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Effect of Ba Addition on the Dielectric Properties and Microstructure of $(Ca_{0.6}Sr_{0.4})ZrO_3$

Authors : Ying-Chieh Lee, Huei-Jyun Shih, Ting-Yang Wang, Christian Pithan

Abstract : This study focuses on the synthesis and characterization of $Ca_{0.6}Sr_{0.4-x}Ba_xZrO_3$ (x = 0.01, 0.04, 0.07, and 0.10) ceramics prepared via the solid-state method and sintered at 1450 °C. The impact of Sr substitution by Ba at the A-site of the perovskite structure on crystalline properties and microwave dielectric performance was investigated. The experimental results show the formation of a single-phase structure, $Ca_{0.612}Sr_{0.388}ZrO_3$(CSZ), across the entire range of x values. It is evident that the $Ca_{0.6}Sr_{0.39}Ba_{0.01}ZrO_3$ ceramics exhibit the highest sintering density and the lowest porosity. These ceramics exhibit impressive dielectric properties, including a high permittivity of 28.38, low dielectric loss of 4.0×10^{-4}, and a Q factor value of 22988 at 9~10GHz. The research reveals that the influences of Sr substitution by Ba in enhancing the microwave dielectric properties of $Ca_{0.612}Sr_{0.388}ZrO_3$ ceramics and the impedance curves clearly showed effects on the electrical properties.

Keywords : NPO dielectric material, $(Ca_{0.6}Sr_{0.4})ZrO_3$, microwave dielectric properties
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