

## Numerical Simulation of REBCO pancake coil with No-Insulation Technique

The No-Insulation (NI) technique has the prospect of high thermal stability and high current density. A REBCO pancake coil with NI technique has no insulation between turns, so that the current can flow directly to the adjacent turns escaping from a local hotspot or a local normal transition. It enhances the thermal stability. The high thermal stability of REBCO pancake coil with NI technique was confirmed in many experiments. The NI REBCO pancake coil did not burn out even though an extremely high current exceeding the critical current was applied. In addition, the absence of insulation increases the current density as well as the thermal stability. Indeed, the electrical phenomenon in the NI REBCO pancake coil is complicated, and the stability is affected by the coil specifications, such as the contact resistivity, the coil size, the number of turns, and so on. However, it is hard to experimentally investigate the electromagnetic and thermal behavior of various NI REBCO pancake coils.

For clarifying the electrical and thermal behavior of NI REBCO pancake coils, we have developed the partial element equivalent circuit (PEEC) model as an electric circuit simulation method. It is combined with the finite element thermal analysis. The simulation results agree with the measurements well. The mechanism of the high stability is clarified through the simulation of the overcurrent test and the sudden discharge test. We will show the simulation method and the comparison between the simulation and measurement results.

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