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Superconducting properties of Prototype Pancake Coil using MgB2 Cable

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MgB₂ wires with $T_c \sim 39$ K has been developed for the applications such as various coils. Considering hydrogen society in the future, MgB₂ coils for the Superconducting Magnetic Energy Storage (SMES) devices under conduction cooling are worth serious consideration. First, the authors evaluated critical current density in commercially available MgB₂ wires as a function of magnetic field and temperature (I_c - B - T) under conduction cooling. I_c of these MgB₂ wires aligned in straight and curve lines under an external magnetic field up to 3.5 T by superconducting magnets was measured at 20-30 K. And then, the authors analyzed bending strain of MgB₂ cable and coil, and designed double-pancake coils for several tens of kJ class SMES system. Finally, the authors produced a prototype pancake coil (200 mm inner diameter, 269 mm outer diameter, and thickness 7 mm) experimentally and evaluated coil properties under an external magnetic field. These results suggest can allow us to construct the robust energy storage system using MgB₂ wires.

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