The Generation of High Trapped Fields in Bulk (RE)BCO High Temperature Superconductors

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Abstract - Bulk, single grain RE-Ba-Cu-O [(RE)BCO, where RE represents a rare earth element or Y] high temperature superconductors (HTS) fabricated by top seeded melt growth (TSMG) have considerable potential for the generation of stable magnetic fields that are much larger than those produced by iron-based ferromagnetic materials (limited practically to less than 1.7 T). High trapped fields in bulk (RE)BCO are achieved by engineering effective flux pinning sites within the bulk microstructure that have similar dimensions to individual flux quanta, which exist in Type II superconductors. We report recent advances in the generation of flux pinning sites based on the engineering of RE_2BaCuO_5 (RE-211) and $RE_2Ba_4CuMO_x$ (RE-2411) secondary phase inclusions in large grain (RE)BCO samples fabricated by a practical seeded melt growth process. Bulk samples of up to 26 mm in diameter have been fabricated by this process and shown to trap record magnetic flux densities in small samples at 77 K. The field-dependent critical current density in small sub-specimens and trapped field profile of single grain samples is reported.

Keywords - Bulk superconductors, flux pinning, trapped magnetic field

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