

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 (E_g) 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 E_g was found to be 2.59 eV. Steepness factor 'σ_A' and 'σ_B', which characterize the slope of exponential optical absorption, is discussed with reference to the variation of E_g. 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.