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Effect of heat treatment in magnetic properties and microstructure of NdFeB-based permanent magnets produced by strip casting alloys

Apresentador: Marcela Enaile de Melo Faria

Autores (Instituição): Faria, M.E.(Instituto de Pesquisas Energéticas e Nucleares); Janasi, S.R.(Instituto de Pesquisas Energéticas e Nucleares); Silva, S.C.(Instituto de Pesquisas Energéticas e Nucleares); Silva Filho, J.C.(Instituto de Pesquisas Energéticas e Nucleares); Martinez, L.G.(Instituto de Pesquisas Energéticas e Nucleares);

Resumo:
Nd14FebalB6 sintered magnets were produced from a strip casting (SC) alloy, obtained in a pilot scale. The SC alloy was submitted to heat treatments (HT) of 2.5 h and 5 h at 1373 K under vacuum atmosphere and then processed by the powder metallurgy route to obtain the magnets. The SC alloys with and without HT were fragilized in hydrogen (H2), milled and, the powders resultants were aligned in a 6 T pulsed field, compacted in isostatic press at 200 MPa and vacuum sintered at 1373 K during 1 h. The X-ray diffraction results showed the presence of magnetic 2:14:1 phase and Fe in the SC alloy without the HT. After the HT of 2,5 h and 5 h, only the phase 2:14:1 was observed, indicating that the HT was sufficient to homogenize the alloy. The microstructural analysis of the alloy after 5 h of HT by electronic scanning microscopy showed the presence of 2:14:1 phase, confirming the XRD results and the Nd-rich phase, as well as the increase in grain size with increasing of the heat treatment time. The increase in grain size of the alloys after the heat treatment resulted in sintered magnets with larger grains than the magnet obtained from the alloy without the heat treatment. The highest magnetic properties among all samples were obtained in magnet produced from the alloy submitted to heat treatment during 5 h, which exhibited the following values of iHc = 462 kAm-1 and Jr = 1.27 T.