

Enhancement of non-ohmic properties of CoO Doped ZnO varistor ceramics using Soda Lime Silica (SLS) glass

ABSTRACT

ZnO-SLS-CoO (ZSC) based varistor ceramics were prepared at a high sintering temperature of 1100 °C via the conventional solid-state method. The effect of SLS glass on the electrical properties was studied at the different concentration of SLS glass ranging from 0.5 mol% to 2 mol%. Scanning electron microscopy (SEM) and X-ray diffractometer (XRD) were used to examine microstructure and crystal structure of the glass phase based ZSC varistor. For the electrical characteristics, the source measuring unit was used. The result shows that SiO₂ as the major chemical compound found in the SLS glass that responsible for controlling the ZnO grain growth. When the concentration of SLS glass higher than 1 mol%, the dominant peak of ZnO was found in XRD pattern, which is the primary phase whereas the additional peak belongs to Zn₂SiO₄ as the secondary phase. ZSC varistor ceramics with 2 mol% of SLS glass possessed the best electrical properties with the highest nonlinear coefficient α at 4.38 and the lowest leakage current. The increasing value of α could be due to the increase in oxygen vacancies that eventually contributes to the increase of Schottky barrier formation.

Keyword: Nonlinear coefficient; Schottky barrier; Solid-state method; Varistors; Zinc oxide