

Scope of Samarium Content on Microstructural and Structural Properties of Potassium-Sodium Niobate (KNN) Based Ceramics

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Abstract : In the research of advanced materials, ceramics based on KNN are an important topic, especially for multifunctional applications. In this work, the physical, structural, and microstructural properties of the (KNN-CaLi-xSm) system were analyzed by varying the concentration of samarium, which was prepared using the conventional solid-state reaction method by mixing oxides. It was found that the increase in Sm⁺³ concentration led to higher porosity in the sample and, consequently, a decrease in density, which is attributed to the structural vacancies at the A-sites of the perovskite-type structure of the ceramic system. In the structural analysis, a coexistence of Tetragonal (T) and Orthorhombic (O) phases were observed at different rare-earth ion contents, with a higher content of the T phase at xSm=0.010. Furthermore, the structural changes in the calcined powders at different temperatures were studied using the results of DTA-TG, which allowed for the analysis of the system's composition. It was found that the lowest total decomposition temperature occurred when xSm=0.010 at 770°C.

Keywords : perovskite, piezoelectric, multifunctional, Structure, ceramic

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