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Phase diagram in a Nb/[Co/Pt]_n bilayer with tunable domain width LEYI ZHU, CHIA-LING CHIEN, Johns Hopkins University, MARTA Z. CIEPLAK, Institute of Physics, PAS, Warsaw, Poland — Exploiting the stripe domain pattern in ferromagnets with perpendicular magnetic anisotropy (PMA), we investigate the influence of domain width in the [Co/Pt]_n multilayer with PMA on the nucleation of superconductivity in the Nb film, where a thin insulating layer separates the Nb and the [Co/Pt]_n to avoid proximity effects. We employ a novel demagnetization procedure on a single Nb/[Co/Pt]_n multilayer to reversibly tune the domain width. This allows us to explore the phase diagram using only one sample without the unavoidable variations when multiple samples are involved. We find that tuning the domain width in [Co/Pt]_n dramatically alters the dependence of the critical temperature T_c on the external magnetic field H_{ext} in the Nb layer. By tuning the domain width, we observe a continuous evolution of the phase boundary $T_c(H)$, from a non-linear dependence with a single maximum at $H_{ext}=0$ for small domain widths, to an reentrant phase boundary line with multiple T_c peaks for wider domains. Our results provide an experimental confirmation of the theoretical predictions of strong dependence of superconductivity nucleation on the magnetic domain size [1]. We demonstrate a unique method to determine the superconducting phase diagram by reversibly tuning the characteristics of a single sample. [1] A. Yu. Aladyshkin et al., Phys. Rev. B 68, 184508 (2003).

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