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Lorentz Microscopy of Magnetic Thin Films

R.A Pickford, SM Thompson, A.K Petford-Long*, R Dunin Borkowski*, R Doole*, M Viret†, P Warin†, E Sondergard†
University of York, UK
**University of Oxford, UK*
†*CEA, France*

Lorentz Microscopy is able to observe first hand the domains and domain walls in magnetic materials. It is important to be able to characterise the magnetic properties of a material, or structure. The work concentrates on Lorentz microscopy of magnetic thin films, focussing on imaging magnetic domains and domain wall behaviour in an applied field. Of particular interest is to be able to image the domain walls in the presence of an applied field and to monitor the movement of the walls through the material and hence determine the magnetisation process. The microscope used is situated in the Materials Department, Oxford University. There are two main groups of samples that are being worked on presently, cobalt patterned structures for domain wall studies and amorphous iron based alloys. The cobalt structures are grown on silicon nitride windows which are made in York. The structures are patterned by e-beam lithography at CEA Saclay, Paris. The cobalt structures have been designed so that domain walls can be isolated in the central bar with an applied field. The motion of the domain walls can then be observed with changing field in the microscope. The amorphous iron based alloys are melt spun and the resultant alloy ribbons are thinned for TEM by ion beam etching or electrochemical polishing. The samples are viewed in Fresnel mode in the microscope. Diffraction patterns are also made.