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Progression of the vortex-solid to vortex-liquid phase boundary with oxygen doping in $Y_{0.8}Ca_{0.2}Ba_2Cu_3O_x$ Films BENJAMIN TAYLOR, RYAN BAUMBACH, M. BRIAN MAPLE, UCSD — By extending magneto-transport measurements to magnetic fields of 35 tesla we have been able to examine the vortex-solid to vortex-liquid transition of thin film $Y_{0.8}Ca_{0.2}Ba_2Cu_3O_x$ samples ($6.45 \leq x \leq 7.0$) over a field-temperature range larger than heretofore reported. It is found in this work that the shape of the phase boundary, $H_g(T)$, evolves from a very shallow low-field temperature dependence to an extremely rapid high field temperature dependence in the highly underdoped regime ($x \approx 6.45$). However, in the lightly overdoped regime ($x \approx 6.9$ - 7.0), $H_g(T)$ displays an increasingly steep low-field temperature dependence followed by a lessening of the steepness of the high-field region as oxygen content increases. This trend suggests that the boundary of the dissipation-less superconducting region of this unconventional high-T_c cuprate based compound is evolving in the overdoped state towards a form that is consistent with what is observed in conventional superconductors. This research was supported by U.S. DOE Grant No. DE-FG02-04ER46105. A portion of this work was performed at the National High Magnetic Field Laboratory, which is supported by NSF Cooperative Agreement No. DMR-0084173, by the State of Florida, and by the DOE.

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