



Contribution ID: 29

Type: **Poster presentation (105min)**

Thermal characteristics of 2G tape with an anodized aluminum stabilizer for a cryogen-free superconducting magnet

The studies on the high temperature superconducting (HTS) magnets cooled by cryogenic refrigerator are actively underway with rapid advancement in 2G tape technology recently.

In order to reduce cooling time and to lower operating temperature of the conduction cooled HTS magnet and promptly to extract hot spot from HTS magnet in quench, the equivalent thermal conductivity of HTS magnet should be high.

Generally, the conventional 2G tape uses the expensive copper stabilizer surround by polyimide electrical insulation tape with low thermal conductivity. Ultimately, the low thermal conductivity of HTS magnet cause cooling time to be lengthened and HTS magnet to be burned out in quench.

In this paper, by replacing expensive copper stabilizer with low priced aluminum stabilizer and substituting polyimide tape with the aluminum oxide layer by anodizing aluminum stabilizer for electrical insulation, the equivalent thermal conductivity of 2G tape was largely improved.

Based on the results of analysis and test, the thermal characteristics of the conventional 2G tape are compared with those of the presented 2G tape.

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Track Classification: M-02: RE123 conductors processing and properties