

OBSERVATION OF DOMAIN WALL BEHAVIOUR IN NANOWIRES BY LORENTZ TEM

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The topic of domain wall (DW) behaviour in nanowires has attracted immense interest both for the understanding of fundamental physics and for spintronic applications. In this field, the work we have been performing at Glasgow has exploited the unique Lorentz imaging capabilities afforded by our highly customised transmission electron microscope (TEM). Our Philips CM20 TEM allows the observation of magnetic structure with spatial resolution <10 nm and the ability to perform in-situ experiments, applying magnetic and electrical stimuli to nanoscale wires and elements.

With regard to nanowires, we have performed a wide range of studies into aspects of DW behaviour. We have investigated how to create DWs using a variety of methods placing an emphasis on gaining control over parameters such as type and chirality. The pinning of DWs at specifically created sites has also been investigated. There, we have examined the nature and strength of the pinning provided both by geometric features such as notches/anti-notches and more subtle irradiation induced defects. For the geometric features, Lorentz TEM has allowed detailed understanding of how the DW structure can be deformed when located at these pinning sites. We have also studied DW propagation in nanowires by the in-situ application of pulsed magnetic fields and currents, the latter attempting to provide further understanding about the spin-transfer-torque effect. Key results from all of these experiments will be presented.