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Wed-Af-Po.04-08: Design, fabrication, and experiment of roller shaped high-temperature superconducting coil joint apparatus

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The fabrication of high-temperature superconductor (HTS) magnets often involves manual soldering joints, which relies on operator skill and causes performance variations. To address these challenges, this study presents the design, fabrication, and experimental evaluation of a roller-shaped HTS coil joint apparatus for soldering rare-earth barium copper oxide (REBCO) tapes. The apparatus was developed to facilitate the soldering process across various coil dimensions, ensuring high performance and reliable joints between HTS coils.
First, simulations and analyses were conducted to ensure the thermal and mechanical requirements based on prior REBCO tape-to-tape joint researches. The apparatus is equipped with functionalities to control parameters such as solder type, target temperature, heating rate, holding time, cooling time, and pressure. Then, the fabricated joint apparatus was primarily utilized to validate the tape-to-tape soldering process, with a focus on maintaining consistent electro-mechanical performance. Finally, experimental evaluations of HTS coil-to-coil joints evaluations demonstrated the ability to achieve high performance and reliability joint, highlighting its potential for applications in advanced HTS REBCO magnet systems.

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