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Influence of reversible vortices motion on low-field features of magnetization in type-II superconductors with strong anisotropic pinning

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As known, the cold-rolled thin Nb-Ti tapes demonstrates very strong anisotropy of pinning force regarding rolling direction and external magnetic field because of dense anisotropic grain boundary structure. This leads in particular to form of "fish-tail"feature in low-field area of magnetization loops in inclined field due to competition of self-field and small external field in media with anisotropic critical current [1]. After heat treatment in vacuum (385℃, 25 h) a large number of additional pinning centers appears in form of small (15-40 nm) particles of α-Ti phase mainly located on grain boundaries, which increase critical current density measured by transport method. We carried out comparative magnetization measurements of both (cold-rolled sample cut along tape rolling direction and heat treated sample cut across tape rolling direction) Nb-Ti tape with the same anisotropy factor (Jmax/Jmin) in relation to magnetic field inclination. In contrast to magnetization loops of cold-rolled samples there are no pronounced "fish-tail"features on magnetization loops of heat treated samples. In our opinion, this may be due to the reversible flux motion within quite large and isotropic α-Ti participates which size significantly exceed the Nb-Ti coherence length (and flux core diameter).

1. Guryev V. et al., AIP Conference Proceedings, Vol. 2163, No. art. 020004 (2019)

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