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Investigations of stability of the second generation HTS composites under of current loads at various regimes

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Currently, the development of superconducting magnetic energy storage devices (SMES) based on the cables from high-temperature superconducting tapes of the second generation are carried out. Such SMES will be used, for example, in the NIKA project to power the pulsed magnets of Booster and Nuclotron accelerators. Similar cables may be used in accelerating magnets as well. The number of working cycles of current pulses can be more than several million. So the important issue is the stability of HTS tape under both multiple pulsed current loads and long-term current loads that typical for the frozen magnetic field mode.
In this report we present the results of the study of stability of industrial samples of 2G HTSC tapes based on REBCO, carried out in three modes of current load.
In the first mode a direct current of *I1 = 0.9Ic, I2 = 1.1Ic* were passed through the sample. The duration of exposure was up to 350 hours. It was observed that under long-term exposure to high current density, the value of the critical current remains within acceptable limits.
In the second mode, simulating a possible quench, HTSC tapes were exposed by pulsed current actions with a current density exceeding the critical current density and duration from 10 μs to 250 μs. We found the parameters at which irreversible changes in the critical current were observed.
In the third mode, that simulates multiply periodical current loads in SMES or an accelerating magnet, HTS tapes were subjected to multiple (more than 1 million times) cyclic changes in the current in the range from *0.5Ic* to *0.8Ic* with a cycle duration of 1s. We report the results of such load current studies that were obtained by means of transport measurements, Hall scanning magnetometry and magneto-optical imaging.

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