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# Investigation of a wire-in-channel NbTi/Cu superconducting wire with a high Jc

Magnetic resonance imaging (MRI) is a medical imaging technique used in radiology to visualize the internal structure of the body in detail. Due to its high copper-to-superconductor ratio, low cost and high stability, the wire-in-channel NbTi/Cu superconducting wire occupies about 70% of the superconducting wire used in an MRI system. NbTi/Cu wire with a copper-to-superconductor ratio of 1.3 and with a diameter of 0.72 mm is used for fabricating a high copper-to-superconductor ratio wire-in-channel superconductor. Furthermore, the effect of heat treatment time, number of heat treatments, the strain space between heat treatments, final drawing strain, as well as different NbTi bars were investigated for optimizing the process for obtaining a high critical current density (Jc). Measurement results show that the acquired maximum Jc can reach about 3208 A/mm2 at 4.2 K and 5 T. The obtained high Jc core wire was then put into an appropriate copper channel and these two parts were soldered by Tin alloy. Thus, a wire-in-channel superconductor with a copper-to-superconductor ratio of 11.5 and with the size of 1.96*1.12 mm2 was fabricated. The critical current density of the wire-in-channel superconductor decreases to 3125 A/mm2 at 4.2 K and 5 T due to the soldering process.

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