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M2Or3H-01: [Invited] Compressive and tensile bending strains in REBCO tapes

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Quantitative bending strain property of critical current is inevitable for designing spiral and pancake coils in practical magnets and other SC applications. The present study is to establish a quantitative measuring method on the bending strain dependence of Ic for REBCO tapes. Practical tapes have two types of twinned structure. They are characterized as having <100> and <110> orientations along the tape axis. These composite tapes consist of brittle oxide and several metallic components which give asymmetrical piling structure. So the bending strain behaviors are characterized in several aspects of structure and applied bending direction. When bending the tapes towards edgewise direction, the bending strain distributes within almost whole cross-section from the maximum tensile strain to compressive one through the neutral strain axis. Decreasing bending diameter, the tape fractures at a critical bending strain. In the case of flatwise bending, there are two kinds of bending manner for a very thin SC layer. In order to measure a compressive bending strain, the tape is bent inwards the neutral axis. For realizing the tensile bending state, the tape is bent outwards the neutral axis. The degradation bending diameter limit (D95) at which the critical current begins to degrade was ˜ 7 mm by both compressive and tensile flatwise bending and ˜400 mm by edgewise one for REBCO tapes examined here. The degradation (fracture) behavior is different for either case of compressive and tensile bending mode. The tensile bending fracture initiates at a interface of SC layer, while the compressive bending fracture happens by buckling or 45o shearing.

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