Effect of sintering temperature on the photothermal spectrum of Bi2O3 - TiO2 - Co3O4 - ZnO ceramics

ABSTRACT

Photopyroelectric spectroscopy is used to study the band-gap energy of the ceramic ZnO+0.5ЈBi2O3+0.5ЈTiO2+0.4ЈCo3O4 (mol%), sintered at the isothermal temperature 1180 and 1210, 1240, 1270, 1300°ЈC for 1 and 2 hours in air. The wavelength of incident light, modulated at 9 Hz, is kept in the range 300 to 800 nm and the photopyroelectric spectrum with reference to the doping level is discussed. The band-gap energy is estimated from the plot (ЈhЗ)2 vs hЗ and is 2.30 eV at 1180°ЈC for 1 hour sintering time and is reduced to 2.15 eV at 1300°ЈC sintering temperature. Eg is constant at about 2.8 eV at all sintering temperatures for 2 hours sintering time. The steepness factor ůA (in A region) and ůB (in B region) which characterizes the slop of exponential optical absorption is discussed with reference to the sintering temperature. The phase constitution is determined by XRD analysis. Microstructure and compositional analysis of the selected areas are analyzed using SEM and EDAX. The maximum relative density 87.5% and the grain size 44.6 εm are observed in this ceramics combination.

Keyword: Photopyroelectric spectroscopy; Varistor; ZnO