

Karakterisasi mikrostruktural material penyerap gelombang elektromagnetik senyawa $\text{La}_x\text{Ba}_{(1-x)}\text{Fe}_{0.25}\text{Mn}_{0.5}\text{Ti}_{0.25}\text{O}_3$, ($x = 0, 0.25, 0.75, 1$) = Microstructural characterization of $\text{La}_x\text{Ba}_{(1-x)}\text{Fe}_{0.25}\text{Mn}_{0.5}\text{Ti}_{0.25}\text{O}_3$, ($x = 0, 0.25, 0.75, 1$), an electromagnetic wave absorbance material

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Abstrak

Pertumbuhan butir pada temperatur 1100oC, 1200oC, dan 1300oC kristal $\text{La}_x\text{Ba}_{(1-x)}\text{Fe}_{0.25}\text{Mn}_{0.5}\text{Ti}_{0.25}\text{O}_3$ dipelajari. Material sampel dipreparasi menggunakan teknik pengaloyan mekanik (mechanical alloying) dengan waktu penggilingan (high ball energy milling) selama 30 jam. Sintering dilakukan selama 0, 1, 3 dan 6 jam. Material dianalisa menggunakan sinar X. Besar ukuran butir dihitung menggunakan persamaan Debye-Scherrer berdasarkan profil difraksi sinar X-nya. Sifat magnetik diukur menggunakan pemagraf. Sedangkan serapan gelombang mikro diukur menggunakan alat Network Analyzer (VNA) dengan metode Transmission/Reflection Line (TRL). Semua pengukuran dilakukan pada temperatur kamar. Hasil penelitian menunjukkan bahwa persamaan pertumbuhan butir kristal $\text{La}_{0.25}\text{Ba}_{0.75}\text{Fe}_{0.25}\text{Mn}_{0.5}\text{Ti}_{0.25}\text{O}_3$ mengikuti model persamaan laju difusi. Hasil serapan gelombang mikro menunjukkan adanya serapan pada frekuensi 11-15 GHz. Serapan ini relatif lebih kecil jika dibandingkan dengan serapan material basisnya yakni $\text{LaFe}_{0.25}\text{Mn}_{0.5}\text{Ti}_{0.25}\text{O}_3$. Namun daerah serapannya relatif lebih luas daripada material basis tersebut.

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Growth of $\text{La}_{0.25}\text{Ba}_{0.75}\text{Fe}_{0.25}\text{Mn}_{0.5}\text{Ti}_{0.25}\text{O}_3$ in the temperatur e1100oC, 1200oC, dan 1300oC during 0, 1, 3 and 6 hours sintering was investigated. Sampels was prepared by mechanical alloying technique with high ball energy milling. Milling time is 30 hours. Sample was analized using x-ray diffraction. Grain size was calculated using Debye-Scherrer equation based on their x-ray diffraction profiles. Material absorbance properties was measured using Network Analyzer (VNA) with Transmission/ Reflection Line (TRL) measurement technique. All analysis was conducted in room temperature.

Data showed that grain growth of $\text{La}_{0.25}\text{Ba}_{0.75}\text{Fe}_{0.25}\text{Mn}_{0.5}\text{Ti}_{0.25}\text{O}_3$ has followed diffusion rate equation model of. Whilst it microwave absorbance measurement data performed its wide absorbance in the fequency range 11-15 GHz. Despite its relatively small absorbance intensity, $\text{La}_{0.25}\text{Ba}_{0.75}\text{Fe}_{0.25}\text{Mn}_{0.5}\text{Ti}_{0.25}\text{O}_3$ has broader bandwith comparing to its base material $\text{LaFe}_{0.25}\text{Mn}_{0.5}\text{Ti}_{0.25}\text{O}_3$.