Characterization of Ca-La M-type hexaferrites synthesized by solid state reaction

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Ca-La M-type hexaferrites were reported to exhibit high saturation magnetization (M_S) and coercivity (H_C) comparable with M-type hexaferrites. In this study, we tried to synthesize $Ca_{1-x}La_xFe_{12}O_{19}$ and influence of the iron content in the formation process of $Ca_{0.5}La_{0.5}Fe_{12-y}O_{19-\delta}$ ($0.75 \leqq y \leqq 2.15$) hexaferrite prepared by solid state reaction. Lanthanum oxide (La_2O_3), calcium carbonate ($CaCO_3$) and iron oxide (Fe_2O_3) were used as raw materials for solid state reaction. In this case, the raw materials were mixed by ball- milling for 24h, and were uniaxial pressed into disks. The precursor disks were calcined at 1200~1300℃ for 12 h in air and whole process was repeated twice. The pellets were sintered at 1275~1325℃ for 4 h. The samples were characterized by X-ray diffraction (XRD), vibrating sample magnetometer (VSM), and scanning electron microscope (SEM).

All XRD patterns of analyzed $Ca_{0.5}La_{0.5}Fe_{12-y}O_{19-\delta}$ ($1.75 \leqq \mathbf{y} \leqq 2.15$) ferrite obtained in the calcined at 1250 for 12 h and 1300℃ for 12 h have single phase hexagonal crystal structure. For the single phases of $Ca_{0.5}La_{0.5}Fe_{12}O_{19-\delta}$ obtained at each sintering temperature, the lattice parameter a, c and unite cell volume are decreased first and increased when y is increased. The maximum M_s value is 77.5 emu/g for the sample of $Ca_{0.5}La_{0.5}Fe_{11.25}O_{19-\delta}$ sintered at 1300℃ for 4 h in air. Detailed magnetic properties of M-type hexagonal ferrites will be presented for a discussion.

Keywords : Ca-La ferrite, Hexaferrite, magnetic property