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[Invited] Design, fabrication and soundness test of a Bi2223 magnet immersed in liquid hydrogen

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The critical heat flux in liquid hydrogen is ten times higher than that in liquid helium, and is approximately half of that in liquid nitrogen. Since the resistivity of pure metal such as copper or silver at 20 K is less than one-hundredth of that at 300 K, HTS magnets immersed in liquid hydrogen are expected to satisfy the cryostable condition at a practical current density for electric power equipment. In order to examine cryostability of HTS magnets in liquid hydrogen, a pool-cooled Bi2223 magnet with a 5 T magnetic field at 20 K has been designed and fabricated. The magnet consists of six outer double pancake coils with the inner diameter of 0.20 m and four inner double pancake coils with the outer diameter of 0.16 m. The turn numbers are 77 turns per layer for the outer coils and 73 turns per layer for the inner coils, and the 5 T magnetic field is induced between the outer coils and inner coils at the current of 400 A. Each double pancake coil has been tested in liquid nitrogen to check the soundness before assembling. Prior to excitation tests in liquid hydrogen, the whole assembly is planned to be tested in liquid nitrogen to evaluate the allowable heat generation, over which the resistive voltage continues to rise. The excitation tests in liquid hydrogen are planned in summer this year.

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