Absorption characteristics of the electromagnetic wave and magnetic properties of the la0.8ba0.2fexmn½(1-x)ti½(1-x)o3 (x = 0.1–0.8) perovskite system

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Abstrak

This paper reports on the magnetic properties and electromagnetic characterization of La0.8Ba0.2FexMn½(1-x)Ti½(1-x)O3 (x = 0.1–0.8). The La0.8Ba0.2FexMn½(1-x)Ti½(1-x)O3 (x = 0.1–0.8) materials were prepared using a mechanical alloying method. All the materials were made of analytical grade precursors of BaCO3, Fe2O3, MnCO3, TiO2, and La2O3, which were blended and mechanically milled in a planetary ball mill for 10h. The milled powders were compacted and subsequently sintered at 1000°C for 5h. All the sintered samples showed a fully crystalline structure, as confirmed using an X-ray diffractometer. It is shown that all samples consisted of LaMnO3 based as the major phase with the highest mass fraction up to 99% found in samples with x < 0.3. The mass fraction of main phase in doped samples decreased in samples with x > 0.3. The hysteresis loop derived from magnetic properties measurement confirmed the present of hard magnetic BaFe12O19 phase in all La0.8Ba0.2FexMn½(1-x)Ti½(1-x)O3 (x = 0.1–0.8) samples. The results of the electromagnetic wave absorption indicated that there were three absorption peaks of ~9 dB, ~8 dB, and ~23.5 dB, respectively, at respective frequencies of 9.9 GHz, 12.0 GHz, and 14.1 GHz. After calculations of reflection loss formula, the electromagnetic wave absorption was found to reach 95% at the highest peak frequency of 14.1 GHz with a sample thickness of around 1.5 mm. Thus, this study successfully synthesized a single phase of La0.8Ba0.2FexMn½(1-x)Ti½(1-x)O3 (x = 0.1–0.8) for the electromagnetic waves absorber material application.