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M1Or3B-05 [Invited]: Round REBCO Wires with Excellent Flexibility and High Engineering Current Densities

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The University of Houston and AMPeers have developed round REBCO wires of 1.3 to 1.9 mm in diameter that can retain nearly 100% of its critical current even when bent to a radius of 15 mm. Such a small bending radius is a requirement of canted cosine theta coils that are being developed for accelerator magnets. Such small diameter wires and excellent bend strain tolerance have been made possible through the use of symmetric REBCO tapes with ultra-thin substrates (~ 18 –22 μm thick). Guided by an analytical stress-strain model, copper stabilizer of an optimum thickness is deposited primarily on the REBCO side to position the REBCO layer close to the neutral plane. Symmetric Tape Round (STAR) wires have been fabricated with 6 –12 layers of tape wound on copper formers of diameters as small as 0.5 mm. STAR wires tested at 4.2K exhibit engineering current densities as high as 739 A/mm² at 15 T and 584 A/mm² at 20 T. STAR wires have been scaled up to long lengths and are becoming available for fabrication of compact coils for accelerator magnets and other applications.

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