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SYNTHESIS AND CHARACTERIZATION OF BARIUM-HEXAFERRITE NANOPARTICLES FOR MICROWAVE ABSORPTION

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ABSTRACT

Prior to its use for microwave absorption, a hard ferrite was synthesized and characterized. A mixture of iron oxide (Fe_2O_3) and barium carbonate ($BaCO_3$) was milled using the mechanical alloying technique and sintered at a temperature of 900ºC for 10 hours to form barium hexaferrite ($BaFe_{12}O_{19}$). X-ray diffractometry (XRD), vibrating sample magnetometry (VSM) and scanning transmission electron microscopy (STEM) were used to investigate the crystalline phase formation, the material's magnetic hysteresis-loop properties and particle size respectively. From the XRD results it is shown that at 900ºC the full phase of barium hexaferrite was formed. The VSM result shows that at a temperature as low as 900ºC, the saturation magnetization can achieve a value as high as 53.5 emu/g and the sample possesses a coercivity as high as 1071.9 Oe. The STEM result shows that the particle size is 300-400 nm. The high magnetization and coercivity values are good for large microwave absorption losses. Barium hexaferrite were mixed with magnetite to form composite. A suitable absorber giving high losses was formed to contain 15 wt% magnetite.

Keywords: mechanical alloying; barium hexaferrite; X-ray phase analysis; VSM; STEM.

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