

DETERMINATION OF THE BAND-GAP ENERGY OF CERAMIC ZnO DOPED WITH MnO BY PHOTOPYROELECTRIC TECHNIQUE

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ABSTRACT

Photopyroelectric spectroscopy (PPES) is used to study the band-gap energy (E_g) of ZnO doped with MnO of 0.1 to 2.0 Mol % and sintered at various isothermal sintering temperature ranged from 850°C to 1300°C. The wavelength of incident light is kept in the range from 300 nm to 800 nm at a modulation frequency of 9 Hz. The photopyroelectric spectrum with reference to the doping level and sintering temperature is discussed. E_g is estimated from the plot $(\rho h \nu)^2$ vs $h \nu$ and is about 3.0 eV for samples with 850°C sintering temperature at all doping levels. At higher sintering temperatures the value of E_g decreases with the MnO mol %; beyond 1 mol % E_g becomes constant at about 2.0 eV. The x-ray diffractometry shows that the crystal structure of ZnO doped with different mol % of MnO at all sintering temperatures remains to be of hexagonal type but a small peak is found related to the new phase $ZnMn_2O_4$ only at 1050°C sintering temperature at 2 mol % of MnO doping level. Density is decreased from 95.5% to 87% with the increase in sintering temperature and doping level.

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