

Weak ferromagnetic behavior of BiFeO₃ at low temperature

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Polycrystalline BiFeO₃, having a spherical shape with a diameter of about 78 μm, has been synthesized by low-temperature hydrothermal method. The observed Raman and x-ray photo electron spectroscopy (XPS) spectra of the sample show the spectra of typical single-phased BiFeO₃, and the x-ray diffractometry (XRD) measurement further confirmed that the synthesized sample is single phase. The value of isomer shift from Mössbauer analysis indicates the Fe³⁺ ionic state without Fe²⁺ ionic state as observed from XPS measurement. The experimentally measured M-H curves show antiferromagnetic behavior at 295 K and weak ferromagnetic behavior at 4.2 K. The appearance of two different magnetic behaviors is due to the fact that the antiferromagnetic coupling becomes weak because of the presence of two distorted octahedral sites. Since the effect of the lattice distortion strongly depends on the thermal agitation effect, the weak ferromagnetic behavior can be observed only at 4.2 K. The detailed Mössbauer spectra analysis result confirms the existence of two distortion octahedral sites, which is in an agreement with XRD results. © 2013 AIP Publishing LLC [<http://dx.doi.org/10.1063/1.4801338>]