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Magnetization Relaxation by Shielding Current in Commercial REBCO Tapes

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High-temperature superconducting REBCO tapes are expected to be applied to next-generation magnets for their high critical current density. One of their problems in the magnet application is the magnetic field instability caused by the decay of magnetization due to the shielding current caused by the tape shape. Therefore, it is important to evaluate the magnetization relaxation of REBCO tapes for the magnet design. We have studied on the magnetization relaxation in REBCO tapes with artificial pinning centers (APCs). In this study, we evaluated the magnetization relaxation of commercial REBCO tapes in a wide temperature and field ranges. Commercial REBCO tapes with and without APCs from Fujikura, SuperPower, and SuperOx were cut into 2 mm squares and magnetization relaxation was measured using MPMS at temperatures of 4-85 K and fields of 0.1-5 T perpendicular to the tapes. As a result, the relaxation was smaller in the doped samples at higher fields and at temperatures above 40 K. It indicates that the APC suppressed plastic flux creep [1]. In the medium temperature range of 20-40 K, a maximum value was observed in the temperature dependence possibly due to the double kink excitation [2]. At low temperatures below 20 K, the magnetization relaxation was proportional to the temperature and showed similar values for all the tapes, which is explained by the collective flux creep due to thermal excitation [3]. We will report in detail on the characteristics of various companies' REBCO tapes, which are important for superconducting magnet design by suppressing magnetization relaxation.

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References

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