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Flux Quantization in Thick Mesoscopic Pb Superconductors .[1]
WAI-KWONG KWOK, ANDREAS RYDH[2], RUOBING XIE, ULRICH WELP, MICHAEL ZACH, GEORGE CRABTREE, Materials Science Division, Argonne National Laboratory, ZHILI XIAO, Dept. of Physics, Northern Illinois University, SIMON BENDING, School of Physics, University of Bath, U.K. — We present studies of novel vortex behavior on a thick triangular-shaped mesoscopic Pb crystal using ballistic micro-Hall probe magnetometry. The Pb single crystal with dimensions of 2 microns on each edge and 0.7 μm thick was placed on a 2DEG Hall sensor with a detection area of 1 μm^2 and the magnetization was studied as a function of applied magnetic field and temperature. The critical field was found to be $H_c = 78$ mT and $T_c = 7.20$ K, in good agreement with values of clean, bulk Pb. Above $T_x = 6.6$ K, we observe a stable Meissner state for increasing field and a remarkable quantized flux entry behavior with decreasing field. Below T_x, we observe quantized flux entry (removal) with increasing (decreasing) field. These behaviors indicate that thick mesoscopic Pb superconductors can be tuned with temperature to exhibit type I or type II superconducting behavior.

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