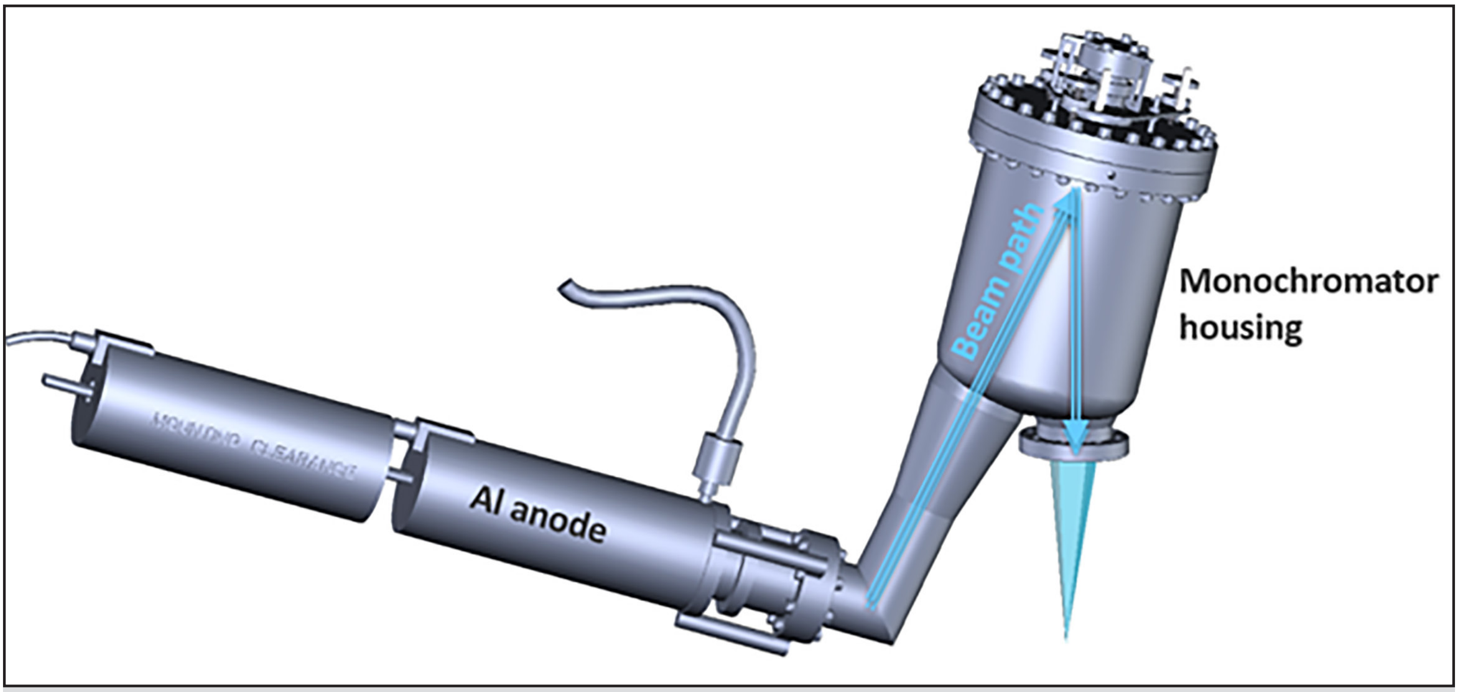
SX300 X-RAY SOURCE
Experience precision and unmatched energy resolution



SX300 X ray source model with beam pathway.

Designed to deliver outstanding surface analysis. The SX300 X-ray source has excellent energy resolution (<250 meV), which enables detailed chemical state information and valence band structure analysis. Identification of chemical shifts is simplified, without satellite interference that occurs with non-monochromatized sources.

With two operation modes - line and circular spot mode - the SX300 is a versatile and user-friendly solution.

Key Features:

- **Monochromated X-ray Source:** High spectral resolution with aluminum anode (Al Kα 1.48 keV).
- **High Power and Focused Spot Mode:** Enhanced photon flux for greater experimental flexibility.
- **Advanced Water-Cooling System:** Prolongs the device lifetime and optimizes performance.
- **Compact, UHV-Compatible Design:** Suitable for ultra-high vacuum conditions with minimal maintenance requirements.
- **Dual Operation Modes:** Line mode and circular spot mode for versatile analytical needs.

The SX300 X-ray source is monochromated, enabling low background noise and absence of satellites which complicate the spectral shapes. Optimum photon flux in combination with excellent energy resolution result in great signal-to-noise ratio which simplifies core level identification. This way the overall time spent for experiment and data analysis is significantly reduced.

