

TEXTURE ANALYSIS IN YBaCuO CERAMICS AND FILMS

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Abstract

Technological applications of high temperature superconductors will be possible only for bulk samples or thin films exhibiting high critical current density. The high anisotropy of the critical current density in YBaCuO gives rise to new interests in texture analysis. Several processing techniques have been developed for the specific purpose of increasing the preferred grain orientation in ceramics.

Quantitative texture studies of oriented YBa₂Cu₃O_{7- δ} bulk samples or films have been carried out by X-ray diffraction pole figures using the Schulz reflection technique. The (00l) pole figures define the c axis alignment, whereas the (l03) and (113) pole figures give information on the rotation about the c axis.

Keywords

High T_c superconductors, YBaCuO, Ceramics, Films, Texture, Pole figures.

Introduction

The range of applications of high T_c superconductors will be limited by the critical current density J_c. In single crystals of YBaCuO, the J_c is strongly anisotropic, the highest values measured in the basal plane being several times greater than those in the c-axis direction. However, the preparation of large crystals, sufficient for device applications, is very difficult. Therefore, a considerable effort has been made to produce grain oriented ceramics or epitaxial films. Several processing techniques have been developed for this specific purpose.

Peak height comparisons from Bragg diffraction scans, sometimes completed by rocking curves, are most commonly used to demonstrate the preferred orientation or "texture" of a crystalline material. The pole-figure technique is shown to be more effective in quantifying the texture and studying epitaxial relationships, comparing different samples and analysing the effects of processing parameters. Texture analysis of YBaCuO oriented ceramics and thin films uni- and bi-layers are presented.