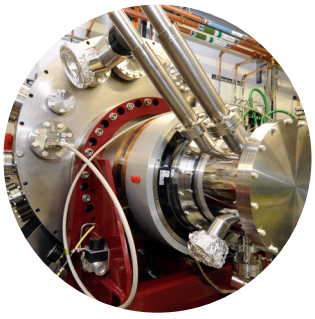
I09

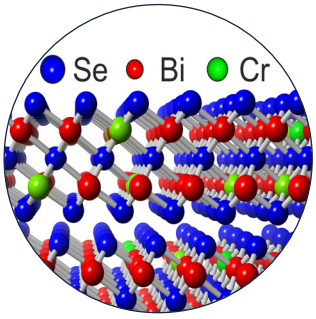
Surface and Interface Structural Analysis

I09 is dedicated to high-resolution studies of atomic and electronic structures of surfaces and interfaces in a wide range of applications.

The main X-ray techniques include high resolution X-ray Photoelectron Spectroscopy (XPS), Hard X-ray Photoelectron Spectroscopy (HAXPES), Near Edge X-ray Absorption Fine Structure (NEXAFS), X-ray Standing Waves (XSW), Energy Scanned Photoelectron Diffraction (PhD).

A unique feature of this beamline is that sample characterisation for hard and soft X-rays measurements is carried out at the same end-station. This approach combines low energy and high energy beams focused on the same sample area, and achieves advances in structural determination of surfaces and interfaces, as well as in nano-structures, biological and complex materials research.



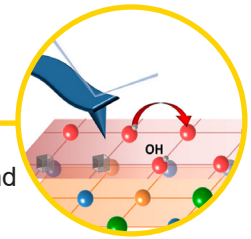


Beamline Specification

Energy range & Polarisations	**Hard:** 2.1 – 10 keV **Soft:** Linear horizontal: 105-1900 eV Vertical: 200 – 1200 eV Helical: 150 – 1200 eV
Beam Size at Sample [µm]	**Hard & Soft Focused:** 40 (H) x 20 (V) μm^2 Defocused: 300 (H) x 300 (V) μm^2
***In situ* surface preparation**	Heating (e-beam or radiative) up to 1500 K Cooling ~ 20 K with LHe or ~100 K with LN_2 Ion sputtering Physical vapour deposition Gas dosing
***In situ* surface characterisation without synchrotron radiation**	LEED and UPS (He lamp with monochromator)
Detectors	VG Scienta EW4000 HAXPRES Ek up to 10 kV Analyzer-incident beam angle – 90° Sample drain currents Reflectivity screen for nominal incidence XSW

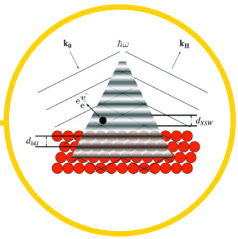
I09 APPLICATIONS

Surface Science



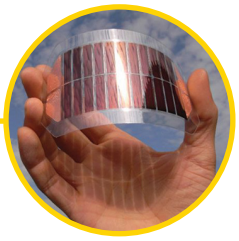
- Study of interfacial structures and compositions of thin films and nanoparticulates;
- Characterisation of heteroepitaxial growth in metals, semiconductors, functional alloys and metal oxides;
- Applications in information storage, spintronics, optoelectronics and sensor devices.

Catalysis and Nanotechnology



- Study of surface reconstructions and monolayer adsorption of monatomic species or small molecules (e.g. CO, NO, amino acids, thiolates) on solid surfaces;
- Comprehensive descriptions of surface structure, in particular the orientation and deformation of adsorbed molecules.

Molecules/ Solid Interfaces



- Investigations of interfaces between organic and inorganic materials;
- Characterisation of the electron density of an organic layer on a solid surface combined with an element specific measurement;
- Exploration of surfaces of polymer films with specific heavy ions involved in biolubrication.

Energy

- Studies on electronic properties of CdO used in solar cell applications;
- Probing the electronic properties of Li-based batteries;
- Characterisation of nuclear waste materials;
- Investigations on the doping interactions in electrolyte materials for solid oxide fuel cell applications.

For further information

Diamond Industrial Liaison Team

+44 1235 778797
industry@diamond.ac.uk
diamond.ac.uk/industry
@DiamondILO

TN-I09-03-2