A study on thermal and electrical characteristics of metallic cladding GdBCO coil

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Abstract

This paper reports the effectiveness of the metal-cladding (MC) winding technique that employs a GdBCO tape with a micrometre-thick SUS-cladding layer in comparison with that of the partial insulation (PI) winding technique, using the results of charge-discharge, sudden discharge, and overcurrent tests. The charge-discharge and the sudden discharge tests showed that the charge-discharge delay of the coil using the metal-clad GdBCO tape was considerably lower compared to that of the PI coils, because the characteristic resistance of the MC coil was higher than that of the PI coil. Although the MC coil exhibited lower thermal/electrical stabilities compared to the PI coils at conditions of excessive current flow, the MC coil was more stable than the fully insulated coil. This study demonstrates that the MC winding technique is promising for the development of electrically stable high-temperature superconducting magnets with fast charge-discharge rates.