

Preparation and characterization of Sr_{1-x}Nd_xFe₁₂O₁₉ derived from steel-waste product via mechanical alloying

ABSTRACT

Steel waste product had been used as the main source of raw material in the preparation of permanent magnets ferrites. Steel waste product is an impure material that contains the iron oxide and impurities. The steel waste product is a form of flakes is grinding for several hours to form a fine powder. The iron oxide powder is separated from magnetic and non-magnetic particle using magnetic particle separation. The magnetic particle was again been purified by using the Curie temperature separation technique. The magnetic powder was carried out from the purification and oxidize at 500 °C for 6 hours at 2 °C/ mins to form the hematite, Fe₂O₃, used as a raw powder to prepare SrFe₁₂O₁₉. Microstructure of Nd-doped strontium ferrites, Sr_{1-x}Nd_xFe₁₂O₁₉, with x = 0.0, 0.1, 0.2, 0.3, 0.4 and 0.5, were prepared through a mechanical alloying technique. Several characterizations have been done, such as X-ray Diffraction (XRD) and Field emission scanning electron microscopy (FESEM). The magnetic properties of coercivity (H_c) and the energy product BH_{max} of samples are carried out. The magnetic properties of samples were investigated with an expectation of enhancing the magnetic properties by substitutions of Nd³⁺ ions on Fe³⁺ ion basis sites. The saturation magnetization M_s revealed magnetic behavior with respect to Nd³⁺ doping concentration, showing a decrease. The coercivity H_c increased with increasing Nd³⁺ doping concentration.

Keyword: FESEM; Hysteresis; Sr_{1-x}Nd_xFe₁₂O₁₉; Steel-Waste