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Enhancement of Critical Current Properties of MgB_2 Bulks by Controlling Microstructure and Crystallinity JUN-ICHI SHIMOYAMA, University of Tokyo, AKIYASU YAMAMOTO, YUKARI KATSURA, ISAO IWAYAMA, SHINYA UEDA, SHIGERU HORII, KOHJI KISHIO — Critical current properties of MgB_2 bulks with various grain size, crystallinity and bulk density were systematically studied. Samples with low crystallinity, which was achieved by the low temperature reaction and/or carbon substitution for boron, exhibited high J_c in fields and high irreversibility fields, reflecting enhanced H_{c2}. In addition, a strong relationship was found between pinning force density and grain size controlled by changing starting particle size of boron, heating conditions and molar ratio between magnesium and boron. The highly dense MgB_2bulks prepared by a diffusion method showed excellent J_c characteristics particularly in low fields. The carbon substitution for the dense bulk was effective for enhancement of J_c under high fields. Essential pinning potential of the $MgB_2$was also evaluated using the dense bulks. Based on these results, a guiding principle to improve critical current properties of practical MgB_2 conductors will be discussed from various viewpoints.

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