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Campbell penetration depth in stoichiometric LiFeAs - evidence for static fishtail effect PLENGCHART PROMMAPAN, HYUNSOO KIM, MAKARIY A. TANATAR, RUSLAN PROZOROV, Ames Laboratory, Ames, IA 50011, USA, BUMSUNG LEE, SEUNGHYUN KHIM, KEE HOON KIM, CeNSCMR & Department of Physics and Astronomy, Seoul National University, Seoul 151-747, Republic of Korea — The "fishtail" or second magnetization peak is one of the most intriguing properties of high$-T_c$ cuprate superconductors. Now it has also been observed in iron-based materials and has been associated with weak collective pinning. To understand whether the fishtail effect has dynamic (due to field-dependent magnetic relaxation) or static behavior (due to actual non-monotonic field dependence of the true critical current) one needs to measure the clean system, which are rare in pnictide superconductors. A stoichiometric LiFeAs is one of the cleanest of the pnictides with RRR=65. We measured the Campbell penetration depth using a 10 MHz tunnel-diode resonator in DC magnetic fields of up to 9 T. As opposed to the "apparent" current density, estimated from the magnetization relaxed over tens of seconds, the Campbell penetration depth depends on the curvature of the pinning potential sampled at time intervals of 0.1 μsec, thus allowing one to estimate the unrelaxed, "true" $j_c(T, B)$. The obtained $j_c(T, B)$ shows a non-monotonic trend with a second peak shifting toward lower fields at higher temperatures implying a static origin of the fishtail effect in LiFeAs.

Plengchart Prommapan

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