Photothermal Radiometry Characterization of Zinc Oxide Based Varistors Doped with Antimony Oxide

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Zinc oxide varistors are voltage-limiting ceramics devices with highly nonlinear resistance, used as overvoltage surge protection in electrical circuits. ZnO-based varistors are semiconducting ceramics fabricated by sintering of ZnO powders with small amounts of additives to enhance the non-linearity of the varistor’s behavior. The origin of their non-ohmic behavior lies in their microstructure, where ZnO grains are three-dimensionally separated from each other by grain boundary layers formed by the reactions of additives with each other and with ZnO. The electrical properties are so sensitive to the microstructure because the breakdown voltage is related to the grain size. The microstructure, electrical and thermal properties of ZnO based varistors both depend on type and content of dopant as well as the method of formulating ZnO and the processing condition [1-3]. In this work, photothermal radiometry is used to obtain the thermal diffusivity of ZnO and ZnSb2O6 performed by a traditional ceramic method and sol-gel method. Also the heat capacity and the thermal conductivity are determined. The correlation of the obtained thermal properties and the I-V response and nonlinear coefficient is investigated. The study is complemented by X-ray diffraction (XRD) and scanning electron microscopy (SEM).

References