IVC probe of the vortex medium in BSCCO-2212 single crystal.

V.N. Zavaritsky

P.L.Kapitza Institute for Physical Problems, 117334 Moscow, Russia

Abstract

Dynamic properties of the vortex state in strongly layered superconductor are probed with quasi-stationary out-of-plane current-voltage characteristics of nanovolt resolution. These are systematically studied over the whole B-T diagram for the both principal orientations of the strong magnetic field with respect to the basal plane of $Bi_2Sr_2CaCu_2O_{8+\delta}$ single crystal with zero field $T_c > 92K$.

It is shown experimentally that IV origins could be fitted nicely with a simple power law; the exponent reveals steep change from $\approx$1.05 to 3-6 on crossing irreversibility line thus favoring KT-scenario. However power law fit fails on the expanded range while TAFF is found to produce reasonable agreement with experimental data over 3-7 orders in electric field magnitude for almost the whole range of fields and temperatures investigated.

Characteristic (Josephson & critical) current temperature and field dependencies are obtained for the both orientations and reveal only slight correlation with the theoretical predictions for Josephson medium. Multiple branch features in VI curves, usually attributed to the intrinsic Josephson effect manifestation, are studied up to 15T and could be described within modified phase slip model.