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Testing the limits for critical currents in $YBa_2Cu_3O_7$ 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, JUDITH MACMANUS-DRISCOLL, Dept. of Materials Science, University of Cambridge, UK, HAIYAN WANG, Texas A & M University, College Station, TX — Vortex pinning in $YBa_2Cu_3O_7$ films can be very strong. At low temperatures and in the absence of applied magnetic field (**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. Remarkably, similar J_cs are attained in $YBa_2Cu_3O_7$ 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 contrast, 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 **H** strength and orientation. I will present a comparison of pinning mechanisms in $YBa_2Cu_3O_7$ films and will analyze the possibilities of further improvements.

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