

A comparative study of electrical properties of $\text{Ba}_4\text{SrRTi}_3\text{V}_7\text{O}_{30}$ (R = Gd, La) TB ceramics

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Abstract : The discovery of ferroelectricity in BaTiO_3 opened plethora of research activities in ferroelectric materials having similar structure as well as unveiling ferroelectricity in other crystal structures. Barium based tungsten bronze (TB) oxides having high dielectric constant and low loss, can be effectively used as transducers, actuators, capacitors and also in memory devices. All these characteristics stimulated the researchers to replace toxic and hazardous lead based materials by barium based TB materials from scientific and industrial studies. In the present research work, polycrystalline samples of $\text{Ba}_4\text{SrRTi}_3\text{V}_7\text{O}_{30}$ (R = Gd, La) were synthesized by a high temperature solid state reaction technique and a comparative study of the dielectric properties of the samples. Preliminary structural (XRD) analyses of these compounds show the formation of single-phase orthorhombic structures at room temperature having average crystallite size of the order of some nanometer for all the compounds. The scanning electron micrographs (SEM) provided information on the quality of the samples and show more or less homogeneous distribution of grains over the entire surface of the samples. The dielectric properties suggest that the Gd modified compound undergoes ferroelectric-paraelectric phase transition at two temperatures well above the room temperatures (i.e., 371°C) whereas no such phase transition is observed in La modified compound in our experimental range.

Keywords: Ceramics; X-ray diffraction; Ferroelectricity; Dielectric properties; Electrical conductivity.

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