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EXPERIMENTAL REPORT

EXPERIMENT N° 5-26-3 INSTRUMENT D 1B

DATES OF EXPERIMENT 14 to 16/06/1995

TITLE

Texture analysis of bulk Bi-2223 from diffraction spectra

EXPERIMENTAL TEAM (names and affiliation)

H.R. Wenk, University of California, Berkeley
D. Chateigner, M. Pemet : Laboratoire de Cristallographie CNRS Grenoble

LOCAL CONTACT B. Ouladiaff

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In June 1995 we had a successful session on beamline D1B and measured textures of several bulk high temperature superconductors. The reason for using neutrons were the low absorption and the high angular resolution which made it possible to deconvolute highly complex diffraction patterns. We were able to document quantitatively very high preferred orientation in bismuth based tapes and wires. These are the first truely quantitative texture characterizations in such materials. Processing of the data was relatively slow because of a lack of an adequate infrastructure. In fall 1995 we developed such a routine procedure by combining capabilities of ILL (XRFIT), CNRS (ILL and ILLPREP) and UCBerkeley (BEARTEX). It is now possible to process spectral data from an external location and to obtain pole figures and orientation distributions in a couple of hours. The slowest part of the procedure is to retrieve numor data from storage. The Lab. Cristallographie CNRS has formalized the procedure and willing to assist users.
Results of the texture measurements are summarized in two manuscripts which have been submitted for publication:

Texture Analysis of Bi 2212 and 2223 Tapes and Wires using Neutron Diffraction

H.R. Wenk, D. Chateigner, M. Pernet, E. Hellstrom, J. Bingert, E. Flukiger and B.Ouladiaff

Abstract

The crystallographic orientation distribution of silver sheathed tapes, wires and multifilaments of Bi-2212 and Bi-2223 superconducting oxides was determined by neutron diffraction using a position sensitive detector. The orientation distribution was determined from measurements of 4-6 pole figures. Textures of tapes and wires display axial symmetry, the multifilament deviates. In tapes and multifilament c-axes are oriented perpendicular to the rolling plane, in wires perpendicular to the wire direction. The multifilament has the strongest texture with a maximum of 46 times that of a random sample. Tapes are 26 and 35 m.r.d., wires are 2.1 and 1.5 m.r.d. For comparison a sinter forged 2223 powder was analyzed. The texture strength correlates with electrical properties.

Orientation Analysis from Incomplete Diffraction Data

D. Chateigner, H.R. Wenk, M. Pernet

Abstract

The crystallite orientations of a magnetic field aligned melt textnred superconducting sample of the Y-Ba-Cu-0 system is measured by neutron diffraction. The orientation distribution of the main superconducting ‘123’ and a minor ‘211’ phase have been derived from very incomplete pole figure using direct methods. The ‘123’ phase is strongly textured with a maximal pole density around 22 m.r.d. in the ODF. There are two orientation components present which are in no apparent relationship with the applied magnetic field. The texture of the ‘211’ phase is very weak with a maximum of 1.7 m.r.d. The textures of the two phases appear to be correlated.