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Mon-Mo-Or2-02: High-field magnets wound from CORC® cables and wires

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Advanced Conductor Technologies has been developing high-temperature superconducting Conductor on Round Core (CORC®) cables and wires wound from $\text{ReBa}_2\text{Cu}_3\text{O}_{7-x}$ coated conductors for use in high-field magnets. Initial development is aimed at CORC® cable performance goals of operating currents exceeding 5-10 kA and engineering current densities (J_e) of over 600 A/mm^2 at 4.2 K in a background field of 20 T. Thinner CORC® wires result in an even more flexible magnet conductor, bendable to radii of less than 25 mm, while operating at comparable currents and current densities as CORC® cables.

CORC® cables and wires have matured into practical magnet conductors with their initial performance goals close to being met. The next step in their development is underway, which is their incorporation into high-field demonstration magnets. Here we outline the latest results of high-field insert magnet development using CORC® cables and wires. Several magnet programs will be discussed, including those focused on the development of high-field solenoids and accelerator magnet inserts for canted-cosine theta (CCT) and Common Coil magnets to reach a total field of 20 T when operating the CORC® insert within a low-temperature superconducting outsert magnet. Progress in each of these magnet programs will be outlined. We will focus on the design and performance test of a CORC® insert solenoid that is being developed to operate in a 14 T background field, while generating a field of 2–3 T at an operating current of 5 kA, resulting in a total field of 16–17 T. The 80 mm bore CORC® insert magnet leaves room for an additional CORC® insert that would increase the total field to 20 T.

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