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Influences of Sn Doping and $CaTiO_3$ Volume Fraction on Microstructure and Electrical Response of Sn-doped $CaCu_3Ti_4O_{12}/CaTiO_3$ Composites

Thursday, May 21, 2015 1:00 PM (3h 30m)

The influences of Sn doping concentration and $CaTiO_3$ volume fraction on microstructure and electrical response of Sn-doped $CaCu_3Ti_4O_{12}/CaTiO_3$ composites prepared from a nominal formula of $Ca_{1+x}Cu_{3-x}Ti_{4-y}Sn_yO_{12}$ (where x = 0, 0.5, 1 and 1.5; y = 0.05 and 0.30) were investigated. The dielectric properties of $CaCu_3Ti_4O_{12}/CaTiO_3$ composites were measured as functions of frequency and temperature. The n-type semiconducting grains of $CaCu_3Ti_4O_{12}$ phase and insulating interfaces between $CaCu_3Ti_4O_{12}$-$CaCu_3Ti_4O_{12}$ grains and $CaCu_3Ti_4O_{12}$-$CaTiO_3$ grains were studied by an impedance spectroscopy technique. The microstructure of $Ca_{1+x}Cu_{3-x}Ti_{4-y}Sn_yO_{12}$ ceramics was slightly changed with increasing $CaTiO_3$ volume fraction. The dielectric properties were strongly affected by Sn content and the volume faction of $CaTiO_3$. At 1 kHz, the dielectric constant (ε') increased with increasing Sn doping concentration. It was also found that ε' decreased with increasing $CaTiO_3$ volume fraction. The activation energy for conduction within the grains slightly increased with increasing the Sn content; whereas, the activation energy for conduction at the internal interfaces decreased slightly. Interestingly, it was found that Egb increased significantly with increasing $CaTiO_3$ volume fraction.

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