

Kratos AXIS-165

X-Ray Photon Spectroscopy

Location: Science and Engineering South, 109B



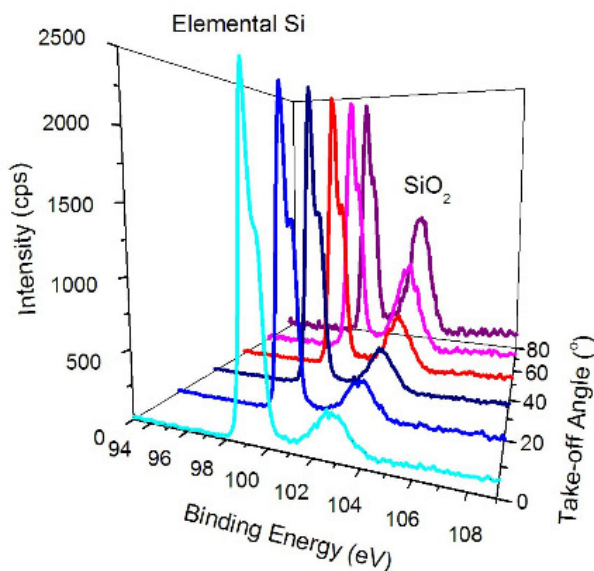
Description

The Kratos AXIS-165 Surface Analysis System is a multi-technique instrument. Our instrument, installed in December 2004, is equipped for X-ray Photon Spectroscopy (XPS - also known as ESCA (Electron Spectroscopy for Chemical Analysis)). This technique is surface sensitive (less than 8nm for XPS) with a spatial resolution in X and Y of down to 30 μm .

For XPS the instrument has a Monochromatic Al X-ray source and is

fitted with a charge neutralization coil. Depth profiling can be done either by tilting the specimen (non-destructive) or using an argon ion gun (destructive). Imaging XPS is possible by using scan plates to raster the focal point of the analyzer over the specimen.

X-ray photoelectron spectroscopy is a surface-sensitive analytical technique that relies on the Photoelectric Effect discovered by Einstein (Nobel Prize 1921). It is a semi-quantitative method for obtaining composition and chemical state information. Because it is a surface-sensitive technique and the photoelectrons generally have low kinetic energies, XPS experiments must be conducted in an ultra-high vacuum (UHV) environment (10^{-9} – 10^{-10} Torr).



X-rays of a fixed wavelength irradiate the specimen and the energies of photoelectrons generated are measured using a hemispherical analyzer. Given that the binding energy of each element's orbitals is unique and is dependent on bonding environment, it can act as 'fingerprints' for identifying elements and chemical compounds. The photoelectrons that give rise to the spectra can only come from depths of less than 8 nm from the specimen surface.

< Angle resolved XPS spectra of Si 2p showing the increase in SiO₂ peak as the specimen is tilted

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Technical Specifications

- Analyzer: 180degree, 165mm hemispherical analyzer
- Energy resolution < 0.45eV.
- X-ray source: Monochromatic (Al).
- Charge neutralization: Kratos patented self compensating system.
- Heat/Cool facility: -100 degC to 600 degC in Prep Chamber.
- Analysis Chamber Vacuum: 5×10^{-10}mb