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Wed-Mo-Po.09-02: Experimental study of thermal contact resistance in stacked REBCO tapes for superconducting cable under dry and wet configuration

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As interest in and the need for advancements in high-field technology grow, the development of superconducting cables capable of stably carrying high currents in the range of tens to hundreds of kA has become increasingly important. Stacking REBCO tapes can meet the high current demands of those systems while maximizing space efficiency.
Within the temperature-dependent critical current characteristics of superconductors, it is essential to maintain stable temperatures of the stacked REBCO tapes. However, the layered structure inherently introduces thermal contact resistance in the transverse direction due to surface roughness and contact pressure between the REBCO tapes. This resistance creates temperature gradients between the stacks, which must be minimized to ensure the stable operation of REBCO stacked cables.
This paper experimentally investigates the thermal contact resistance of stacked REBCO tapes and explores the parameters to reduce the thermal contact resistance between stacks. Using the REBCO tape stack, both dry and wet configurations with In52Sn48 soldering were tested under varying conditions of former presence and applied pre-load levels. Thermal contact resistance was calculated by measuring the temperature using a conducting cryocooler, and the results were analyzed.

Author: KOO, Jaheum (Department of Electrical and Computer Engineering, Seoul National University, 08826, Korea)

Co-authors: Mr JANG, Wonseok (Department of Electrical and Computer Engineering, Seoul National University, 08826, Korea); PARK, Hyunsoo (Seoul National University); Mr KIM, Geonyoung (Seoul National University, 08826, Korea); Dr KIM, Jaemin (Standard Magnet Inc., Seoul, 08826, Korea); Mr YOON, Sangwon (Applied Superconductivity Center, Electric Power Research Institute, Seoul National University, 08826, Korea); Prof. HAHN, Seungyong (Department of Electrical and Computer Engineering, Seoul National University, 08826, Korea); Prof. LEE, Sangjin (Department of Electrical and Computer Engineering, Seoul National University, 08826, Korea)

Presenter: KOO, Jaheum (Department of Electrical and Computer Engineering, Seoul National University, 08826, Korea)

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