Effect of Nd_2O_3 and CeO_2 co-doping on the Dielectric Properties of $\text{Ba}_{0.94}\text{Ca}_{0.06}\text{Ti}_{0.90}\text{Sn}_{0.10}\text{O}_3$ Lead-Free Ceramics

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The $\text{Ba}_{0.94}\text{Ca}_{0.06}\text{Ti}_{0.90}\text{Sn}_{0.10}\text{O}_3$ lead-free piezoelectric ceramics co-doped with 0.03mol% CeO_2 and Nd_2O_3 (BCTS-Ce-x Nd_2O_3 , x=0, 0.01, 0.02, 0.03, 0.04, 0.05) were prepared by solid-state sintering method at 1410°C. The effects of Nd_2O_3 on phase structure, microstructure and electrical properties were investigated. The X-ray diffraction (XRD) analysis indicates that single perovskite structures were obtained. The tetragonal and rhombohedral phases coexisted in the composition with x=0.02-0.05. SEM images reveal that the grain sizes of the samples decreased from 68.7 μm to 17.1 μm with x increasing. The optimized piezoelectric properties were obtained at x=0.03 with piezoelectric coefficient of 578 pC/N and planar electromechanical coupling factor of 49.0%. Diffuse phase transition behavior of the samples was weakened by the addition of Nd_2O_3 .

Keywords: BaTiO₃; Dielectric properties; Piezoelectric properties; Nd_2O_3 and CeO_2 co-doping

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