Effect of MnO2 doping on nonlinear coefficeint of Zn-Bi-Ti-O varistor ceramics

ABSTRACT

The work aims the improvement of nonlinear coefficient (Ŭ) can achieve by the addition of MnO2. The investigation regarding to the Ŭ variation of MnO2 doping on ZnO-Bi2O3-TiO2 system is discussed. The crystalline phases were identified by an XRD (PANalytical (Philips) XôPert Pro PW3040/60) with CuK Ŭ radiation and the data were analyzed by using XôPert High Score software. The density of varistor ceramics was measured by the geometrical method. The current-voltage characteristics of the varistor ceramics were evaluated. The average grain size (d) was determined by lineal intercept method. The Ŭ of ZnO doped with 0.5 mol% of Bi2O3, 0.5 mol% of TiO2 and x mol% of MnO2 was calculated from data analysis of current-voltage characteristics obtained through a Source Measure Unit (Keithley 236). The calculation of Ŭ is done by using Origin Pro8.0 software which at low concentration at 1170 oC has the value 10.36 and 9.21 at 45 and 90 min sintering time, respectively, and then decreases to 5.63 and 5.27 at 0.8 mol% MnO2 concentrations. The addition of MnO2 dopant in Zn-Bi-Ti oxide ceramics sintered at 45 minutes cause the value of Ŭ to increase up to 0.4 mol% and decrease after further addition.

Keyword: Electrical properties; MnO; Sintering; ZnO varistors