

X-ray texture analysis in YBaCuO ceramics and films

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The technological applications of high temperature superconductors will be possible only for bulk samples or thin films exhibiting high critical current density. It has been confirmed that the superconducting properties of polycrystalline materials are strongly orientation-dependent, these properties being affected by the orientation of the crystallites. In order to improve the critical current, strongly textured materials are necessary. The simplest method to analyse the preferred orientation or texture of a crystalline material is to compare qualitatively the intensities of (h k l) reflexions of an X-ray diffraction pattern. This allows, however, only a rough estimation of the main features of the texture. Another method is the pole figure determination. The intensity is measured by fixing the Bragg angle θ and rotating the sample around two axis. An (h k l) pole figure gives the orientation distribution of the normal direction to the (h k l) planes of the crystallites. Its representation is done in a stereographic projection which gives the crystallographic orientation of the crystallites with respect to a specific orientation of the sample.

In YBaCuO samples, generally the (00l) pole figures define the c-axis alignment, while the (h k l) pole figures give information concerning the rotation about the c-axis i.e. the "in plane texture". The pole-figure technique allows one to compare different samples, to analyse the effects of processing parameters and to study epitaxial relationships. Texture analysis of YBaCuO oriented ceramics and uni and bi-layer films will be presented.

The (007) and (103) pole figures of a ceramic textured by a zone melting process.

The (005), (103) YBaCuO and {002}, {111} YSZ pole figures in the YBaCuO/YSZ/sapphire multilayer.