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M4Or1A-03: [Invited] IBS conductors developed for high field accelerator magnets

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Iron-based superconductors (IBS) are very promising candidates for high-field magnet applications owing to their ultrahigh upper critical fields and very small anisotropy. In recent years, tremendous progress has been made on the critical current density (J_c) of IBS wires and tapes based on a powder-in-tube technique, e.g., high transport J_c up to 2.2×10^5 A cm⁻² at 4.2 K and 10 T was achieved in 122 type IBS tapes. Furthermore, the transport J_c of IBS tapes with high-strength composite metal sheath such as Cu/Ag and Stainless steel/Ag was enhanced above 10^5 A cm⁻² at 4.2 K and 10 T as well. On the other hand, with hot isostatic pressing process, the J_c -performance of IBS round wires was also significantly improved. With the achievement of high-performance multifilamentary IBS long-length tapes, the first IBS single pancake coil and double pancake coil were fabricated and tested at 24 T and 30 T background field, respectively. Two IBS racetrack coils using 100-meter long IBS tapes were successfully made and tested in a superconducting dipole magnet which provided a maximum background field of 10 T at 4.2 K. These results demonstrate the great potential of IBS wires in high-field accelerator applications.

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