Conference Abstract

Sintering properties and development of ternary $ZnAl_2O_3$ phase in Al_2O_3 - ZnO composite ceramics

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Abstract

Zinc doped aluminium oxide ($ZnAl_2O_3$) is a wide bandgap semiconducting material with optical transparency. The wideband gap of 3.6 eV makes it as an interesting material in several applications like gas and chemical sensors and photovoltaic devices [1]. In this work, we studied the sintering properties of the alumina (Al_2O_3) and zinc oxide (ZnO) composite ceramics.

The Al_2O_3 based ceramic matrix nanocomposite reinforced by 5 mol.%, 10 mol.%, 15 mol.% of zinc oxide (ZnO) nanoparticles, has been prepared and consolidated by pressureless sintering method. Nearly fully dense composite could be obtained by sintering at 900°C for 2 h. X-ray diffraction (XRD) has been used to characterize the as-prepared and sintered powders. X-ray diffraction results revealed that the samples were crystalline with a hexagonal wurtzite phase. As the concentration of alumina (Al_2O_3) increases in ZnO, the X-ray diffraction peaks shifts towards higher angle. This shifting in peak position and decrease in intensity reflect that Al is successfully replaced Al in ZnO matrix and the formation of $ZnAl_2O_3$. Previous studies have reported the formation of the ternary $ZnAl_2O_3$ phase at sintering temperature 1200°C and above. However, the phase development was observed at relatively lower temperature of 900°C in this study. Further studies could pave the way to the fabrication of $ZnAl_2O_3$ composite at low cost for several applications.

Keywords: Alumina, Zinc oxide, XRD, Sintering

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Reference:

[1] P. Ooi., et al., J. Mater. Sci. Technol., (2011), **27**, 465-470