Spectroscopy

X-ray Magnetic Circular Dichroism

X-ray Absorption Spectroscopy (XAS)

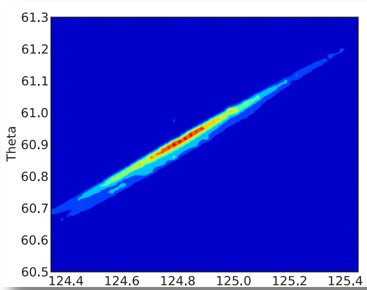
diamond

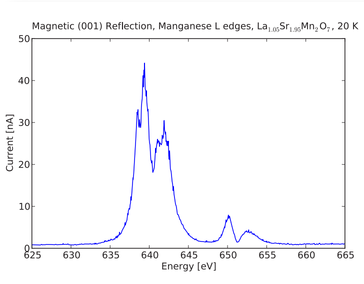
I10 Technique Information

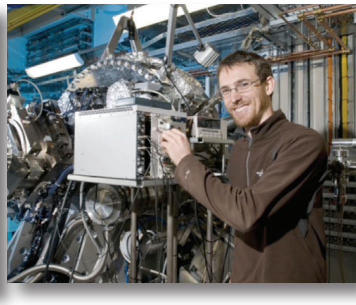
I10 – Beamline for Advanced Dichroism Experiments (BLADE)

Accessing important absorption edges such as the 3d transition metal $L_{2,3}$ edges, rare earth $M_{4,5}$ edges, and actinide $N_{4,5}$ edges, BLADE is ideally suited to the study of magnetic dichroism and magnetic structure of novel nanostructured materials using soft X-ray resonant scattering (reflection and diffraction) and X-ray absorption.

The beamline is composed of two branch lines; a multi-circle UHV diffractometer (RASOR) for soft X-ray resonant magnetic scattering (XRMS) and a high field magnet with a UHV environment for X-ray magnetic circular dichroism (XMCD),and X-ray magnetic linear dichroism (XMLD).







Beamline Specification

Techniques available	X-ray absorption spectroscopy, X-ray magnetic circular and linear dichroism
Energy range [eV]	400 – 2000
Circular Polarisation	Left and Right
Linear Polarisation	Horizontal > 250 eV Vertical > 480 eV
RASOR end-station	Polarisation analysis at O (K edge), Mn, Fe, Co and Ni (L edges) Azimuthal sample rotation
High Field Magnet end-station	Maximal magnetic flux density ± 14T Field polarity reversal time < 1 hour Sample rotation around the vertical axis ± 90°
Temperature control	12 K – >300 K (RASOR) 2 K – 420 K (High Field Magnet)
Beam size (μm)	20 x 200 (RASOR) 10 x 100 (High Field Magnet)

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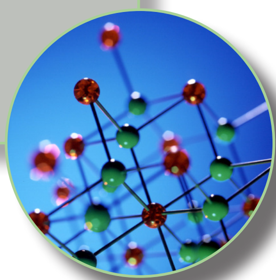
I10 Applications

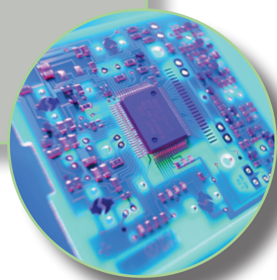
Novel Materials

- Obtain chemically selective information from glasses, ceramics, minerals and catalyst materials;
- Inform the development of half-metallic materials;
- Understand electronic and magnetic phenomena in novel crystalline materials;
- Strongly correlated systems.



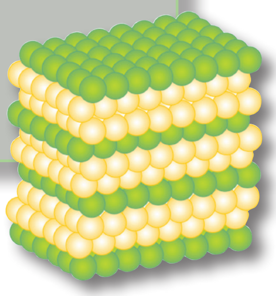
Electronics

- Investigation of the behaviour of materials for highdensity magnetic recording media and read heads;
- Development of novel device technologies including magnetic tunnel junctions and spin-valve transistors;
- Diluted magnetic semi-conductors for room temperature ferromagnetic materials.



Multilayers and Monolayers

- Determination of the structure of buried interfaces in multilayers and heterostructures, particular in microelectronics;
- Examine the chemical environment of thin films and coatings;
- Explore self assembled molecular magnet in either 2D (monolayer) or 1D (step edge) arrays.



Bionanomagnetism

- Nanofabrication of catalytic nanoparticles from precious metal waste streams using bacteria;
- Exploring the use of biomineralising bateria for the production of low energy and low cost metal nanocrystals for information management technologie;
- Explore the use of bacterial surfaces as patterns, templates and scaffold for metal nanocluster deposition.

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