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Peculiarities of magnetization loops forms of highly anisotropic NbTi superconducting tapes in an inclined magnetic field

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At the present time the various composite superconducting wires (mainly based on conventional Nb-Ti alloy and intermetallic compound Nb3Sn, or on modern high-temperature superconductors) have application to superconducting magnetic systems. All these materials demonstrate pronounced anisotropy of current carrying capacity caused by:
1) internal physical properties of vortex matter (in HTS layered compounds there is the high anisotropy of the effective mass of carriers, values of the coherence length ξ and the magnetic field penetration length λ);
2) due to anisotropic pinning system (even in metals with cubic cell) which appears during wire drawing process and observed in practical superconductors such as Nb3Sn and Nb-Ti.
In the present work we used thin superconducting Nb-Ti tapes to investigate anisotropic pinning processes. The degree of critical current anisotropy of narrow-width Nb-Ti samples can be varied by cutting from wide Nb-Ti tape at different angles to rolling direction or by high-temperature (380-450℃) aging. We used Vibrating Sample Magnetometer to measure magnetization in field up to 1 T with different orientation of field vector to samples. Some peculiarities in magnetization loop form were registered in low-field area in inclined field. It was shown that these features can be explained in taking into account inhomogeneous current distribution over the sample cross section due to the high anisotropy of the current-carrying capacity of Nb-Ti tape and the effect of the self-field. The results are discussed in comparison with magnetization loops for HTS.

Primary author: Mr GURYEV, Valentin (National research centre "Kurchatov Institute")

Co-authors: Dr EMELYANOV, Andrey (National research centre "Kurchatov institute"); Dr CHUMAKOV, Nikolay (National research centre "Kurchatov institute"); Mr SHAVKIN, Sergey (National research centre "Kurchatov institute"); Dr KRUGLOV, Vitaliy (National research centre "Kurchatov institute")

Presenter: Mr GURYEV, Valentin (National research centre "Kurchatov Institute")

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