Abstract Submitted
for the MAR07 Meeting of
The American Physical Society

Irreversibility line of $YBa_2Cu_3O_7$ films as a function of angle and field up to 50 Tesla S.A. BAILY, B. MAIOROV, F. HUNTE, H. ZHOU, S.R. FOLTYN, Q.X. JIA, L. CIVALE, Superconductivity Technology Center, LANL, Los Alamos, NM, F.F. BALAKIREV, M. JAIME, National High Magnetic Field Laboratory, LANL, Los Alamos, NM — Studying the irreversibility line (resistivity=0) in high T_c superconductors is scientifically and technologically relevant because the critical current drops to zero at this vortex solid-liquid transition. We have used low current transport measurements to study the irreversibility line of $YBa_2Cu_3O_7$ films in fields up to 50 T. Electronic mass anisotropy can describe most of the angular dependence, but fails to account for deviations along the crystalline axes. Correlated pinning causes a large increase in the irreversibility field along the $a-b$ planes, and a small c-axis peak. Inclusion of $BaZrO_3$ not only adds c-axis correlated defects, but increases the overall irreversibility field and alters the shape of the resistivity vs. magnetic field curve in the liquid state. We will discuss the results in terms of vortex pinning, the corresponding types of phase transitions, micro-structural analysis, and information obtained from critical current measurements.

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Date submitted: 06 Dec 2006 Electronic form version 1.4