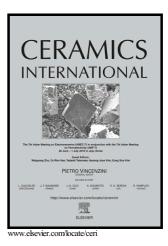
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The effect of Sm_2O_3 on the microstructure and electrical properties of SiO_2 -doped SnO_2 - Zn_2SnO_4 ceramic varistors

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ACCEPTED MANUSCRIPT

The effect of Sm_2O_3 on the microstructure and electrical properties of SiO_2 -doped SnO_2 - Zn_2SnO_4 ceramic varistors

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Abstract:

In this work, $Sm_2O_{3^-}$ and SiO₂-codoped SnO₂-Zn₂SnO₄ ceramic variators were prepared through traditional ceramic processing, and the effect of Sm_2O_3 on the resulting microstructure and electrical properties was investigated. The results demonstrated that the ceramics were composed mainly of SnO₂ and Zn₂SnO₄, and Sm was distributed homogeneously in the grains and along the grain boundaries. With 0.2 mol% Sm₂O₃ doping, the grain growth was obviously promoted. Further increases in Sm₂O₃ to 0.4 mol% resulted in trace amount of SiO₂ and segregations containing elemental Sm via X-ray diffraction patterns and microstructure photos, respectively. In the sample doped with 0.3 mol% Sm₂O₃, optimal electrical characteristics of α =9.4, E_B =10 V/mm, J_L =46 μ A/cm² and ε' =1.2×10⁴ were obtained. Simultaneously, the sample doped with 0.3 mol% Sm₂O₃ had the lowest conductance activation energy of 0.16 eV at temperatures lower than 110°C. This good performance indicates that Sm₂O₃- and SiO₂-codoped SnO₂-Zn₂SnO₄ composite ceramics are viable candidate for the manufacture of capacitor-varistor functional devices.

Key words: varistors; electroceramics; dielectric properties

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