

## Pengaruh substitusi Mn pada sifat magnetik Barium Heksaferit = Effect of Mn substitution to magnetic properties of Barium Hexaferrite

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### Abstrak

Barium heksaferit disubstitusi Mn,  $Ba(Fe_{1-x}Mn_x)_{12}O_{19}$ , telah diteliti dengan nilai  $x=0.00, 0.05, 0.10, 0.15, 0.20, 0.30, 0.40$  dan  $0.50$ . Sampel dipreparasi dengan metode solid state reaction dengan tahapan milling, kalsinasi dan sintering. Sampel dicampur dari bahan dasar  $BaCO_3, Fe_2O_3$  dan  $MnO_2$  kemudian dimilling selama 24 jam dengan attritor ball mill. Hasil DTA didapatkan ada peak endotermik pada suhu  $200^\circ C, 300^\circ C$  dan  $600^\circ C$  yang berhubungan dengan dehidrasi sampel, dekomposisi  $MnO_2$  dan pelepasan  $CO_2$  dari  $BaCO_3$ . Sampel dikalsinasi pada suhu  $1200^\circ C$  selama 2 jam dengan kenaikan suhu  $30C/menit$ . Hasil XRD setelah kalsinasi menunjukkan bahwa tidak didapatkan lagi fase bahan dasar dan single phase. Hasil refinement dengan rietveld analysis didapatkan nilai parameter kisi  $a, b$  dan  $c$ . Sampel dikompaksi pada tekanan 5 MPa untuk sampel berbentuk ring dan 8MPa untuk sample berbentuk pellet pada medan magnet. Sampel disintering pada suhu  $1050^\circ C, 1100^\circ C, dan 1200^\circ C$  selama 2 jam. Sebelum dicapai suhu sampel ditahan pada suhu  $100^\circ C, 300^\circ C$  dan  $600^\circ C$  masing-masing selama setengah jam. Massa jenis sample diukur dengan metode Archimedes dan didapatkan bahwa massa jenis sample diatas 75% dari massa jenis teori ( $5.3 \text{ gram/cm}^3$ ). Hasil pengukuran porositas didapatkan bahwa porositas dibawah 10%. Sample diukur sifat magnetiknya dengan permagraph. Didapatkan bahwa remanence dan energy produk berkurang ketika nilai  $x$  bertambah.

.....Barium Hexaferit doped Mn,  $Ba(Fe_{1-x}Mn_x)_{12}O_{19}$ , have been investigated for  $x=0.00, 0.05, 0.10, 0.15, 0.20, 0.30, 0.40$  and  $0.50$ . The preparation is carried out by solid state reaction that corresponds to milling, calcinations and sintering. The precursor  $BaCO_3, Fe_2O_3$  and  $MnO_2$  were mixed and milled for 24 hours using attritor ball mill. DTA results shown there were endothermic peak at  $200^\circ C, 300^\circ C$  dan  $600^\circ C$  that corresponds to sample dehydration, decomposition of  $MnO_2$  and releasing of  $CO_2$  from  $BaCO_3$ . Samples were calcined at  $1200^\circ C$  for 2 hours with increment  $30C/minute$ .

XRD result showed there were no precursor phase and single phase. Lattice parameter obtained through refinement rietveld analysis. Samples were pressed by 5 MPa for ring shaped and 8 MPa for pellet shaped in magnetic field. Sample were sintered at  $1050^\circ C, 1100^\circ C, and 1200^\circ C$  for 2 hours.

Before reached the sintering temperature was hold at  $100^\circ C, 300^\circ C$  and  $600^\circ C$  for a half hours each.

Density was measured trough arhimedes method and obtained that density was more than 75 % theoretical density ( $5.30 \text{ gram/cm}^3$ ). Porosity measurement result were under 10%. The sample magnetic properties was measured using permagraph. The results showed that remanence and energy product decrease as  $x$  value increase.