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Edge-Imposed Domain Ordering in Antiferromagnetic LaFeO3 Nanostructures[1] J.K. GREPSTAD, E. FOLVEN, T. TYBELL, Norwegian University of Science and Technology, A. SCHOLL, A. YOUNG, Advanced Light Source, LBNL, S.T. RETTERER, Oak Ridge National Laboratories, Y. TAKAMURA, University of California, Davis — The antiferromagnetic (AFM) domain structure of submicron-sized $LaFeO_3$ nanostructures was imaged with photoemission electron microscopy in combination with x-ray magnetic linear dichroism. These nanostructures were defined in epitaxial $LaFeO_3$ thin films using e-beam lithography and Ar^+ ion implantation to locally destroy the magnetic order in the surrounding matrix. Extended domains were found to form along the perimeter of rectangular-shaped islands, when their edges were aligned with the in-plane <100> axes of the cubic $SrTiO_3$ substrate. The AFM spin axis of these domains was confined to lie within the film plane, aligned with the edges of the nanostructures. This domain configuration predominated for nanoislands scaled down to 500x500 nm^2. However, no edge-imposed domain ordering was observed for rectangular islands rotated by 45° with respect to the in-plane crystalline axes, suggesting a magnetocrystalline origin of the extended edge-bound AFM domains. These findings may prove important to spintronic devices relying on exchange-biased nanostructures, where domain engineering in antiferromagnets remains relatively unexplored and has the potential to provide new device opportunities.

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J.K. Grepstad
Norwegian University of Science and Technology

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