N90-27797

FLUX FLOW AND FLUX DYNAMICS IN HIGH-T_c SUPERCONDUCTORS

L.H. Bennett, M. Turchinskaya, A. Roytburd, and L.J. Swartzendruber, Materials Science and Engineering Laboratory, National Institute of Standards and Technology, Gaithersburg, MD 20899.

Because high temperature superconductors, including BYCO and BSCCO, are type II superconductors with relatively low H_{c1} values and high H_{c2} values, they will be in a critical state for many of their applications. In the critical state, with the applied field between H_{c1} and H_{c2}, flux lines have penetrated the material and can form a flux lattice and can be pinned by structural defects, chemical inhomogeneities, and impurities. A detailed knowledge of how flux penetrates the material and its behavior under the influence of applied fields and current flow, and the effect of material processing on these properties, is required in order to apply, and to improve the properties of, these superconductors. When the applied field is changed rapidly, the time dependence of flux change can be divided into three regions, an initial region which occurs very rapidly, a second region in which the magnetization has a ln(t) behavior, and a saturation region at very long times. We have defined a critical field for depinning, H_{cp}, as that field at which the hysteresis loop changes from irreversible to reversible. As a function of temperature we find that H_{cp} is well described by a power law with an exponent between 1.5 and 2.5. The behavior of H_{cp} for various materials and its relationship to flux flow and flux dynamics will be discussed.