

IcAUMS 2018

The 5th International Conference of
Asian Union of Magnetics Societies

June 3-7 (Sun.-Thur.), 2018

Ramada Plaza Jeju Hotel, Jeju, Korea

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¹University of Ulsan, Korea, ²Institute of Physics and Chemistry for Materials of Strasbourg, France
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Haein Yim
Sookmyung Women's University, Korea

Mössbauer studies of BaCoZnFe₁₆O₂₇ W-type hexaferrite

Jeonghun Kim, Jung Tae Lim, Hyunkyu Kim, Chul Sung Kim*

Kookmin University, South Korea

The BaCoZnFe₁₆O₂₇ polycrystal sample was prepared by the solid-state reaction method and wet ball-mill process by using a BaCO₃, Co₃O₄, ZnO, α -Fe₂O₃ as the starting materials. The mixture was put into a ball-mill jar with zirconia ball and distilled water, and was ball-milled for 24 h together with dispersant (Sannopco 5468CF) of 0.3 wt.%. These mixtures were sintered at 1000 °C for 3 h and 1275 °C for 3 h in air. The crystalline structure and phase purity of sample were confirmed with x-ray diffractometer (XRD) and the measured XRD pattern was analyzed by using Rietveld refinement method with FULLPROF program. The measurements of magnetic properties were carried out with vibrating sample magnetometer (VSM) and Mössbauer spectrometer at various temperatures ranging from 4.2 to 740 K. Also, the dielectric properties of sample were measured by network analyzer (NA). From the refined XRD patterns, the prepared sample was found to be hexagonal with space group $P6_3/mmc$ at room temperature and the lattice constants of sample were $a_0 = 5.912$, and $c_0 = 52.638$ Å, respectively. From the hysteresis curves of sample up to 15 kOe at various temperatures ranging from 4.2 to 295 K, sample shows the ferrimagnetic behavior and at 295 K, the saturation magnetization (M_s) and coercivity (H_c) of sample were found to be $M_s = 80.11$ emu/g, $H_c = 34$ Oe, respectively. To determine spin reorientation temperature (T_{SR}) and Curie temperature (T_c), the temperature dependence of zero-field-cooled (ZFC) magnetization curves were measured under applied field of 100 Oe between 4.2 and 800 K. Three temperature-dependent magnetic transitions (T_{SR1}) occurred in the BaCoZnFe₁₆O₂₇ sample. The first spin reorientation was caused by the change of spin from planar direction to conical direction at the temperature of 135 K and the other transition corresponded to the change of spin from conical direction to c-axis direction at the spin transition temperature (T_{SR2}) = 385 K. The Curie temperature (T_c) was determined to be 680 K. Also, we have observed the magnetic-field dependence of magnetization in sample under 300 and 1000 Oe between 4.2 and 800 K. Mössbauer spectra were obtained at various temperatures ranging from 4.2 and 700 K and hyperfine field (H_{hf}) and electric quadrupole shift (E_Q) of sample have shown abrupt changes around T_{SR1} .