
LORENTZ IMAGING

When electrons pass through a magnetic specimen they are deflected sideways by the so-called Lorentz force. The term Lorentz microscopy¹ refers to the various imaging modes that enable the magnetic microstructure to be visualized. There are two primary modes. The technique of Foucault imaging utilizes the splitting of electron diffraction spots in the back focal plane caused by magnetic deflections of the transmitted electrons in different directions. Qualitative estimation of domain size and shape is rapidly achieved by using a suitably placed objective aperture to exclude some of the deflected electrons. The technique of Fresnel or out-of-focus imaging highlights the positions of domain walls which appear as bright and dark lines that reverse contrast when changing from underfocus to overfocus imaging. Quantitative measurements of magnetic induction can sometimes be obtained when a coherent field-emission electron source is used. ²

Possible Applications

- characterization of magnetic microstructure

Limitations

The magnetic specimen cannot be placed within the strong field of the normal objective lens. Either this lens must be turned off and an auxiliary lens used for imaging, or else an alternative specimen holder must be used to locate the sample outside the objective lens.

Suitable Microscopes

This technique is available on the following instrument:

- Philips CM200-FEG

References

1. J.N. Chapman, J. Phys. D 17 (1984) 623.
2. J.N. Chapman et al. IEEE Trans. Magn. 30 (1994) 4479.