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Synthesis and Magnetic Properties of $SrZn_xFe_{(2-x)}Fe_{16}O_{27}$ ($0.0 \leq x \leq 2.0$)

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The hexagonal ferrite or simply hexaferrite is a ferromagnetic oxide material that has a hexagonal crystal structure. Since its discovery in 1950s, hexaferrite has drawn a great attention of many researchers due to its low price and multitude of uses and applications. W-type hexaferrite exhibits high saturation magnetization (M_s) about 80 emu/g and high anisotropy field (H_a) about 19 kOe. For this reason, W-type hexaferrite has attracted attention for microwave applications. In this report, we tried to prepare Zn-substituted SrW bulk samples with the compositions of $SrZn_xFe_{(2-x)}Fe_{16}O_{27}$ ($0.0 \leq x \leq 2.0$) in a reduced oxygen atmosphere, and identify the effect of Zn^{2+} substitution on their magnetic properties. Furthermore, we tried to investigate the phase stability region change of $SrZn_xFe_{(2-x)}Fe_{16}O_{27}$ with varying x. For these purposes, the samples were annealed at the temperature region of 1125–1350 ˚C for 2 h in $PO_2 = 10^{-3}$ atm. As a result, lattice parameters of the samples increased with increasing x due to larger ionic radius of Zn^{2+} than Fe^{2+}. The saturation magnetization of the samples increased with increasing x from 0 to 1.0, and decreased from x = 1.0 to 2.0 which is a similar behavior to the spinel ferrite when nonmagnetic ion of Zn^{2+} is substituted. The temperature of phase stability region of $SrZn_xFe_{(2-x)}Fe_{16}O_{27}$ decreased with increasing x, and the width of the phase stability region remained almost constant. Detailed properties of $SrZn_xFe_{(2-x)}Fe_{16}O_{27}$ W-type hexaferrite will be presented for a discussion.