

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 $1050^\circ C, 1100^\circ C, \text{ dan } 1200^\circ C$ 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 $1050^\circ C, 1100^\circ C, \text{ and } 1200^\circ C$ 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.