Journal of the Korean Physical Society (2021) 79:557–561
https://doi.org/10.1007/s40042-021-00274-0

Online ISSN 1976-8524
Print ISSN 0374-4884

ORIGINAL PAPER - CONDENSED MATTER

Mössbauer and magnetic properties of $Ba_2Co_{1.7}Mg_{0.3}Fe_{12}O_{22}$

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Received: 9 July 2021 / Revised: 22 July 2021 / Accepted: 2 August 2021 / Published online: 25 August 2021

Abstract

We have studied the crystal structure and magnetic properties of $Ba_2Co_{1.7}Mg_{0.3}Fe_{12}O_{22}$ using X-ray diffraction (XRD), a vibrating sample magnetometer (VSM) and a Mössbauer spectrometer. We analyzed the XRD patterns to apply FullProof Riedvelt refinement. From the XRD analysis, we found the crystal structure of $Ba_2Co_{1.7}Mg_{0.3}Fe_{12}O_{22}$ is hexagonal(R-3m). The temperature-dependent magnetic properties of $Ba_2Co_{1.7}Mg_{0.3}Fe_{12}O_{22}$ were measured by a VSM. The hysteresis loops were measured at several temperatures. From the zero-field-cooled–field-cooled (ZFC–FC) experiment, the spin re-orientation temperature (T_s) of this sample was 209 K. In the results of the Mössbauer spectrometer experiment from 4.2 to 295 K, the magnetic hyperfine fields (H_{hf}) decreased with respect to increase in temperature. The isomer shift values were between 0.1 and 0.4 mm/s, and represented the ion states of the sample, which were the balanced Fe^{3+} state at all temperatures. H_{hf} and quadrupole splitting values showed abrupt change at 209 K, we deduced that this is occurred because of spin re-orientation.

Keywords Hexaferrite · Mössbauer spectroscopy · Magnetic properties