

RESONANT MAGNETIC X-RAY AND POLARIZED NEUTRON ANALYSIS OF MAGNETIC FILMS AND SUPERLATTICES

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Polarized neutron reflectivity (PNR) and x-ray resonant magnetic scattering (XRMS) play an essential role for the exploration of magneto- and spintronic nanostructures. The magnetic sensitivity is based on the neutron magnetic moment interacting with unfilled 3d or 4f shells on the one hand, and on the x-ray magnetic linear and circular dichroism on the other hand. Well known systems extensively studied by PNR and XRMS include exchange coupled magnetic superlattices, exchange spring valves between soft and hard magnetic films, exchange bias systems between ferromagnetic and antiferromagnetic films, magnetic semiconductors and half metallic ferromagnets. In addition to studies of layered systems, these scattering methods can also be used for the investigation of laterally structured magnetic media such as stripes and islands on sub-micrometer to nanometer length scales, including self-assembled magnetic nanoparticles. After introducing the experimental techniques of PNR and XRMS, selected examples will be discussed for illustration of their complementarity and their future potentials. In particular we will discuss magnetization profiles, magnetic hysteresis, and off-specular scattering. The emphasis is on the advantages and disadvantages of both techniques and their complementarity.

Recommended Literature:

Resonant elastic soft x-ray scattering, J Fink, E Schierle, E Weschke and J Geck, Rep. Prog. Phys. 76 (2013) 056502, doi:10.1088/0034-4885/76/5/056502

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