Influence of disorder on the vortex pinning and cutting of YBa$_2$Cu$_3$O$_7$ films

B. MAIOROV, L. CIVALE, Q.X. JIA, H. ZHOU, S.R. FOLTYN, T.G. HOLESINGER, Superconductivity Technology Center, LANL, Los Alamos, NM, S. BAILY, Superconductivity Technology Center and National High Magnetic Field Laboratory, LANL, Los Alamos, NM, H. WANG, Texas A & M University, College Station, TX, J.L. MACMANUS-DRISCOLL, Dept. of Materials Science, University of Cambridge, UK, T.N. HAUGAN, P.N. BARNES, Air Force Research Laboratory, Wright-Patterson Air Force Base, OH — Flux cutting and recombination has been used to explain high critical current densities ($J_c$) observed in experiments done in Force-Free (FF) and Variable Lorentz Force (VLF) configurations i.e., when the current $I$ is totally or partially aligned to the applied magnetic field $H$. However, the effect of different pinning centers has not been studied. We present angular and field $J_c$ studies in FF and VLF configurations and study the effects of random, correlated and extended defects on the $J_c$ of YBa$_2$Cu$_3$O$_7$ films. Results are analyzed in terms of vortex pinning at different defects and vortex cutting mechanism. We show that pinning greatly influences $J_c$ in FF and VLF, up to the point of obtaining $J_c$ higher than $J_c(H = 0)$ up to magnetic fields as high as 3T.

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