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In-field evaluation of REBCO superconducting joint

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The superconducting joint is one of key technologies to evolve high temperature superconducting (HTS) conductors and their applications. Various joint techniques have been proposed in these years [1]. To evaluate developed joint efficiently, we developed a resistance evaluation system for superconducting joints [2]. The system consists of a superconductor sample with a joint, a copper coil to inject (induce) current to the sample, and a superconducting magnet for external fields applied to the joint. Using this system, joint resistance (R_j) ranging 10^{-15}-10^{-7} Ω can be quantitatively evaluated as a function of injected current (I_{in}) magnitude, temperature, and external magnetic field. In addition, I_c and T_c of the joint can be evaluated. In this paper, we report the evaluation results of the REBCO superconducting joint [3]. At 4.2 K without external field, R_j stayed ~10^{-14} Ω at I_{in} up to ~300 A. This indicates that the I_c of the joint is sufficiently larger than 300 A. At 77 K, I_{in} of ~150 A rapidly decreased to ~116 A and evaluated R_j was ~10^{-12} Ω. This higher R_j is considered to be due to a high load factor of ~100% at the joint. R_j at 4.2 K showed almost no dependence on external field ranging $0 \le B \le 3$ T. Even at 77 K and 3 T, the junction carried I_c of ~17 A and R_j was ~10^{-12} Ω. This work is based on results obtained from a project commissioned by JST-Mirai Program Grant Number JPMJMI17A2, Japan.

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