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Evidence for interface superconductivity in rare-earth doped $CaFe_2As_2$ single crystals BING LV, L.Z. DENG, F.Y. WEI, Y.Y. XUE, TcSUH and Dept. of Physics, University of Houston, C.W. CHU, TcSUH and Dept. of Physics, University of Houston; Lawrence Berkeley National Laboratory — To unravel to the mysterious non-bulk superconductivity up to 49K observed in rare-earth (R=La, Ce, Pr and Nd) doped $CaFe_2As_2$ single-crystals whose Tc is higher than that of any known compounds consisting of one or more of its constituent elements of R, Ca, Fe, and As at ambient or under pressures, systematic magnetic, compositional and structural have carried out on different rare-earth-doped $(Ca_{1-x}R_x)Fe_2As_2$ samples. We have detected extremely large magnetic anisotropy, doping-level independent Tc, unexpected superparamagnetic clusters associated with As vacancies and their close correlation with the superconducting volume fraction, the existence of mesoscopic-2D structures and Josephson-junction arrays in this system. These observations lead us to conjecture that the Tc enhancement may be associated with naturally occurring chemical interfaces and thus provided evidence for the possible interface-enhanced Tc in naturally-grown single crystals of Fe-based superconductors.

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