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Introduction

Bismuth based high temperature superconductors received significant attention. These compounds are at present most amenable to the techniques currently available to manufacture long lengths of wire or tape with good performance, thanks particularly to their low weak link behaviour in front of Y or Tl based compounds. Also single crystals of $Bi_2Sr_2Ca_2Cu_3O_{10}$ (Bi-2223) have a high shape anisotropy and occur as platelets and are amenable to high crystallite alignment. Since current transport is restricted to the 001 (basal) plane, high alignment (texture) is essential to obtain large critical currents, as has been documented by various studies [1,2]. Recently [3], local measurements showed a strong variation of the critical current density (Jc) along the width of Ag-sheathed monofilament tapes. The Jc increases approximately by one order of magnitude from the core to the edge of the tape.

Two main reasons for this increase were proposed up to now. On one hand parasitic phases may be involved, which are observed in the central part of the tapes, their presence being associated to the lower Jc of the tapes. On the other hand, the mechanical fabrication may induce different texture degrees at the edges and core. This study aimed to measure if a texture evolution from edges to center may explain the Jc variations, using local microtexture measurements, as has been conducted previously on this beamline [4].

Experimental method

The samples were fabricated by cold rolling, using the so-called powder-in-tube technique. Powders of former oxides were embedded in silver tubes before rolling and subsequent heat treatment which provided the formation of the Bi-2223, in 3mm wide tapes. Two monofilament samples with silver removed were studied, and one multifilament. The local Jc measurements were conducted on the adjacent part of the samples used in this study and showed the attempted variation.

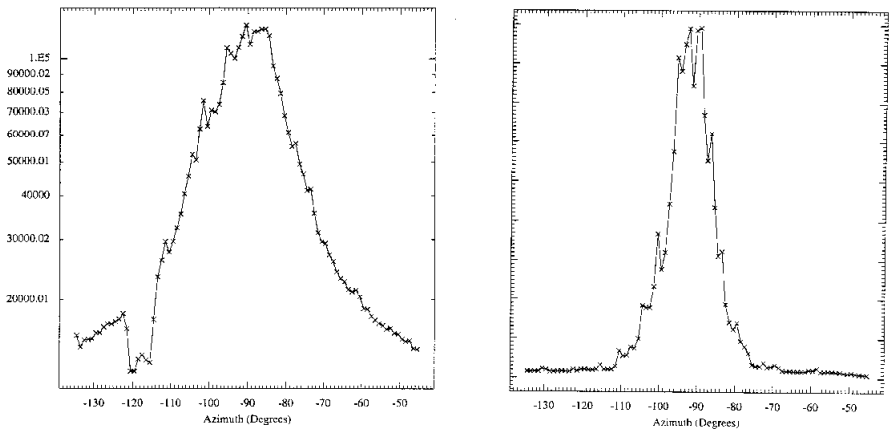
The synchrotron experiments were carried out in a reflection geometry using a monochromatic (0.7A) 30 micrometer diameter beam, after having estimated that 10μm was not statistically reliable (number of grains). The stripe (rolling) direction of the tape was positioned parallel to the incident beam, and a point by point scan along the tape's width with 100μm increments was measured, after positionning the incident angle at the maximum of the 0014 peak. The same procedure was repeated for the 0010 line, and for the multifilament tape. The diffraction patterns were recorded with a CCD camera. The fall width at half maximum of 0010 and 0014 reflections, measured on the Debye-Scherrer rings were used as a quantitative measure of the texture strength.

We controlled the measurements at several locations along the tapes lengths in order to get independant of local uncharacteristic variations due to big parasitic grains Also we verified that there was no influence from the near interfaces with Ag which could have been textured differently. This was done by polishing the samples at different depths.

First results

We observed local variations of the rings half widths. After a careful check of these variations from part to part of the samples and for the two monofilaments, which have two different Jcs, we concluded that no correlation between the local Jc measurements and the observed texture variations was observable. This result is of importance since it definitely cancel the 'texture hypothesis' for Jc in this kind of high temperature superconductors. More quantitative interpretation of the data will be carried out in a near future on the average deviations of the prefered orientations. Also, since the parasitic phases may play an important rule, we will concentrate on these at a deeper stage of the analysis.

Another interesting direct result is the confirmation of a much stronger texture stabilization in the multifilament tape. This was already observed using neutron diffraction [5], but since these samples are of very irregular shape, this observation is of significant **importance. By comparison** with monofilaments, it is also interesting to remember that multifilamentary tapes have generally higher Jcs for optimized preparing conditions. The figure below compares the 0014 reflection half wisths of Bi-2223, in a monofilament (left) and a multifilament (right). The irregular variation of the curves are due to the presence of the beam stop.



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