Development of $BaTiO_3/CoFe_2O_4$ thin films for functional magnetoelectric devices

노병일, 양수철†
동아대학교
(scyang@dau.ac.kr†)

Magnetoelectric effect coexisting ferroelectric and ferromagnetic orders has recently been attracted due to potential applications such as magneto-electric or electro-magnetic functional sensors, transducers, actuators even drug delivery systems. In particular, 2-2 nanostructures were found to exhibit strong magnetoelectric values of 6 V/cm·Oe at resonance frequency of 90 kHz. However, 2-2 magnetoelectric thin films less than 1 μm thickness possessed clamping effect between thin films and substrates, which can be a limitation of effective piezoelectric bending.

In this study, BaTiO3/CoFe2O4 films with cylinder/matrix system were successfully developed to minimize clamping effect in magnetoelectric thin films. First, vertically aligned BaTiO3 nanotubes were synthesized with mean diameter of 100 nm and wall distance of 50 nm via two-step Ti anodization and topochemical reaction. Then, BaTiO3/CoFe2O4 films were prepared by sol-gel coating of CoFe2O4 with pyrolysis.

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