

PREPARATION AND CHARACTERIZATION OF MULTIFERROIC 0.8 BiFeO₃-0.2 BaTiO₃ THIN FILMS BY PULSED LASER DEPOSITION

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Abstract : BiFeO₃ (BFO), when forming a solid solution with BaTiO₃ (BTO), shows structural transformations over the entire compositional range, which not only gives a way to increase structural stability and electrical resistivity but also applies a means to have better ferromagnetic ordering. In this respect, we have prepared and studied 0.8 BFO-0.2 BTO thin films on Pt(111)/TiO₂/SiO₂/Si substrates by pulsed laser deposition. Various deposition parameters, such as deposition temperature and oxygen pressure, have been optimized to get better quality films. Based on the X-ray diffraction results, thin films were successfully deposited at the temperature of 700°C and an oxygen partial pressure of 10mTorr and 330mTorr. The dielectric, ferroelectric, and magnetic properties have then been characterized. It was found that the films deposited under lower and higher oxygen pressure corresponded to lower leakage current. Magnetism measurement showed an induced ferromagnetism. The microstructures associated with the magnetic and dielectric properties of this mixed-perovskite solid solutions were observed by transmission electron microscopy, which revealed the existence of complicated ferroelectric domains, suggested that the weak spontaneous magnetization was closely associated with the decrease in the extent of rhombohedral distortion by a partial substitution of BaTiO₃ for BiFeO₃.

Key Words : pulsed laser deposition, multiferroic, ferroelectricity, ferromagnetism, BiFeO₃, aTiO₃

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