Effect of Seed Addition on SnO_2-Based Varistors for Low Voltage Application

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The effect of seed addition on the microstructure and non-ohmic properties of the SnO2 + 1%CoO + 0.05%Nb2O5 ceramic-based system was analyzed. Two classes of seeds were prepared: 99% SnO2 + 1%CuO and 99% SnO2 + 1%CoO (mol%); both classes were added to the ceramic-based system in the amount of 1%, 5%, and 10%. The two systems containing 1% of seeds resulted in a larger grain size and a lower breakdown voltage. The addition of 1% copper seeds produces a breakdown voltage (V_b) of ~ 37 V and a leakage current (f_{ic}) of 29 μA. On the other hand, the addition of 1% cobalt seeds produced a breakdown voltage of 57 V and a leakage current of 70 lA. Both systems are of great technological interest for low voltage varistor applications, by means of appropriate strategies to reduce the leakage current. Using larger amounts of seeds was not effective since the values of breakdown voltage in both cases are close to a system without seeds. To our knowledge, there are no reports in the literature regarding the use of seeds in the SnO_2 system for low voltage applications.

A potential barrier model which illustrates the formation of oxygen species ($O'_{2(ads)}$, $O'_{ads,}$ and O''_{ads}) at the expense of clusters near the interface between grains is proposed.

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