$(Bi,Nd)(Fe,Ti)O_3$ 세라믹 및 박막의 상변화 거동

Phase Evolution Behavior of $(Bi,Nd)(Fe,Ti)O_3$ Ceramics and Thin Films

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Abstract : Couplings between electric, magnetic, and structural order parameters result in the so-called multiferroic phenomena with two or more ferroic phenomena such as ferroelectricity, ferromagnetism, or ferroelasticity. The simultaneous ferroelectricity and ferromagnetism (magnetoelectricity) permits potential applications in information storage, spintronics, and magnetic or electric field sensors. The perovskite $BiFeO_3$(BFO) is known to be antiferromagnetic below the Neel temperature of 647K and ferroelectric with a high Curie temperature of 1043K. It exhibits weak magnetism at room temperature due to the residual moment from a canted spin structure. It is likely that non-stoichiometry and second-phase formation are the factors responsible for leakage current in BFO. It has been suggested that oxygen nonstoichiometry leads to valence fluctuations of Fe ions in BFO, resulting in high conductivity. To reduce the large leakage current of BFO, one attempt is to make donor-doped BFO compounds and thin films. In this study, $(Bi,Nd)(Fe,Ti)O_3$ thin films have been deposited on $Pt(111)/TiO_2/SiO_2/Si$ substrates by pulsed laser deposition. The effect of dopants on the phase evolution and surface morphology are analyzed. Furthemore, electrical and magnetic properties are measured and their coupling characteristics are discussed.

Key words : BFO $BiFeO_3$, multiferroic