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Imprinting magnetic vortices into heterostructure multilayer rings[1] VOLKER ROSE, Argonne National Laboratory, VITALI METLUSHKO, University of Illinois at Chicago, BOJAN ILIC, Cornell University, JOHN W. FREELAND, Argonne National Laboratory — While thin (5 nm) microscale single-layer ferromagnetic rings usually only exhibit a one-step switching between opposite bidomain states, also referred to as onion states, we show that in a trilayer (NiFe/Cu/Co) ring structure the interlayer dipolar interactions can lead to the stabilization of flux-closure vortex states. Using X-ray resonant magnetic scattering we have studied magnetic interactions in a series of single- (5 nm NiFe and Co) and multilayer (NiFe (5 nm)/Cu (3 nm)/Co (5 nm)) continuous films and patterned ring arrays. Each ring has a width of 0.75 μm and an outer diameter of 2 μm. In the NiFe and Co single-layer rings the spin switching occurs from an initial onion state to a final reverse onion state. By contrast, in a NiFe/Cu/Co multilayer ring the magnetostatic coupling strongly affects the reversal and gives rise to the nucleation of a well-defined vortex state in the NiFe layer.

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