

Influence of pH adjustment parameter for sol-gel modification on structural, microstructure and magnetic properties of nanocrystalline strontium ferrite

ABSTRACT

Synthesis of nanocrystalline strontium ferrite (SrFe₁₂O₁₉) via sol-gel is sensitive to its modification parameters. Therefore, in this study, an attempt of regulating the pH as a sol-gel modification parameter during preparation of SrFe₁₂O₁₉ nanoparticles sintered at a low sintering temperature of 900 °C has been presented. The relationship of varying pH (pH 0 to 8) on structural, microstructures, and magnetic behaviors of SrFe₁₂O₁₉ nanoparticles were characterized by X-ray diffraction (XRD), field emission scanning microscope (FESEM), and vibrating sample magnetometer (VSM). Varying the pH of precursor exhibited a strong effect on the sintered density, crystal structure and magnetic properties of the SrFe₁₂O₁₉ nanoparticles. As the pH is 0, the SrFe₁₂O₁₉ produced relatively largest density, saturation magnetization, Ms, and coercivity, Hc, at a low sintering temperature of 900 °C. The grain size of SrFe₁₂O₁₉ is obtained in the range of 73.6 to 133.3 nm. The porosity of the sample affected the density and the magnetic properties of the SrFe₁₂O₁₉ ferrite. It is suggested that the low-temperature sintered SrFe₁₂O₁₉ at pH 0 displayed Ms of 44.19 emu/g and Hc of 6403.6 Oe, possessing a significant potential for applying in low-temperature co-fired ceramic permanent magnet.

Keyword: Sol-gel; pH; Structural; Microstructure; Magnetic behavior; Strontium hexaferrite (SrFe₁₂O₁₉)