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Lower critical fields of ultraclean URu₂Si₂ single crystal
RYUJI OKAZAKI, MASAOKI SHIMOZAWA, HIROAKI SHISHIDO, TAKASADA SHIBAUCHI, YUJI MATSUDA, Department of Physics, Kyoto University, MARCIN KONCZYKOWSKI, Laboratoire des Solides Irradiés, CNRS-UMR 7642 and CEA/DSM/DRECAM, Ecole Polytechnique, 91128, Palaiseau, France, YOSHINORI HAGA, TATSUMA D. MATSUDA, Advanced Science Research Center, Japan Atomic Energy Agency, Tokai 319-1195, Japan, YOSHICHIKA ONUKI, Advanced Science Research Center, Japan Atomic Energy Agency, Tokai 319-1195, Japan, Graduate School of Science, Osaka University, Toyonaka, Osaka 560, YOICHI YANASE, Department of Physics, Niigata University, Niigata 950-2181, Japan — We study the lower critical fields H_{c1} on extremely clean single crystals of URu₂Si₂ ($T_c = 1.4$ K) by using a miniature Hall-sensor array magnetometry which can precisely determine the first flux penetration above H_{c1} [1]. For $H // c$, $H_{c1}(T)$ shows highly unusual behavior and is strongly suppressed below 1.2 K with a distinct kink anomaly, while $H_{c1}(T)$ for $H // a$ is well described by the previously proposed multiband nature. We suggest that this anomalous $H_{c1}(T)$ behavior for $H // c$ derives from a peculiar flux penetration through the domain walls in the multicomponent superconductor with broken time reversal symmetry. [1] R. Okazaki et al., arXiv:0909.1075.

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