Improvement of the Flux Trapping in Gd-Ba-Cu-O Bulk Using Magnetic Particles

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Abstract - The trapped magnetic flux of Gd-bulks increases due to the improvement of its critical current density J_c. To obtain higher J_c, introduction of pinning centres is known as one of the effective methods. In a previous study, we have found that the doping by magnetic particles has a significant potential to increase the J_c under a magnetic field. From the viewpoint of magnetic pinning effect, several soft-ferromagnetic materials are thought to act as a positive reinforcement for pinning centres. In this paper, four kinds of alloy particles such as Fe-Si, Fe-Si-Al, Fe-Si-B-Cr-C and Fe-B-Si-Nb-Cr-Cu are independently introduced into the Gd-123 matrix. Various amounts of those particles, ranging from 0 to 0.6 mol% of Gd-123, were added into a Gd-123 matrix together with Gd-211 particles. Top-seeded melt growth process has been done. Samples with the size of 10 mm x 10 mm were annealed and polished to 7 mm in height. Trapped magnetic flux measurements have been conducted at 77 K after field cooling at 1 T. The result shows that the trapped flux of the Fe-B-Si-Nb-Cr-Cu doped and Fe-Si doped samples exceed considerably those of the undoped ones. A value of B = 0.16 T was obtained for the local maximum in the centre of the top surface in Fe-Si and Fe-B-Si-Nb-Cr-Cu doped samples. The results are discussed comparatively from the viewpoint of magnetic and flux trapping properties.

Keywords - Magnetic particle, Fe-Si addition, Gd-Ba-Cu-O system, Magnetic pinning

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