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# Thu-Af-Or19-06: Electromechanical Performance of CORC® Cables and Wires under Axial Tension and Transverse Compression

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Advanced Conductor Technologies is developing high-temperature superconducting (HTS) Conductor on Round Core (CORC®) cables and wires for high-field accelerator, fusion and scientific magnets. One of the concerns with operating any HTS conductor in magnets that operate at currents exceeding 10,000 A at fields of over 20 T in future accelerator magnets, or 50,000 A at fields over 12 T in fusion magnets, is the effect of mechanical stress and stress cycling on the conductor performance. Detailed mechanical tests of the conductor performance under axial and transverse stress relevant for magnet operation are thus required to develop robust magnet conductors. Here we present test results of critical current (Ic) degradation as a function of applied transverse compressive load on CORC® cables and wires as well as axial tensile stress on CORC® wires at 76 K. The critical load, or stress at which Ic degrades irreversibly by at least 2 –3 % in practical CORC® conductors is predominantly determined by the properties of the metal former and to a lesser extend by the superconducting tapes. Significant strengthening of the CORC® conductors can thus be achieved by optimization of the former size and yield stress. Fatigue cycling is performed at different stress levels up to 100,000 cycles to investigate Ic retention beyond the design life of modern user magnets and fusion devices. CORC® cables and wires presently exhibit excellent electrical performance in mechanical fatigue at stress levels where Ic degraded by only 3 –5 %, and even at stress levels at which the initial decrease in Ic was as high as 20 %.

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