



Kratos AXIS Supra X-Ray Photoelectron Spectrometer

The Kratos AXIS Supra is a high performance multi-technique surface analysis instrument combining high-sensitivity X-ray photoelectron spectroscopy (XPS) with a dual anode Al/Ag monochromatic X-ray source, ultraviolet photoelectron spectroscopy (UPS) and ion scattering spectroscopy (ISS). It is capable of parallel XPS imaging and scanning with a spatial resolution as high as 1.0 micron.

The system is also equipped with a gas cluster ion source (GCIS) producing focused energetic Ar ion beam in both monoatomic and cluster mode for sputter cleaning and depth profiling of any inorganic or organic material, conductive or insulating.

The analysis chamber is equipped with an integral charge neutralizer for the analysis of non-conductive materials, sample cooling/heating (-150°C to 800°C), a Hemispherical and Spherical mirror analyzer equipped with a 128 channel Delay-Line Detector allows for fast parallel imaging and excellent signal-to-noise.

The Axis Supra is also equipped with a high tilt sample stage which can be used to acquire Angle-Resolved XPS (ARXPS).

A surface science station (SSS) attached to the analysis chamber provides a dedicated UHV chamber configured with a manual sample stage for surface science studies and in-situ sample preparation.

The system is run by the Escape Data Acquisition System on a windows platform which provides unparalleled automation and user-friendly software for sample handling, data acquisition and processing.





Instrument specifications:

Monochromatic Source

- Al anode $K\alpha$ (1486.7 eV)
- Ag anode $L\alpha$ (2984.2 eV)
- 500 mm Rowland circle Monochromator

UPS Lamp

- He (I): 21.22eV
- He (II): 40.80eV

Energy resolution and Sensitivity

- > 760 kcps @ 0.48 eV FWHM (Ag 3d 5/2)
- > 44 kcps @ 0.68 eV FWHM on insulators (PET C 1s)

Imaging

- Spatial resolution up to 1 μ m

Sample analysis chamber

- 5 axis precision software-controlled manipulator, accuracy 2 μ m (X, Y, Z-axis)
- Sample maximum size: diameter 32 mm, thickness 7 mm
- Sample heating/cooling from -100°C to 800°C
- Magnetic lenses ensure efficient collection of photoelectrons
- Lateral resolution 15 μ m for spectroscopy, 1 μ m for parallel imaging
- Detection limits 0.1 to 1 atomic %
- Depth resolution: 2 to 8 nm
- Charge neutralization using low energy electrons for analysis of insulating samples

Minibeam

- Sample etching (milling or sputtering) using argon ion for depth profiling of organic and inorganic materials and cleaning of inorganic and metal surfaces.
- Monoatomic
Ar⁺ ions from 500eV to 4 keV
- Gas-cluster ion source (GCIS) for gentle etching
5 keV Ar⁺, 500 eV Ar⁺, 20 keV Ar₅₀₀⁺, 20 keV Ar₁₀₀₀⁺, 10 keV Ar₁₀₀₀⁺, 10 keV Ar₂₀₀₀⁺, 5 keV Ar₁₀₀₀⁺, 5 keV Ar₂₀₀₀⁺

Ion scattering spectroscopy

Monolayer surface characterisation using elastic scattering of helium ions

- 1 keV He⁺ - Elements $3 < Z < 40$
- 3 keV He⁺ - Elements with $Z > 40$

Load lock chamber (Flexi-lock)

- 3 slots for sample holders
- Automated transfer from/to sample analysis chamber
- Sample heating/cooling from -100°C to 800°C
- a glovebox could be connected to the flexi-lock for sample handling in inert atmosphere



Surface science station (SSS)

- Samples mounted on 15 mm sample stubs
- Sample heating/cooling from -100°C to 600°C
- A residual gas analyzer (RGA)
- Broad spot ion etching
- Sample storage dock

Applications of XPS:

XPS surface analysis can provide answers to a wide range of research or industrial problems. The following are some examples.

Application Categories:

- Biological
- Catalysis
- Defect Analysis
- Energy
- Thin film Coatings
- Microelectronics
- Oxides & Metals
- Polymers
- Corrosions
- Tribology
- Surface treatment, etc.