

Phase Transition and Electrical Properties of $\text{Ba}_{0.8}\text{Sr}_{0.2}\text{TiO}_3$: Comparison of Different Preparation Techniques

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Abstract. This research studied the effect of the different preparation techniques on phase transition and electrical properties of $\text{Ba}_{0.8}\text{Sr}_{0.2}\text{TiO}_3$. The samples compared 3 preparation technique, there are conventional mix-oxide, molten-salt and seed-induced method. The samples prepared by molten-salt calcined at 800 °C, the samples prepared by conventional mix-oxide and seed-induced method was calcined at 1200 °C for 3 h. All of samples sintered at 1400 °C for 3 h. The phase formation and morphology of samples were characterized via X-ray diffraction (XRD) and scanning electron microscopy (SEM), respectively. The dielectric properties of the samples were measurement by LCR-meter.

Introduction

$\text{Ba}_{(1-x)}\text{Sr}_x\text{TiO}_3$ is the one of attractive ferroelectric ceramics with perovskite structure, there are high dielectric constant and excellent ferroelectric properties [1]. Due to the good properties of BST, It has been applied in electronic industry such as piezoelectric transducers, capacitors, phase shifters, ferroelectric memories and gas sensors [2-4]. The properties of $\text{Ba}_{(1-x)}\text{Sr}_x\text{TiO}_3$ depend on many factors as the ratio of Ba/Sr, homogeneity, particle size and phase purity [3]. The BST ceramic process has many techniques such as sol-gel [5], coprecipitation [4], direct current arc discharge [6] molten salt method [7], and the conventional mixed oxide method [8]. The different methods have effects on the structure as ferroelectric properties or electrical properties. The molten salt method is the technique can be reduced the calcination temperature, this technique used the salt for reduced the reaction temperature. Usually, BST was calcined at 1100 °C to 1200 °C, this technique can reduced to 800 °C to 900 °C [7]. The seed-induced method is a technique that relies on a nano-crystalline start for induced the phase formation by decreasing the energetic barrier for phase formation [9-11]. In this work, we would like study the effect on the difference preparation method on the properties of $\text{Ba}_{0.8}\text{Sr}_{0.2}\text{TiO}_3$ ceramic as physical properties, phase formation and dielectric properties. The conventional mixed oxide method, molten salt method and seed-induced method were used in this research. The morphology and phase formation were observed by scanning electron microscope (SEM) and x-ray diffraction (XRD). The dielectric constant of samples was measured by LCR meter.

Experimental Procedure

This research studied the effect of preparation technique on the properties of $\text{Ba}_{0.80}\text{Sr}_{0.20}\text{TiO}_3$ (BST) ceramic. The samples were prepared by difference technique, conventional mix-oxide, molten-salt and seed-induced method. The reagent grade metal oxide powders BaCO_3 (98.5%),