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# Improved magnetic properties of Zn-substituted strontium W-type hexaferrites

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*Abstract*— The  $\text{Zn}^{2+}$  substitution for the  $\text{Fe}^{2+}$  site was found to be effective for the improvement of the saturation magnetization ( $M_s$ ) of strontium W-type hexaferrite ( $\text{SrFe}_{18}\text{O}_{27}$ ). For this study, polycrystalline  $\text{SrFe}_{18}\text{O}_{27}$  with various Zn-substituents of  $\text{SrZn}_x\text{Fe}_{(2-x)}\text{Fe}_{16}\text{O}_{27}$  ( $\text{SrZn}_x\text{Fe}_{(2-x)}\text{W}$ ,  $0.0 \leq x \leq 1.5$ ) were sintered at high temperatures in a reduced oxygen atmosphere of  $10^{-3}$  atm. While pure  $\text{SrZn}_x\text{Fe}_{(2-x)}\text{W}$ -type solid solutions ( $0.0 \leq x \leq 1.0$ ) could be obtained from the samples of  $x = 0$ – $1.0$ , the second phase of  $\text{ZnFe}_2\text{O}_4$  was obtained from the sample of  $x = 1.5$ . With increasing  $x$  up to  $1.0$ ,  $M_s$  values were monotonously increased and the highest  $M_s$  value of 87.7 emu/g was achievable from the sample of  $x = 1.0$  sintered at  $1250^\circ\text{C}$ . In addition, post-annealing heat treatments of samples for oxygenation at  $300^\circ\text{C}$  in pure oxygen gas revealed that oxygen non-stoichiometry increased with increasing the sintering temperature, leading to the increase in  $M_s$ , unit cell volume, and electrical conductivity.

**Keywords:** W-type hexaferrite; low oxygen pressure;  $\text{Zn}^{2+}$  substitution; oxygen non-stoichiometry; magnetic property; saturation magnetization

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