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The low-temperature vortex liquid in $La_{2-x}Sr_xCuO_4$ **and** $Bi_2Sr_{2-y}La_yCuO_6$ LU LI, YAYU WANG[1], JOSEPH G. CHECKELSKY, Physics Department,Princeton University, SEIKI KOMIYA, SHIMPEI ONO, YOICHI ANDO, Central Research Institute of Electric Power Industry,Japan, NAI PHUAN ONG, Physics Department,Princeton University — Diamagnetism in lightly-doped crystals of $La_{2-x}Sr_xCuO_4$ (LSCO)with doping $x = 0.03$ to 0.09 has been investigated by torque magnetometry, which resolves weak 2D supercurrents against a nearly isotropic paramagnetic spin response.By carefully subtracting the large paramagnetic susceptibilities of the van Vleck and spin terms, we observe the diamagnetic signal of vortices in fields up to 45 T, even for x as low as 0.03. The torque results allow the x dependence of both the melting field H_{irr} and upper critical field H_{c2} to be measured. We find that H_{c2} extends smoothly across the critical doping value $x_c \simeq 0.055$. Below x_c, the pair condensate survives as a vortex liquid in intense fields, but long-range phase coherence is absent down to our lowest temperature $T = 0.35$ K. We discuss the interesting differences between the vortex liquid and solid phases, and the collapse at low T of phase coherence at the boundary. The close correlation of T_{onset} to H_{c2} in LSCO and Bi 2201 will also be reported. Resarch supported by NSF grant DMR 0213706.

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