HDDR process as a powder metallurgy technique for recycling sintered Nd-Fe-B magnets

Engerroff, J.A.B.(1); Keller, F.O.(1); Lopes, L.U.(2); Mascheroni, A.A.(1); Takiishi, H.(2); Wendhausen, P.A.P.(1);
(1) UFSC; (2) IPEN;

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Abstract:
In recent years, rare earth metals have hit the headlines due to supply restrictions of neodymium (Nd) and dysprosium (Dy) from the main suppliers. Some authors have addressed the so-called ‘rare-earth crisis’ by reducing rare earth usage, especially dysprosium content in rare earth magnets. Thus, HDDR (hydrogenation-disproportionation-desorption-recombination) has been emerging as powder metallurgy technique for recycling Nd-Fe-B sintered magnets. In this work, Nd-Fe-B powder was obtained by processing Nd-Fe-B magnets via HDDR. This process was carried out under 100 kPa of hydrogen for 10 minutes during disproportionation and fully recombination under 0.01 Pa for 15 min. Microstructural changes were characterized, as well the final magnetic properties. Results showed that powder obtained were isotropic, with jHc = 850 kA/m and Br = 0.6 T. Microestrutural analysis also concluded that HDDR process was effective to grain refinement, showing visibility as a method of scrap Nd-Fe-B sintered magnets recycling.