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Reduction of AC losses in REBCO split wire and coil without deterioration of critical current

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Recently, we proposed a REBCO split wire having multi-core structure. The split wire is fabricated by separating the REBCO layer using the commercial REBCO-coated conductor. The fabrication method is electrical separating by bending stress (ESBS) and electrical separating by pressure concentration method (ESPC) [1]. In the measurement of the screening current induced magnetic field, that was largely improved in split wire and coil [2, 3]. In this study, we measured and evaluated AC losses for the split wires and coils. For the wires, magnetic field dependence of magnetization was measured by using MPMS device, and then, AC loss was obtained by the calculation using the area surrounded by hysteresis curve. Two coils were fabricated by using original coated conductor and split wire with the same single pancake structure (wire length: 18 m, inner/outer diameter: 80 mm/111 mm). The measurements of the coils were carried out by nitrogen boil-off method without coil energization in AC magnetic field. This measurement method is considered to be better to improve the measurement precision of AC loss, that removed the unrelated loss due to current resistance at normal conducting wires. As a result, reduction of loss up to 95% was estimated for the split wires in 77 K and 4.2 K. Regarding the reduction of AC loss of a coil it was about 80% at 77K, which is the same as a split wire of the coil.

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[2] Xinzhe Jin, et al, *IEEE Transactions on Applied Superconductivity* 29 (2019) 6601304

[3] Tetsuro Matsuda, Xinzhe Jin, Tetsuji Okamura, *Cryogenics* 86 (2017) 38–41

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