Photopyro-electric spectroscopic studies of ZnO-MnO2-Co3O4-V2O5 ceramics.

Abstract

Photopyroelectric (PPE) spectroscopy is a nondestructive tool that is used to study the optical properties of the ceramics (ZnO + 0.4MnO2 + 0.4Co3O4 + xV2O5), x = 0–1 mol%. Wavelength of incident light, modulated at 10 Hz, was in the range of 300–800 nm. PPE spectrum with reference to the doping level and sintering temperature is discussed. Optical energy band-gap (Eg) was 2.11 eV for 0.3 mol% V2O5 at a sintering temperature of 1025 °C as determined from the plot (ρhν)2 versus hν. With a further increase in V2O5, the value of Eg was found to be 2.59 eV. Steepness factor ‘σA’ and ‘σB’, which characterize the slope of exponential optical absorption, is discussed with reference to the variation of Eg. XRD, SEM and EDAX are also used for characterization of the ceramic. For this ceramic, the maximum relative density and grain size was observed to be 91.8% and 9.5 μm, respectively.

Keyword: Photopyroelectric spectroscopy; ZnO; V2O5; Sintering; Secondary phase; Optical energy band-gap.