

# Kinetika pertumbuhan kristal dan karakteristik serapan gelombang mikro material LSMO di substitusi Fe-Ti melalui proses pemaduan Mekanik = Crystallite Growth Kinetic and Microwave Absorbtion Characteristic of Fe-Ti Ions Substituted LSMO Based Materials by Mechanical Alloying

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## Abstrak

### <b>ABSTRAK</b><br>

Penelitian ini membahas kinetika pertumbuhan kristal dan karakterisasi material penyerap gelombang mikro berbahan dasar LSMO di substitusi Fe-Ti dengan formula  $\text{La}_{0.5}\text{Sr}_{0.5}\text{Mn}_{0.8}\text{Fe}_{0.1}\text{Ti}_{0.1}\text{O}_3$ . Preparasi material menggunakan metode paduan mekanik selama 10 jam, kemudian diberikan variasi waktu 0, 1, 5 dan 24 jam pada temperatur 1000 C, 1100 C dan 1300 C. Pengujian XRD sebelum proses sintering dan sesudah sintering yang menunjukkan hasil bahwa sintesa bahan atau paduan  $\text{La}_{0.5}\text{Sr}_{0.5}\text{Mn}_{0.8}\text{Fe}_{0.1}\text{Ti}_{0.1}\text{O}_3$  memiliki fasa tunggal (single phase) dengan struktur kristal orthorombik dengan parameter kisi  $a=7.7 \text{ \AA}$  ;  $b=5.5 \text{ \AA}$  ;  $c=5.4 \text{ \AA}$ . Berdasarkan hasil pengukuran ukuran kristal rata-rata melalui metode Debye-Scherrer, kinetika pertumbuhan kristal rata-rata mengikuti persamaan Avrami dengan nilai energi aktivasi sebesar  $Q=21.29 \text{ kJ/mol.K}$ . Karakteristik nilai serapan gelombang mikro pada frekuensi 8-15 GHz dianalisa menggunakan Vector Network Analyzer (VNA). Karakterisasi kurva reflektansi loss sampel material T1300-24jam memberikan nilai intensitas yang paling optimal yaitu sebesar -3.58 dB atau 34% frekuensi serapan pada frekuensi optimal 12.5 GHz, dan lebar pita penyerapan sebesar 3 GHz.

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### <b>ABSTRACT</b><br>

<i>The kinetics of crystallite growth and microwave characteristics for Fe-Ti substituted LSMO with  $\text{La}_{0.5}\text{Sr}_{0.5}\text{Mn}_{0.8}\text{Fe}_{0.1}\text{Ti}_{0.1}\text{O}_3$  composition was investigated. Material preparation was carried out by means of mechanical alloying process for 10 hours milling times. The powders which prepared from mechanically milled material were sintered at temperatures 1000 C, 1100 C dan 1300 C respectively for 0, 1, 5 and 24 hours time sintering time. The XRD traces for sintered materials confirmed that the  $\text{La}_{0.5}\text{Sr}_{0.5}\text{Mn}_{0.8}\text{Fe}_{0.1}\text{Ti}_{0.1}\text{O}_3$  is a single phase material with a orthomobic crystal structure  $a=7.7 \text{ \AA}$  ;  $b=5.5 \text{ \AA}$  ;  $c=5.4 \text{ \AA}$ . Referring to mean crystallite size evaluation which employing Debye Scherrer method. It was found that the kinetics of mean crystallite growth followed the Avrami equation with an activation energy for crystallite growth  $Q=21.29 \text{ kJ/mol.K}$ . In addition to crystallite growth kinetics the absorbtion characteristics of material was evaluated by a Vector Network Analyzer (VNA) in the electromagnetic frequency range 8-

15GHz. The best absorption characteristics was found in the sample code T1300-24h. This follows that the reflection loss of -3.58 dB or 34% was absorb occurred at frequency 12.5 GHz was the bandwidth 3GHz.</i>