

## Absorption characteristics of the electromagnetic wave and magnetic properties of the $\text{La}_{0.8}\text{Ba}_{0.2}\text{Fe}_x\text{Mn}_{1/2}(1-x)\text{Ti}_{1/2}(1-x)\text{O}_3$ ( $x = 0.1-0.8$ ) perovskite system

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### Abstrak

This paper reports on the magnetic properties and electromagnetic characterization of  $\text{La}_{0.8}\text{Ba}_{0.2}\text{Fe}_x\text{Mn}_{1/2}(1-x)\text{Ti}_{1/2}(1-x)\text{O}_3$  ( $x = 0.1-0.8$ ). The  $\text{La}_{0.8}\text{Ba}_{0.2}\text{Fe}_x\text{Mn}_{1/2}(1-x)\text{Ti}_{1/2}(1-x)\text{O}_3$  ( $x = 0.1-0.8$ ) materials were prepared using a mechanical alloying method. All the materials were made of analytical grade precursors of  $\text{BaCO}_3$ ,  $\text{Fe}_2\text{O}_3$ ,  $\text{MnCO}_3$ ,  $\text{TiO}_2$ , and  $\text{La}_2\text{O}_3$ , which were blended and mechanically milled in a planetary ball mill for 10h. The milled powders were compacted and subsequently sintered at  $1000^\circ\text{C}$  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  $\text{LaMnO}_3$  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  $\text{BaFe}_{12}\text{O}_{19}$  phase in all  $\text{La}_{0.8}\text{Ba}_{0.2}\text{Fe}_x\text{Mn}_{1/2}(1-x)\text{Ti}_{1/2}(1-x)\text{O}_3$  ( $x = 0.1-0.8$ ) samples. The results of the electromagnetic wave absorption indicated that there were three absorption peaks of  $\sim 9$  dB,  $\sim 8$  dB, and  $\sim 23.5$  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  $\text{La}_{0.8}\text{Ba}_{0.2}\text{Fe}_x\text{Mn}_{1/2}(1-x)\text{Ti}_{1/2}(1-x)\text{O}_3$  ( $x = 0.1-0.8$ ) for the electromagnetic waves absorber material application.