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# Influence of Pre-Sputtering Technique on Material Properties of BST Thin Films for Tunable Microwave Applications

## Abstract

This paper focuses on the influence of pre-sputtering process on the material properties of RF sputtered Barium Strontium Titanate (BST) thin films. $Ba_{0.5}Sr_{0.5}TiO_3$ thin films were synthesized on sapphire substrates via RF magnetron sputtering system for 2-, 3- and 4-hour deposition time. The samples were then post-annealed for 2 hours at 900 °C in conventional furnace and characterized using x-ray diffraction (XRD), atomic force microscopy (AFM), field emission scanning electron (FESEM) and energy dispersive x-ray (EDX). The AFM analysis revealed that the BST thin film of the 4-hour deposition time produces rougher surface due to larger grain size. All the XRD patterns observed to have intense (110) peaks, indicating the preferred orientation of the BST thin films. From the FESEM results, it is observed that the 3-hour deposited sample is denser and uniform compared to its 2-hour counterpart. However, the 4-hour deposited sample shows a non-uniform film. EDX analysis showed that the elemental composition of the 4-hour deposited sample is the closest to the ideal atomic concentration (at. %) of the BST thin film.

## Keywords

Annealing; BST thin films; Microwave devices; RF sputtering