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Demonstration of a kA-class Rutherford Cables using MgB2 Wires for Energy Storage Device optimal for Liquid Hydrogen Indirect Cooling System

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Along with development of hydrogen-use, sustainable society in which it is used as clean energy source as well as energy storage material, MgB2 superconducting power applications have been attracted scientific interest due to its huge potential of superconducting characteristics, made from affordable elements and applicability to liquid hydrogen cooling. As MgB2 wires have been commercially available in the last decade, our group had designed, fabricated and demonstrated Rutherford cables and magnets with kA current capacity to make large-scale magnets for superconducting magnetic energy storage (SMES) device, which is suitable for compensation of rapid-change, short-period power fluctuations originated from renewable power source unlike chemical batteries. Although the MgB2 seems to be one of the most promising superconducting materials because it does not include rare constituents, its strain sensitivity especially after heat treatment and Ic deterioration caused by strand deformation during twisting and compaction process in cable manufacturing are still big problems to apply it to magnets for energy storage device. In this study, we will report the design and fabrication results of the cable with nominal current of kilo-amperes and demonstrate transport properties under the wide-range of background magnetic field, boiled He gas cooled condition. Our research will accelerate making large-scale energy storage magnets suitable for developing hydrogen society and stabilize electric power from renewable power source.

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