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Effect of post heat-treatment on microstructure and dielectric properties of $Ba_{0.5}Sr_{0.5}TiO_3$ thin films by RF magnetron sputtering

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Barium strontium titanate (BST) thin films were studied for a tunable device at microwave frequencies. The BST thin films are deposited by radio-frequency magnetron sputtering on platinized Si substrates. The films were analysed by X-ray diffraction(XRD), atomic force microscopy(AFM), field emission scanning electron microscope(FESEM) and X-ray photoelectron spectroscopy(XPS). The BST thin films prepared at 800℃ show a single perovskite. The film which was prepared by post-RTA treatment at 800℃ for 5min in O_2 atmosphere or by post-annealing at 1100℃ for 1h in air exhibited enhancing dielectric property. Grain size and surface roughness of the film was increased due to post-RTA and post-annealing process, respectively. As a result, It was shown ferroelectric hysteresis loops changed from paraelectric to ferroelectric by post heat-treatment. The bare BST thin film deposited only at 800℃ showed dielectric constant of 202 and dielectric loss of 0.014. However, the BST thin film by post-RTA or post-annealing showed increasing dielectric constant of 313 / 358 and decreasing dielectric loss of 0.013 / 0.010, respectively.

Keyword : BST thin film, Rapid Thermal Annealing(RTA), Post-annealing, Dielectric property

TT-P054

Low leakage current and enhanced ferroelectric properties of BiFeO3/$PbZrTiO_3$ Bilayer and Multilayer Thin Films

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BiFeO3 (BFO) is one of well-known multiferroic materials which have the antiferromagnetic and ferroelectric behaviors at room temperature. One of the major problems of BFO thin films is their large leakage current, which affects the measurement of ferroelectric properties at room temperature. Many researchers employed different approaches to obtain the high resistivity of BFO thin films. In this paper, bilayer and multilayer thin films of BFO/$PbZrTiO_3$(PZT) were prepared on Pt/Ti/SiO2/Si substrate by chemical solution deposition (CSD). In order to obtain the high resistivity of thin films, we investigate the conditions of the optimized deposition and the annealing process. As a result, pure perovskite structure of BFO/PZT bilayer and multilayer thin films without any observable secondary phase can be obtained, which are confirmed by X-ray diffraction spectroscopy. Their lower leakage current of BFO/PZT also can be obtain than the single layer BFO thin films. And large remanent polarization values were observed in the BFO/PZT bilayer(～44μC/cm^2) and multilayer(～40μC/cm^2) thin films than the single layer BFO thin films.

* This work was supports by the Seoul Research and Business Development Program (Grant No. 10583).