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Combined domain structures in superconducting/ferromagnetic hybrids V. VLASKO-VLASOV, Argonne National Laboratory, U. WELP, ANL, A. BUZDIN, U.of Bordeaux, France, A. MELNIKOV, IPM, Novgorod, Russia, D. ROSENMANN, W. KWOK, ANL — Combined domain (CD) structures of superconducting (SC) vortices strongly coupled to magnetic domains are studied using direct magneto-optical imaging in a bilayer of type II SC Nb film on a RE - iron garnet film. In a bare garnet film the domain width D increases with decreasing temperature and is substantially larger that the film thickness h. Below the SC Tc the CDs are formed which become much narrower than normal state domains after application of the AC fields in contrast with thermodynamic predictions for D>>h. A model is proposed explaining the observed effect by emergence of a transitional nonequilibrium state of the CD in the AC field. The studied CD structure defined by both SC and magnetic properties of the hybrid yields a novel electromagnetic response similar to that of a type I SC where the magnetization goes through the domain wall motion. The system acquires an enhanced pinning due to the coupled vortex/domain dynamics. The mobility of vortices reduces resulting in the suppression of thermo-magnetic avalanches at low temperatures and increased critical currents at T $\sim$ Tc.

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