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Superconductivity and Glassiness in Strongly Underdoped $\text{Y}_{1-x}\text{Pr}_x\text{Ba}_2\text{Cu}_3\text{O}_{7-\delta}$ ¹ C. C. ALMASAN, V. SANDU, P. GYAWALI, Kent State University, B. J. TAYLOR, M. B. MAPLE, University of California at San Diego — We performed magnetic investigations on single crystals of $\text{Y}_{0.47}\text{Pr}_{0.53}\text{Ba}_2\text{Cu}_3\text{O}_{7-\delta}$ ($T_c = 7.0$ K) at temperatures $4 < T < 80$ K. Magnetization M vs field H data measured at $T > 6.3$ K exhibit an evolution from a hysteretic loop typical for superconducting mixed state at low H to one typical for a spin glass state at high H . The latter opens as a separate loop above the irreversible field and expands on the account of the superconducting loop with which overlaps at $T < T_c$. This second loop survives up to temperatures higher than 40 K and shows positive magnetization. The M vs T dependence displays also a hysteresis above T_c for fields between 10 and 60 mT with a maximum width at about 30 mT. Magnetic susceptibility χ vs T data follow a Curie dependence $\chi(H, T) = C(H)/[T + \theta(H)]$ at low fields with field-dependent C and θ , as for an antiferromagnetic glass. These findings are consistent with the previously reported intrinsic inhomogeneity of the underdoped cuprates, where superconducting and antiferromagnetic nano-droplets coexist over a large T range, while the latter droplets persist up to $T \gg T_c$.

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