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Pronounced enhancement of the lower critical field and critical current deep in the superconducting state of $PrOs_4Sb_{12}$[1] A.C. MOTA, T. CICHOREK, F. STEGLICH, Max-Planck Institute for Chemical Physics of Solids, D-01187, Germany, N.A. FREDERICK, W.M. YUHASZ, M.B. MAPLE, Department of Physics and Institute for Pure and Applied Physical Sciences, UCSD, CA 92093 — We have observed an unexpected enhancement of the lower critical field $H_{c1}(T)$ and the critical current $I_c(T)$ deep in the superconducting state below $T{\approx}0.6$ K ($T/T_c{\approx}0.3$) in the filled skutterudite heavy fermion superconductor $PrOs_4Sb_{12}$. From a comparison of the behavior of $H_{c1}(T)$ with that of the heavy fermion superconductors $U_{1-x}Th_xBe_{13}$ (x=0.027) and UPt_3, we speculate that the enhancements in $PrOs_4Sb_{12}$ reflect a transition into another superconducting phase that occurs below $T/T_c{\approx}0.3$. An examination of the literature reveals unexplained anomalies in other physical properties of $PrOs_4Sb_{12}$ near $T/T_c{\approx}0.3$ that correlate with the features we have observed in $H_{c1}(T)$ and $I_c(T)$. On the other hand, the lack of obvious features in the heat capacity at $T/T_c{\approx}0.3$ is somewhat reminiscent of the transition between the A and B phases of superfluid ^{3}He. Vortices in $PrOs_4Sb_{12}$ are very strongly pinned. They relax from a metastable state following a logarithmic law with decay rates smaller than 0.5%.

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