

Abstract Submitted
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Correlation of superparamagnetism and self-assembled defects with non-bulk superconductivity up to 49 K in (Ca,Pr)Fe₂As₂ single crystal BING LV, F.Y. WEI, L.Z. DENG, Y.Y. XUE, C.W. CHU, TcSUH and Dept. of Physics, University of Houston — We have found the unusual simultaneous occurrence of superparamagnetism and superconductivity single crystals of (Ca_{1-x}Pr_x)Fe₂As₂ with an x-independent T_c and a close correlation of the superconducting volume fraction with the magnetic cluster density and self-assembled As-defect density. The finding demonstrates a close relationship of superconductivity with superparamagnetism associated with the self-assemble defects. In addition, we have detected extremely large magnetic anisotropy, doping level independent T_c, the existence of mesoscopic-2D structures and Josephson-Junction Array couplings in the system. All these observations provide the physical basis of interfaces for the proposed interface-mechanism, and the best evidence for interface-enhanced superconductivity in a naturally occurring (vs artificially synthesized) material system to date.

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