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Imprinting topological domain structure in epitaxial Ni/Fe/Co/Cu(001) ALI TAN, JIA LI, ZI QIANG QIU, University of California Berkeley, ELKE ARENHOLZ, ANDREAS SCHOLL, Lawrence Berkeley National Laboratory, CHANYONG HWANG, Korea Research Institute of Standards and Science — A vortex state can be stabilized in magnetic thin films by reducing the lateral dimension of the thin film such that the shape anisotropy imposes flux-closure on the magnetic domains. In the language of skyrmions, a vortex state has a topological skyrmion charge Q = $\pm 1/2$, with vorticity w = +1 and helicity $\gamma = \pm\pi/2$. By tuning the interlayer coupling strength, various domain structures can be imprinted on an adjacent ferromagnetic layer. We investigated domain imprinting by cobalt (Co) vortices on nickel (Ni) layer through a face-centered-cubic (fcc) iron (Fe) interlayer in a Ni/Fe(wedge)/Co(disks)/Cu(001) trilayer system. Using element-specific X-ray Magnetic Circular Dichroism, we observed a strong antiferromagnetic IEC for 5 ML thick Fe interlayer. From the domain images of each elements obtained using Photoemission Electron Microscopy (PEEM), we observed that the relative strength of the bilinear and biquadratic exchange coupling changes as a function of Fe interlayer thickness, leading to non-collinear coupling between Ni and Co around 5.5 ML of Fe. The resulting Ni domain structures have topological skyrmion charge Q = $\pm 1/2$, with vorticity w = +1 but varying helicity γ.

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