Abstract

$Bi_2Sr_2CaCu_2O_{8+\delta}$ is the most anisotropic compound among the high temperature superconductors. As a consequence its very rich magnetic field vs. temperature ($H - T$) phase diagram as well as the dynamic properties of the vortex structure have some unique properties. Instead of being composed by rectilinear objects, the vortex structure is made up of bidimensional pancake vortices weakly coupled between them.

This thesis is a study of the elastic and pinning properties of the vortex structure at low magnetic fields and low enough temperatures where thermal effects can be disregarded.

In the first part, the changes in the phase diagram induced by an overdoping of the samples are shown. The transition from the ordered phase at low fields and the disordered phase at high fields is modified by the changes in the kind and strength of the pancakes coupling due to overdoping.

The next part is a detailed study of the pinning properties at low fields using ac magnetic susceptibility in the linear response limit. The different pinning regimes and the transitions between them are shown. The order-disorder transition, characterized by the second peak effect in the critical current, is specially considered.

At last, the non linear pinning response, induced by large currents flowing in the sample, is studied.