

Evaluasi koersifitas magnet permanen Nd-Fe-B antara efek ukuran partikel dan substitusi parsial dysprosium terhadap neodmium =
Evaluation of Nd-Fe-B permanent magnet coercivity between particle size effects and partial substitution dysprosium with neodmium.

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Abstrak

Telah dilakukan rekayasa struktur material magnet pemanen berbasis fasa Nd₂Fe₁₄B melalui substitusi parsial atom neodmium (Nd) dalam sel satuan dengan atom dysprosium (Dy) sehingga membentuk fasa (Nd,Dy)₂Fe₁₄B untuk meningkatkan nilai koersifitas. Rekayasa struktur untuk peningkatan nilai koersifitas dimaksud juga dilakukan melalui pengecilan ukuran partikel fasa (Nd,Dy)₂Fe₁₄B dengan memperpanjang durasi waktu penghalusan pada proses penghalusan mekanik. Ingot material dengan tiga komposisi berbeda Nd_{20-x}Dy_xFe₁₄B dengan x = 1, 3, 5 at.% dipersiapkan dengan mini arc melting furnace (AMF) dan dilanjutkan dengan perlakuan anil selama 24 jam untuk homogenisasi mikrostruktur. Sampel magnet untuk masing - masing komposisi diperoleh setelah tahapan-tahapan penghalusan mekanik dengan variasi durasi waktu penghalusan 5, 10, 15 dan 20 jam. Evaluasi nilai koersifitas sampel magnet memperlihatkan peningkatan tajam terjadi karena pembentukan mikrostruktur yang terdiri dari fasa utama (Nd,Dy)₂Fe₁₄B dan fasa yang kaya Nd (Nd-rich phase) paska perlakuan panas.

.....A change of the cell structure of the permanent magnet materials based on the Nd₂Fe₁₄B phase has been carried out through partial substitution of the neodmium (Nd) atom with the dysprosium (Dy) to form (Nd, Dy)₂Fe₁₄B phase to increase the coercivity value. The increase in coercivity has also been achieved by refining the particle size of (Nd, Dy) by mechanical milling with varying times of time. Ingot of Nd_{20-x}Dy_xFe₁₄B with x = 1, 3, 5 at.% were prepared by mini arc melting furnace (AMF) and successively followed by annealing treatment for 24 hours in a sealed quartz tube for microstructure homogenization. As annealed magnetic ingots for for each composition was then mechanically refined for the duration of grinding times 5, 10, 15 and 20 hours and compacted in a cylindrical die of 12 mm diameter for magnetic sample preparation. The value of coercivity of all magnetic samples was evaluated from the hysteresis loop. It is found that the best improvement of coercivity occurred due to microstructural formation which consisting of the main phase (Nd, Dy)₂Fe₁₄B and the Nd rich phase (Nd rich phase) after heat treatment.