

Abstract Submitted  
for the MAR07 Meeting of  
The American Physical Society

**Testing the limits for critical currents in  $\text{YBa}_2\text{Cu}_3\text{O}_7$  films**  
LEONARDO CIVALE, BORIS MAIOROV, SCOTT BAILY, HONGHUI ZHOU,  
FRANK HUNTE, IGOR USOV, STEPHEN FOLTYN, TERRY HOLESINGER,  
QUANXI JIA, Superconductivity Technology Center, LANL, Los Alamos, NM, JU-  
DITH MACMANUS-DRISCOLL, Dept. of Materials Science, University of Cam-  
bridge, UK, HAIYAN WANG, Texas A & M University, College Station, TX —  
Vortex pinning in  $\text{YBa}_2\text{Cu}_3\text{O}_7$  films can be very strong. At low temperatures and  
in the absence of applied magnetic field ( $\mathbf{H}$ ), critical current densities  $J_c$  of about  
20% of the depairing limit have been obtained. This is as high as the best achieved  
in commercial Nb-based superconducting wires after decades of optimization. Re-  
markably, similar  $J_c$ s are attained in  $\text{YBa}_2\text{Cu}_3\text{O}_7$  films grown by various methods  
that produce vastly different nanostructures, suggesting that perhaps we are close  
to an effective  $J_c$  limit regardless of the details of the pinning mechanisms. In con-  
trast, the different types of pinning centers (either naturally occurring or artificially  
introduced by material nanoengineering) produce distinctively different  $J_c$  behavior  
as a function of  $\mathbf{H}$  strength and orientation. I will present a comparison of pin-  
ning mechanisms in  $\text{YBa}_2\text{Cu}_3\text{O}_7$  films and will analyze the possibilities of further  
improvements.

Leonardo Civale  
Superconductivity Technology Center, LANL, Los Alamos, NM

Date submitted: 02 Dec 2006

Electronic form version 1.4