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Thu-Af-Or19-04: Recent Advances in REBCO Tapes and Round Wires for High Magnetic Field Applications

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Through a combination of thick films (4-5 μm) and a high density (8000 –12000/ μm^2) of fine nanocolumnar defects, excellent critical currents have been achieved in REBCO tapes over a wide temperature range of 4.2K –65K and magnetic fields of 1.5T –30T. Record-high engineering current density (J_e) of 5200A/ mm^2 at 4.2K, 15T (corresponding critical current density (J_c) of 10MA/ cm^2) which is more than a factor of five better than the J_e of the best Nb₃Sn wires and 7 times better than the J_e of commercial REBCO tapes has been demonstrated. At 65K, 1.5T, critical currents exceeding 1750A/12mm have been achieved, meeting a key milestone of the Next Generation Electric Machines program funded by the DOE-Advanced Manufacturing Office. We have also developed a Symmetric Tape Round (STAR) wire technique to fabricate 1.6 to 1.9mm diameter round REBCO wires with high J_e and excellent tolerance to bend strain. STAR REBCO wires can be bent to a radius of just 15mm while sustaining a J_e of 600A/ mm^2 at 4.2K, 20T which meets key stringent requirements of accelerator magnets. Both high performance REBCO tapes and round wires are being scaled to long lengths to fabricate prototype coils and magnets. Details of the latest advances in REBCO tapes and round wires for high magnetic field applications will be discussed in this presentation.

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