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Soft magnetic lithography and giant magnetoresistance in superconducting/ferromagnetic hybrids. V. VLASKO-VLASOV, U. WELP, A. IMRE, D. ROSENMANN, J. PEARSON, W. KWOK, Argonne National Laboratory — We report on direct visualization confirmed by the transport measurements of strong interactions between superconducting vortices and ferromagnetic domains in bilayers of type-II SC lead films and FM permalloy films with perpendicular magnetic anisotropy. Domains in permalloy formed a submicron stripe lattice that could be easily aligned in the film plane. We show that domain walls yield a robust magnetic pinning potential providing preferential vortex motion along the stripe domains. The effect is observed in a wide temperature range and results in a noticeable anisotropy of critical currents. The anisotropy increases near Tc when the core pinning becomes inefficient and the anisotropy direction is changed by reorienting the stripe domains. Such a tunable magnetic lithography is a convenient way of varying transport properties of superconductors and developing new cryotronic devices such as microscale superconducting switches and modulators. In our samples we found an unusually high magnetoresitance of $10^6\%$ in the fields of $\sim$10 Oe for the currents perpendicular to the domain walls. It can be referred to the granular structure of the lead films assisting the formation of easy flux flow channels along the stripe domains. — The work was supported by the U.S. DOE Office of Science under Contract No. DEAC02-06CH11357.

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