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M1Po3B-03: Mechanical Properties of Stainless-Steel co-wind Tapes for REBCO magnets

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REBCO high-temperature superconductor tapes offers remarkably high critical current density in high magnetic fields. It has been used successfully in ultra-high field superconducting magnets. To address the challenge of high mechanical stress in these magnets, co-winding REBCO tapes with insulated stainless-steel tapes has emerged as a promising technique to enhance their overall performance. In this paper, we present the mechanical properties of 316L stainless steel co-wind tapes of different tempers. In addition, we investigated the impact of heat treatment, a process simulating the curing of sol-gel insulation, on the mechanical properties of 316L stainless steel tapes. Quarter-hard (0.006") and half-hard (0.008") stainless steel tapes were subjected to heat treatment at 550°C for approximately one minute. Subsequent mechanical testing at 77 K revealed an increase of 6.5% in the modulus of elasticity for both tape thicknesses by heat treatment. Conversely, the yield strength decreased by 2%. These findings provide crucial insights into the mechanical behavior of heat-treated stainless-steel tapes and their suitability for co-winding with HTS tapes in high-field superconducting magnets. By understanding the effects of heat treatment on the mechanical properties, we can optimize the design and performance of future superconducting systems.

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