

Abstract of Presentation

Assessment of the local supercurrent flow in superconductors

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Abstract :

In order to qualify novel superconducting materials for applications, the supercurrent flow, e.g. across grain boundaries, must not be suppressed. Therefore, characterizing these materials on the scale of a few 10 to 100 μm is required. Global information obtained by direct transport or magnetization measurements on “macroscopic” samples needs to be complemented by more “local” techniques that have been developed during the past few years, especially for analyzing the current transport in high temperature superconductors. I'll present results on the following techniques: 1) Magnetoscan, a new technique for assessing the local supercurrent flow on the scale of a few 100 μm ; 2) Hall mapping of trapped fields and inversion of the field profiles in terms of local critical currents for superconductors with sufficiently small thickness; 3) Hall mapping of the field distribution under ac field conditions with and without dc currents; 4) Low temperature STM/MFM for studying the local interaction of flux lines with crystalline defects; 5) Transport measurements on bi-crystals with a well defined low angle mismatch and assessment of the angular dependence of the critical currents; and 6) Analysis of the magnetic moments in zero field after applying successively increasing magnetic fields for determining the inter- and intra-grain current contributions.

Together with the fundamental reversible parameters obtained from global magnetic techniques, essential information for guiding the process conditions for novel materials and for assisting their optimization can be obtained in this way. Existing collaborations with European and Japanese groups on the subject will certainly facilitate a success of the project.