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Joint resistance evaluation of longer HTS tape joints with indium insertion

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Simply- and quickly-fabricated low-resistive joints between various high-temperature superconducting (HTS) tapes are needed for some cases in high-temperature superconducting (HTS) magnets such as nuclear magnetic resonance (NMR) magnets, nuclear fusion magnets, and so on. We have developed pressure welding with indium foil inserted between the joint surfaces at room temperature or with a low-temperature heat treatment at ˜370 K. The joint achieved a joint resistivity (product of joint resistance and joint area) of 11–25 nano-Ohm cm2 for silver sheathed BSCCO tapes and 25–35 nano-Ohm cm2 for copper-stabilized REBCO tapes at 77 K, self-field with shorter joint length less than 10 mm, which were comparable or less than those for conventional pressure-controlled solder joints. The Joint resistivity was also reduced at 4.2–10 K to be from one-third to a half of that at 77 K. The joint performance has been improved sufficiently with short joint, however, longer joint with lower joint resistance is required for a practical usage.
In this study, we fabricated various joint samples using the pressure welding with indium insertion changing joint length and combination of HTS tapes, REBCO-REBCO, BSCCO-BSCCO and REBCO-BSCCO. The joint resistance and critical current were evaluated at 77 K (cooling with liquid nitrogen) at first, then evaluated at 4.2 K (cooling with liquid helium). The preliminary fabrication of BSCCO tape with 50–250 mm joint length showed that the joint resistivity became twice larger than that for short samples with critical current degradation. The joint performance of various longer joint samples with improved fabrication process and detail of the results are presented at the conference.

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