

Imaging Spiral Magnetic Domains in Rare Earth Metals*

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This work presents images showing the temperature dependence of the spiral magnetic domains in Dy and Ho metals. In these materials, the moments order ferromagnetically in the hexagonal basal plane, with the magnetization direction rotating between successive atomic layers forming a helix. The sense of this rotation can be either right or left handed leading to the formation of chirality domains. At magnetic Bragg diffraction peaks, circularly polarized X-rays are sensitive to the handedness of such a helix (i.e. either right or left handed). The spiral domain structure can therefore be imaged by combining phase retarding optics with micro-diffraction techniques. This contrast between the chiral domains, occurs both for resonant and non-resonant magnetic scattering. Near the $L_{2,3}$ absorption edge resonances, however, the differences in the scattering intensity vary dramatically. On either side of the enhancement, the contrast is strongly suppressed to $\sim 10\%$, while at the enhancement peak and far from the edge the contrast approaches $\sim 85\%$. Images showing the energy, temperature, and wave vector dependence of the domain structure will be presented.

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