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M1Or1A-01: Comparative study between 77 K, self-field Ic and that of in-field and 4.2 K based on high throughput reel-to-reel continuous Ic measurements on a PLD processed long REBCO coated conductor

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Spatial homogeneity of critical current, Ic, is one of the most important practical performances of REBCO coated conductors. Continuous magnetization measurement by use of Hall-probe array is now widely adopted for the study of longitudinal Ic homogeneity in commercial REBCO tapes. However, the measurement condition is generally limited at 77 K and at around self-field (or low magnetic fields), while the practical operation conditions of the wires are much wider including higher magnetic fields and lower temperature. In this study, we have carried out in-field continuous Ic measurements of a long REBCO tapes not only at 77 K but also at 4.2 K, and have studied the correlation between Ic at 77 K self-field and that of various conditions including in-fields and 4.2 K. The high throughput measurements allow us to study these correlations based on many data points. Our results show that the positional variation of Ic is scaled independent of the conditions of temperature or external magnetic fields if we normalize the Ic value by the spatial average at each operation condition. This indicates that the spatial variation of the local Ic is dominated by the variation of effective cross-section area due to macroscopic defects and/or thickness- or width-variation whereas the flux pinning nature controlled by nano-scale defects is almost uniform along the longitudinal position in macroscopic scale. Namely, this suggests stable reproducibility of the nano-structure obtained by the PLD process.

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