Effect of heat treatment on the optical properties of ceramic ZnO-MnO-Dy2O3.

ABSTRACT

Photopyroelectric spectroscopy is used to investigate the optical absorption behaviour of the ceramic composite (ZnO + 1 MnO + y Dy2O3), where y = 0 - 2 mol%. Ceramics were sintered at 1200 and 1300°C for 1 and 5 h. PPE spectrum with reference to the doping level and sintering time is discussed. Optical energy band-gap (Eg) is determined from the plot (ρhυ)2 vs hυ. It is found that the the value of Eg is reduced from 3.2 (pure ZnO) to 2.15 eV at the 0 mol% of Dy2O3 and is further reduced to 2.04 eV at the 2 mol% of Dy2O3 for 5 h sintering time at the 1300°C sintering temperature. Steepness factor σA and σB which characterizes the slope of exponential optical absorption is discussed with reference to the variation in the value of Eg. The phase constitution is determined by XRD analysis. Microstructure and compositional analysis are analyzed using SEM and EDAX. The maximum grain size and density of the ceramic were found to be 14 μm, 89%, respectively.

Keyword: Photopyroelectric spectroscopy; ZnO; Optical Band Gap; Dy2O3.