Spectroscopy

ARPES

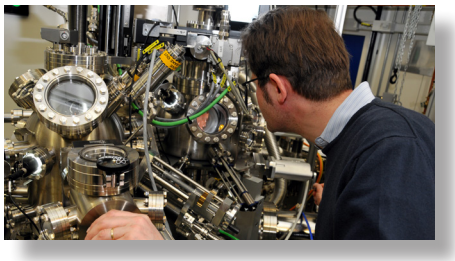
diamond

I05 Technique Information

I05 – Angle Resolved Photoemission Spectroscopy (ARPES)

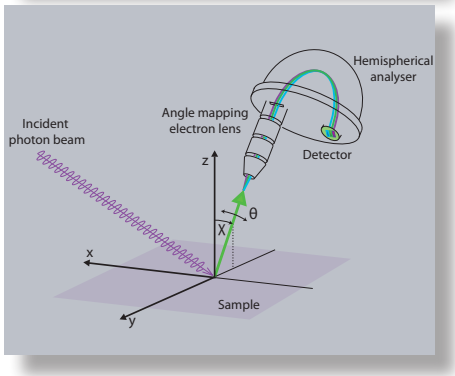
Angle-Resolved Photoemission Spectroscopy (ARPES) maps the dispersion of electronic bands near the Fermi level and, in particular, the Fermi surface itself by exciting the bound electrons in a sample with a given photon energy. The momentum parallel to the surface is fully conserved, thus making the method suitable for layered low-dimensional materials. The three-dimensional momentum distribution is also reflected in the photoelectron features thus making the spectroscopy applicable to metallic single crystals, provided that a well-defined clean surface can be prepared in ultra-high vacuum. The minimum samples size is 500 x 500 μm^2 given by the light spot (50 x 50 μm^2) and the sphere of confusion of the sample goniometer.

Sample Preparation



Samples have to be prepared *in situ* in ultrahigh vacuum to achieve atomically controlled, clean surfaces. The vacuum system of the high resolution ARPES branch provides the following methods:

- cleavage of layered materials by knocking off a post glued to the top surface
- Ar-ion etching and annealing for polished metal surfaces
- evaporation sources for the preparation of ultrathin films
- direct heating flash for passivated semiconductor surfaces
- port for attaching user-supplied preparation equipment



Beamline Specification

Beamline I05	High Resolution Branch
Photon Energy Range	18 – 240 eV
Energy Resolution	10 meV
Angular Resolution	0.1˚
Available Polarisation Modes	Linear Horizontal/Vertical, Circular Left/Right
Smallest Sample Size	500 x 500 μm²
Controlled Sample Temperature Range	10 – 400 K
Vacuum Conditions	< 5 x 10^{-11} mbar

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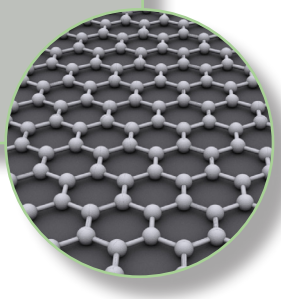
I05 Applications

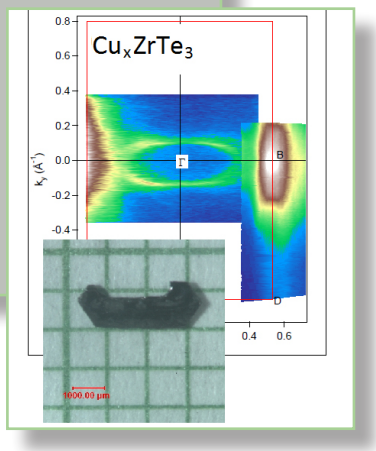
Carbon-Based Materials

- Graphene
- Molecular electronics
- Carbon nanotubes



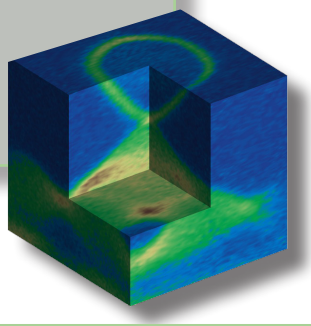
New Materials

- ARPES as soon as single crystals aregrown



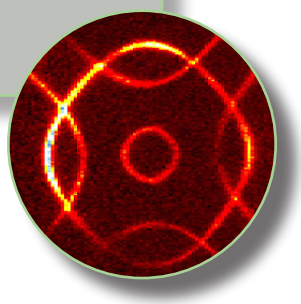
Transition Metals

- Quantitative analysis of electron interactions
- Fermi surfaces
- Renormalisation
- Energy gaps



Surfaces and Interfaces

- Molecular adsorbates
- Ultrathin films
- Stepped surfaces
- Epitaxially grown nano-wires
- Topological insulators



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