Mössbauer Studies Magnetic Properties of $BaCo_{2-x}Zn_xFe_{16}O_{27}$

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The $BaCo_{2-x}Zn_xFe_{16}O_{27}$ ($x = 0, 0.5, 1$) samples were prepared by solid-state reaction method. The prepared samples are single-phased, and their crystal structures are determined to be hexagonal with a space group of $P6_3/mmc$ from Rietveld refinement analysis. The magnetic saturation values were increasing, and the values of coercivity were decreasing with increasing Zn contents. The experimentally measured temperature dependence of magnetization curves shows magnetic transitions. We have measured Mössbauer spectroscopy at various temperatures to investigate microscopic magnetic properties. We analyze the obtained spectra with the five magnetic sites of $4f_{VI}$, $6g + 4f_{VI}$, $4e_{IV} + 4f_{IV}$, $12k_{VI}$, and $2d_V$. In addition, from the Mössbauer spectra, we notice the changes in the magnetic hyperfine field and electric quadrupole shift. The substituted Zn^{2+} ions are located at tetrahedral site, and increase the M_s. Curie temperatures were determined from zero-field-cooled magnetizations measurement.

Index Terms—**$BaCo_2FeO_{27}$, Co_2W, Mössbauer spectroscopy, spin reorientation.**