

Effect of Zinc Oxide Nano-particles Coated with Bi₂O₃ on Microstructure of Varistors

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1. Introduction

The bismuth-rich phase locating surround on ZnO grains is very important in the microstructure of varistors. In this paper, according to the function and location of Bi₂O₃, a new designed particle structure is reported, that is Bi₂O₃ layer was coated on the ZnO nanoparticles surface. It is speculated that this pre-designed structure can help to promote grains growth and a homogeneous bismuth-rich phase net production.

2. Experimental

ZnO nanoparticles coated with 1-5wt% Bi₂O₃ were prepared by conducting the precipitation of Bi(NO₃)₃ solution on the precursor of ZnO. Bi(NO₃)₃ and NH₄HCO₃ solution were dropped onto separate spots on the suspension of basic carbonate of zinc to obtain the Bi(OH)₃ precipitation. Varistors were made with these particles according to conventional process.

The morphology and particle size of zinc oxide were observed using TEM. The microstructure of the varistors was characterized using SEM.

3. Results

TEM shows that homogeneous Bi₂O₃ layer located on the ZnO particles. The particles are nearly spherical with size about 20 nm.

Microstructures of varistors show that ZnO grain is soaked in the homogeneous layer of Bi₂O₃ phase net. And with the increase of the Bi₂O₃, the thickness of Bi₂O₃ phase layer and the ZnO crystal particle size increase.