

펄스 레이저 증착법으로 제작된

다강체 $0.7\text{BiFeO}_3\text{-}0.3\text{BaTiO}_3$ 박막의 특성 연구

김경만¹, Pan Yang², Jinsong Zhu², 조영걸³, 이희영¹

영남대학교 신소재공학과¹, 남경대학교(중국)², 영남대학교 물리학과³

Preparation and Characterization of Multiferroic

$0.7\text{BiFeO}_3\text{-}0.3\text{BaTiO}_3$ Thin Films by Pulsed Laser Deposition

Kyung Man Kim¹, Pan Yang², Jinsong Zhu², Young-Gull Joh³, and Hee Young Lee¹

¹School of Materials Science and Engineering, Yeungnam University, Gyeongsan, Korea

²National Laboratory of Solid State Microstructures, Physics Department, Nanjing University, Nanjing, P. R. China

³Department of Physics, Yeungnam University, Gyeongsan, Korea

Abstract : BiFeO_3 (BFO), when forming a solid solution with BaTiO_3 (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 $0.7\text{BFO}\text{-}0.3\text{BTO}$ thin films on Pt(111)/ TiO_2 / SiO_2 /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 600°C and an oxygen partial pressure of 10mTorr. The dielectric, ferroelectric, and magnetic properties have then been characterized. It was found that the films deposited under lower 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 BaTiO_3 for BiFeO_3 .

Key Words : multiferroic, ferroelectricity, ferromagnetism, mixed-perovskite compound