

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 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 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 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.