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Peculiarities of dissipative phenomena in coated YBCO tapes carrying constant current during flux creep

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The effect of flux creep on the dissipation phenomena in tapes based on YBCO leading to the essentially nonlinear voltage-current characteristic of a superconductor is discussed. The obtained results are compared with the calculations, made in the framework of the existing thermal stabilization theory based on the model assuming jump transition from a superconducting state to a normal one. It is shown that this model incorrectly describes the dissipation states in a temperature range up to the critical temperature of the superconductor. It is shown that the type of nonlinearity of VCC has a significant effect on the dissipative phenomena in tapes. As a result, the allowable currents stably flowing in superconducting tapes may be higher than a priory defined critical current determined for continuously increasing voltage-current characteristic. Therefore, the critical current of high-T_c superconducting tapes, which is determined using continuously increasing voltage-current characteristic, has no physical meaning. Accordingly, fundamentals of the thermal stabilization theory must consider real temperature dependence of the dissipation energy in high-T_c superconducting tapes, which is a function of nonlinearity of their voltage-current characteristic.