Sintesis dan karakterisasi sifat magnetik dan sifat listrik senyawa La0.67Ba0.33Mn1-xNix/2Tix/2O3 untuk aplikasi material penyerap gelombang mikro = Synthesize and characterization La0.67Ba0.33Mn1-xNix/2Tix/2O3 compound for microwave absorber

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Abstrak

[ABSTRAK
Penggunaan gelombang mikro dalam beberapa tahun terakhir ini mengalami peningkatan yang sangat pesat seiring berkembangnya teknologi komunikasi dan informasi. Hal ini menimbulkan masalah baru yakni terjadinya polusi gelombang mikro. Untuk mengimbangi dampak negatif polusi interferensi gelombang elektromagnetik, para peneliti mencoba mengembangkan material penyerap gelombang elektromagnetik. Salah satu material yang menjadi kandidat potensial untuk aplikasi penyerap gelombang mikro adalah material berbasis lantanum manganat. Pada penelitian ini dipelajari rekayasa struktur material berbasis lantanum manganat dengan sistem La0,67Ba0,33Mn1-xNix/2Tix/2O3 (x = 0; 0,02; 0,04 dan 0,06). Fasa tunggal senyawa La0.67Ba0.33Mn1-xNix/2Tix/2O3 berhasil dibuat melalui proses pemaduan mekanik menggunakan prekusor-prekusor La2O3, MnCO3, BaCO3, TiO2, dan NiO dengan tingkat kemurnian tinggi. Selanjutnya serbuk hasil pemaduan mekanik menjalani perlakuan pemanasan pada suhu 1200oC selama 10 jam. Material yang telah dipanaskan kemudian dihaluskan kembali selama 20 jam. Hasil refinement pola difraksi sinar X menunjukkan bahwa senyawa La0,67Ba0,33Mn1-xNix/2Tix/2O3 memiliki strukstur kristal monoklinik untuk seluruh variasi x. Kurva histerisis sampel menunjukkan bahwa material ini termasuk magnet lunak. Hasil evaluasi distribusi ukuran partikel material dengan komposisi terbaik yakni La0,67Ba0,33Mn0,06Ni0,03Ti0,03O3 adalah 82,4 nm. Hasil pengujian sifat serapan gelombang mikro pada rentang 8-12,4 GHz menunjukkan material mampu mereduksi gelombang mikro hingga 94 % pada frekuensi 11,4 GHz. Dengan demikian senyawa La0,67Ba0,33Mn1-xNix/2Tix/2O3 dapat dijadikan sebagai material penyerap gelombang mikro.;
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ABSTRACT
In recent years, application of microwaves has been increased along with the development of communication and information technology and highly produces electromagnetic wave interference. To solve this problem, scientist tries to develop a new material that could absorb electromagnetic waves. One of potential candidates for absorbing materials is lanthanum manganese-based system. In this research, La0.67Ba0.33Mn1-xNix/2Tix/2O3 (x = 0, 0.02, 0.04, and 0.06) compound were studied as a microwaves absorber materials. Single phase of La0.67Ba0.33Mn1-xNix/2Tix/2O3 were successfully synthesized by mechanical alloying method. The mixture of all precursors were first mechanically milled for 20 hours and then sintered at a temperature of 1200oC for 10 h in which a fully crystalline material is ensured. The sintered materials were then re-milled for 20 hours to obtain powder-based nanoparticle. X-ray diffraction refinement shows that the samples have monoclinic structure at all x compositions. The hysteresis curve evaluation showed that the sample materials is soft magnetic. The best composition of La0.67Ba0.33Mn1-xNix/2Tix/2O3 with x = 0.06 has been evaluated. The compound has 82.4 nm particle size distributions and

it is able to absorb up to 94% microwaves at 11.4 GHz. The study concluded the material of La0.67Ba0.33Mn1-xNix/2Tix/2O3 have a good potential to be a candidate of microwaves absorbing materials.

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