Electrical and microstructural properties of ZnO-Bi2O3-TiO2-Sb2O3-Al2O3-based varistor ceramics fabricated by solution coating method

ABSTRACT

This paper presents the electrical and microstructure properties of ZnO-Bi2O3-TiO2-Sb2O3-Al2O3 varistor synthesized via solution coating technique. The mixed ZnO powder were sintered at 1250 °C in air at various holding time of 90, 120, 150, 180 and 240 min. The prepared powder was characterized by scanning electron microscopy (SEM), thermo gravimetric analysis (TGA), and particle size distribution. The results demonstrated that the ZnO composite powder is homogeneously coated and ultrafine. The densification, phase composition, and microstructure of ZnO varistors was studied by VPSEM, X-ray diffraction (XRD), and Energy-dispersive X-ray spectroscopy (EDX), respectively. The electrical parameters shows that 150 mins holding time has the highest value of nonlinear coefficient and ($\alpha = 16.93$), highest value of breakdown electric field (Eb =66.35 V/mm) and the lowest values of leakage current ($6.37 \times 10{-}5$ mA/cm2). This result well documented that solution coating is a promising route to prepare ZnO varistors.

Keyword: ZnO; Varistors; Solution method; Microstructure; Electrical properties; Holding time