

APP3-4

Electromagnetic and Mechanical Properties of Two-ply REBCO Tape double Pancake Coils

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We have succeeded in operating a 25 T cryogen-free superconducting magnet (25T-CSM), which consists of LTS outsert coils and Bi2223 insert pancake coils [1]. As a next step, an upgrading design of 25T-CSM is considered by replacing the Bi2223 insert coils with REBCO coils, since REBCO tapes have better mechanical and in-field critical current properties. In this design, co-winding of two REBCO tapes is a key technology to increase the current density in the coil. We investigate electromagnetic and mechanical properties of two-ply REBCO double pancake coils with and without a co-wound Hastelloy tape for reinforcement. The coils were fabricated with a Fujikura REBCO tape that had a dimension of 4 mm width and 0.1 mm thickness, and a Hastelloy tape of 0.05 mm thickness. The inner diameter of the coils was 100 mm, and the outer diameters were 188 and 169 mm for with and without the co-winding Hastelloy tape, respectively. The coil voltages and strains were measured at 4.2 K under a background field of 11 T by using a 360 mm room temperature bore superconducting magnet at the HFLSM, IMR Tohoku University. The maximum hoop stress in the coil without a Hastelloy tape was estimated to be about 540 MPa by using the BJR relation for 700 A and 11 T. The maximum strains on the outermost winding were approximately 0.25-0.39% at the operation current of 700 A. For the case of the Hastelloy co-wound coil the stress was induced up to the almost same level, and the strains on the innermost winding as well as on the outermost winding were obtained. In the presentation, the IV properties and the strains as a function of operating current for the both coils including the results under the self field will be reported and discuss about the results.

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[1] S. Awaji *et al.*, *Supercond. Sci. Technol.* **30** (2017) 065001.

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