

Analisis struktur kristal dan sifat magnetik paduan sistem (Ba,Sr)_{0.6}Fe₂(1-x)(Mn,Ti)_xO₃ (x=0;0.25; and 0.5)

Wisnu Ari Adi, author

Deskripsi Lengkap: <https://lib.ui.ac.id/detail?id=145411&lokasi=lokal>

Abstrak

ANALISIS STRUKTUR KRISTAL DAN SIFAT MAGNETIK PADUAN SISTEM Ba_{0,5}Sr_{0,5}O₆Fe₂(1-x)Mn_xTi_xO₃ (x = 0, 0.25, dan 0.5). Telah dilakukan analisis struktur kristal pada bahan magnet system Ba_{0,5}Sr_{0,5}O₆Fe₂(1-x)Mn_xTi_xO₃ menggunakan difraksi sinar-x. Bahan system Ba_{0,5}Sr_{0,5}O₆Fe₂(1-x)Mn_xTi_xO₃ dibuat dengan metode reaksi padatan menggunakan proses mechanical milling dan di sintering pada suhu 1050 oC selama 15 jam dengan variasi x = 0, 0.25, dan 0.5. Hasil refinement dari pola difraksi sinar-x menunjukkan bahwa telah terbentuk single phase bahan magnet system Ba_{0,5}Sr_{0,5}O₆Fe₂(1-x)Mn_xTi_xO₃ (x = 0, 0.25, dan 0.5) dengan struktur kristal heksagonal (grup ruang P 63/m m c). Struktur heksagonal ini dibangun menjadi 4 blok sub unit yang disebut dengan 2 blok sub unit S (Fe₆O₈)₂⁺ dan 2 blok sub unit R (Ba_{0.52}Sr_{0.52}Fe₆O_{11.2})₂⁻ yang merupakan panjang ikatan berturut-turut Fe₃⁺(5)?Fe₃⁺(1)?Fe₃⁺(5) dan Fe₃⁺(5)?Fe₃⁺(2)?Fe₃⁺(5). Substitusi Mn dan Ti ke dalam atom Fe mengakibatkan volume unit sel dan jarak blok S membesar sedangkan kerapatan atomic dan jarak blok R menjadi semakin berkurang. Karakterisasi magnetic sampel Ba_{0,5}Sr_{0,5}O₆Fe₂(1-x)Mn_xTi_xO₃ (x = 0; 0,25; dan 0,5) ditandai dengan menurunnya medan coercive H_c dari 1508 Oe (x = 0) menjadi 296 Oe (x = 0,5). Dan karakterisasi uji serapan, bahwa rentang frekuensi serapan terjadi pada daerah 8 ? 11 GHz, 11 ? 13,5 GHz, dan 13.5 ? 16 GHz, dan titik puncak serapan terjadi pada frekuensi 9,3 GHz, 11,3 GHz, dan 13,7 GHz yang berturut-turut untuk sampel Ba_{0,5}Sr_{0,5}O₆Fe₂(1-x)Mn_xTi_xO₃ (x = 0; 0,25; dan 0,5). Disimpulkan bahwa telah berhasil dibuat single phase bahan magnet system Ba_{0,5}Sr_{0,5}O₆Fe₂(1-x)Mn_xTi_xO₃ (x = 0, 0.25, dan 0.5) untuk kandidat bahan absorpsi untuk gelombang elektromagnetik ultra tinggi.

ANALYSIS OF CRYSTAL STRUCTURE AND MAGNETIC PROPERTIES ON Ba_{0,5}Sr_{0,5}O₆Fe₂(1-x)Mn_xTi_xO₃ (x = 0, 0.25, and 0.5) SYSTEM COMPOUND. The analysis of Ba_{0,5}Sr_{0,5}O₆Fe₂(1-x)Mn_xTi_xO₃ system magnetic material by using x-ray diffraction technique have been performed. The synthesis of Ba_{0,5}Sr_{0,5}O₆Fe₂(1-x)Mn_xTi_xO₃ (x = 0, 0.25, and 0.5) system magnetic material are used by solid state reaction method through the mechanical milling process and sintered at 1050 oC for 15 hours. The result of refinement of x-ray diffractions showed that the single phases of of Ba_{0,5}Sr_{0,5}O₆Fe₂(1-x)Mn_xTi_xO₃ (x = 0, 0.25, and 0.5) system magnetic materials have been formed with the crystal structure of hexagonal (space group P 63/m m c). The hexagonal with space group P63/mmc is constructed from 4 building blocks, namely two S blocks (Fe₆O₈)₂⁺ and two R blocks (Ba_{0.52}Sr_{0.52}Fe₆O_{11.2})₂⁻. And then S and R blocks are bond length of Fe₃⁺(5)?Fe₃⁺(1)?Fe₃⁺(5) and Fe₃⁺(5)?Fe₃⁺(2)?Fe₃⁺(5), respectively. The substitution of Mn and Ti under Fe caused the volume of unit cell and S block space increase, while the atomic density and R block space decrease. Magnetic characterization show that the coercivity for x = 0 was 1567 Oe decrease drastically to 256 Oe for x = 0.5. And absorption characterization show that the bandwidth of absorption frequency was the range 8 ? 11 GHz, 11 ? 13,5 GHz, dan 13.5 ? 16 GHz, for sample of Ba_{0,5}Sr_{0,5}O₆Fe₂(1-x)Mn_xTi_xO₃ (x = 0; 0.25; dan 0.5), respectively. We conclude that the single phases of of Ba_{0,5}Sr_{0,5}O₆Fe₂(1-x)Mn_xTi_xO₃ (x = 0, 0.25, and

0.5) system magnetic materials have been synthesized with successfully.</i>