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Ultra-low resistance joints between Bi2223 and NbTi wires using superconducting Bi-Pb solder

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The next generation NMR spectrometer operated at 1.3 GHz (30.5 T) is currently being developed [1]. The superconducting magnet in this NMR consists of low temperature superconducting (LTS) coils using Nb-Ti and Nb3Sn, and high temperature superconducting (HTS) coils using Bi2223 and RE123, which are connected in series. Superconducting joints between Nb-Ti and Bi2223 are preferable to realize the persistent-current mode operation of this NMR magnet. However, we are facing difficulties to realize the superconducting joints between Nb-Ti and Bi2223 wires. Instead, we are developing ultra-low resistance joint between Bi2223 and Nb-Ti wires using superconducting Bi-Pb solder. The resistance of this joint is required to be sufficiently low, i.e., below 0.1 nΩ to operate the 1.3GHz NMR magnet in the persistent-current mode. The superconducting joint between Nb-Ti wire and Bi-Pb solder was achieved using the conventional method. On the other hand, Bi2223 wire was jointed to the Bi-Pb solder through Ag sheath. The resistance of the joint was measured by four-probe method at 4.2 K. We have successfully fabricated the joint between Bi2223 and Bi-Pb with sufficiently low resistance of 0.097 nΩ. This work was supported by JST-Mirai Program Grant Number JPMJMI17A2, Japan.
References
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