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Pulsed field magnetization of GdBaCuO superconducting bulks with high magnetization efficiency using a split type coil with a soft iron yoke

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Single-grain REBaCuO superconducting bulks have significant potential as a trapped field magnet (TFM) because they can trap a magnetic field, BT, over several tesla. To enhance the BT value, reliable seeding methods for the fabrication of REBaCuO bulks is essential to increase critical current density, Jc. The top-seeded melt growth (TSMG) technique is a well-known growth method to fabricate large single grains [1]. The top-seeded infiltration growth (TSIG) technique is also a reliable, alternative growth method, which has shown the potential to provide a more homogeneous microstructure and improved Jc properties compared with TSMG bulks. [1]. In a previous study, we performed the pulsed field magnetization of YBaCuO bulks prepared by TSMG and TSIG using a solenoid coil, for which the TSIG bulks achieved a BT over 2 T at Ts = 40 K by single-pulse PFM due to a reduced temperature rise [1]. In addition to this, a split coil with a soft iron yoke can potentially achieve higher trapped fields in TSIG bulks as required for a wide range of applications [2].
In the present work, we performed PFM experiments on GdBaCuO superconducting bulks prepared by TSMG and TSIG using a split coil. A maximum trapped field, BTmax, over 3.5 T was achieved at Ts = 40 K on the TSIG bulk surface by single-pulse PFM. The magnetization efficiency (= BTmax / Bapp) for the TSIG bulks was higher than that of the TSMG bulks, where Bapp is the applied field when the maximum trapped field was achieved. The differences in the magnetization properties are discussed including critical current density, Jc (H), and field cooled magnetization (FCM) measurements.
[1] D. K. Namburi *et al.*, Supercond. Sci. Technol. **33** (2020) 115012
[2] M. D. Ainslie *et al.*, Supercond. Sci. Technol. **29** (2016) 074003

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