

Inversion of the Upper Critical Field Anisotropy in Fetes Films

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Abstract - We present the complete superconducting upper critical field (H_{c2}) – temperature (T) diagram of FeTeS films measured at three crystalline orientations (H || c, 45° and ab). We find that H_{c2} is *almost* isotropic in magnetic field orientation with $\mu_0 H_{c2}(T=0) \sim 30$ T, and a transition temperature of $T_c \sim 7$ K. A small but clear H_{c2} angular anisotropy is observed, with a crossover around $T = 0.7 T_c$, from $H_{c2}(\parallel c) < H_{c2}(\parallel ab)$ for $T > 0.7 T_c$ to $H_{c2}(\parallel c) > H_{c2}(\parallel ab)$ for $T < 0.7 T_c$. This change in the anisotropy is similar to that observed in FeTeS and FeTeSe single crystals but occurs at a higher T/T_c for our film. We analyze the $H_{c2}(T)$ in terms of pair-breaking mechanisms and two-band superconductor theory. Understanding the inversion of H_{c2} , opens the possibility to adjust the effective anisotropy of superconductors for different applications.

Keywords - Fe SeTe films, iron-based superconductors, upper critical fields, anisotropy of superconductors

IEEE/CSC & ESAS SUPERCONDUCTIVITY NEWS FORUM (global edition), October 2013

Received October 17, 2013; Accepted October 22, 2013. Reference No. ST351; Category 5.

This manuscript was published by *Superconductor Science & Technology* (SuST, IOP) 27, No. 4, 044005, (2014).