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Investigation on Quench and Normal Zone Propagation Behaviors of REBCO Coil wound by vanadium III oxide turn-to-turn insulator

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In this study, the quench initiation and propagation characteristics of REBCO coil, which was electrically and thermally insulated by a vanadium III oxide (V_2O_3), were investigated under internal heater activation. When the quench occurs in REBCO coil, V_2O_3 insulator can enhance the thermal stability of REBCO coil due to its automatically and remarkably switched from high to low turn-to-turn contact resistances depending on its temperature rising. This special ability allowing the REBCO coil operates as an insulated and non-insulated coil under the steady and transient states, respectively. First, thermal quench tests were performed on a single pancake REBCO coil heated by heater activation to investigate the current bypass behavior based on the resistance switching feature of V_2O_3 insulator as well as the heat transfer behavior in terms of the minimum quench energy and normal zone propagation velocity. Then, the thermal transient characteristics were analyzed and compared with that of conventional counterpart insulated by Kapton polyimide film.

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