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Domain walls in antiferromagnetically-coupled multilayer films

ERIC FULLERTON, ANDREAS BERGER, Hitachi Global Storage Technologies, San Jose, CA, OLAV HELLWIG, BESSY, Berlin, Germany — We report experimentally observed magnetic domain-wall structures in antiferromagnetically-coupled multilayer films with perpendicular anisotropy [1, 2]. Our studies reveal a first-order phase transition from domain walls with no net moment to domain walls with ferromagnetic cores. The transition originates from the competition between dipolar and exchange energies, which we tune by means of layer thickness. The overall dipolar fields generated by such a ferromagnetic domain wall can be reduced by having the orientation of the ferromagnetic regions reverse periodically along the domain wall. This produces a one-dimensional equivalent of stripe domains that form in ferromagnetic thin films with perpendicular anisotropy. With increasing layer thickness these one-dimensional stripe domains evolve continuously into two dimensional stripe domains that fill the sample. Although observed in a synthetic antiferromagnetic system, such domains-wall structures may be expected to occur in A-type antiferromagnets with anisotropic exchange coupling. [1]. O. Hellwig *et al.*, Nature Materials **2**, 112 (2003). [2]. O. Hellwig, A. Berger and E. E. Fullerton, Phys. Rev. Lett. **91**, 197203 (2003).

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