. La9.33(SiO4)6O2 ceramic consist of ahexagonal apatite type structure and a small amount of a second phase of La2SiO52due to the law temperature ofsintering.Electrical properties of the sample have been studied between 302 and 802°C by the complex impedancemethod. The results of the conductivity measurements obtained between 302 and 605°C are treated first, in thetotal form of the sample, and then, by separating the grain from the grain boundary. Electrical conductivity of theLa9,33(SiO4)6O2apatite-type was found of a value of 1.04 10-3S.cm-1at 605°C. This value is higher than thatobtained with yttria stabilized zirconia(YSZ) at the same intermediate temperatures.

Keywords : electrolyte, Apatite, Lanthanum silicate, Ionic conductivity