A flat aluminum anode (1486.6 eV, Al Kα) is combined with a small-spot focusing monochromator of 4 quartz crystals mounted on a 3-axis manipulator for user-friendly adjustment. By diffracting the X-rays using a quartz crystal backplane (Bragg diffraction) the energy line width is reduced to 0.25 eV.

Tungsten Cathode

The Yttria coated Tungsten cathode allows operation in small spot and high power mode (300 W) delivering high count rate and therefore experimental flexibility. The advanced design ensures true UHV operation with a bakeout temperature up to 120 °C and offers optional differential pumping ports and shutter mechanism.

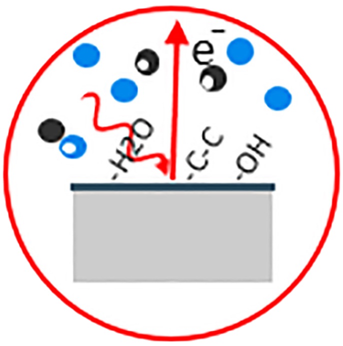
Thermal compensation

SX300 is thermally compensated to eliminate the need for temperature stabilization and removal of the toroidal monochromator crystal housing during bake-out. This way we ensure straightforward and quick operation for multi-user facilities.

Advantages of a monochromated XPS source:

- Excellent energy resolution <250 meV
- Detailed chemical state information
- No X-ray satellites
- Access to valence bands
- Clear chemical shifts

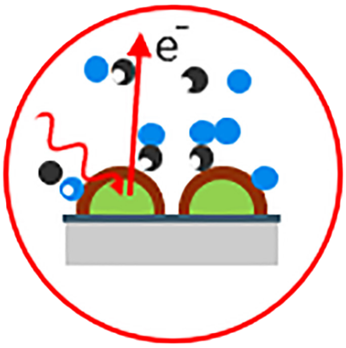
Surface chemical composition analysis



Identification and quantification of the elemental composition of a material's surface (typically the top 1-10 nm)

- High surface sensitivity
- Oxidation states
- Chemical shifts

Detection of Surface Modifications



Surface modifications on thin films, and coatings

Interface sensitivity

- Nanoparticles
- Low dimension materials
- Depth profile with sputtering

Applications

EXAMPLE 1: Surface Treatment Induced Changes

Unravel the surface chemistry of metallic surfaces through detailed XPS analysis.

The spectra to the right reveal the oxidation states of iron (Fe), chromium (Cr), and molybdenum (Mo), with contributions that belong to metal oxide and hydroxide species.

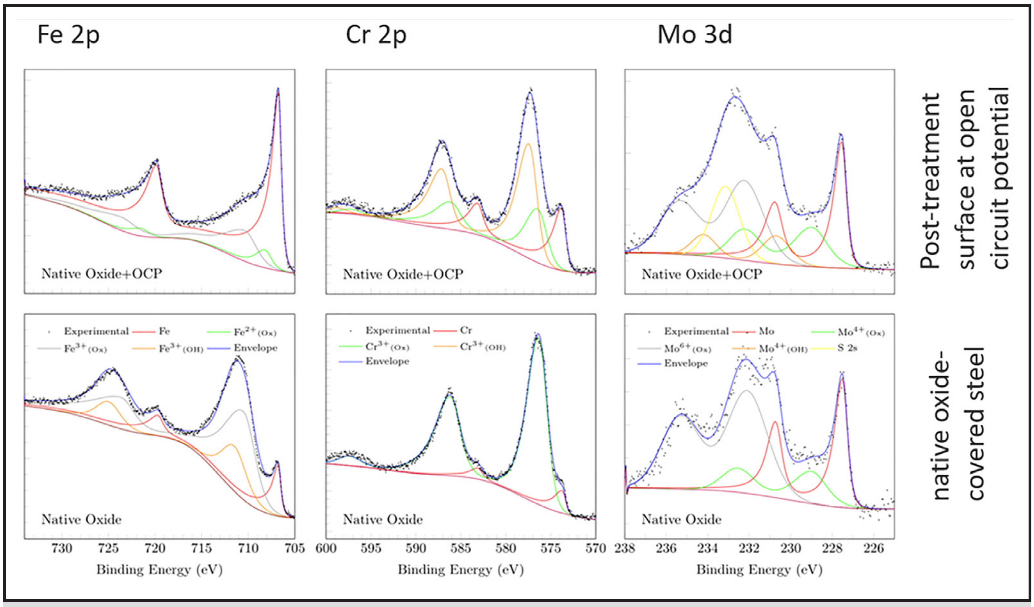


Figure1. The bottom row shows the native Fe 2p, Cr 2p and Mo 3d in steel („Native Oxide“). This chemical composition changes after the treatment with sulfuric acid (H_2SO_4.) under open-circuit potential, as shown in top row („Native Oxide + OCP“). Experimental data (dotted), deconvoluted peaks, and the peak fit curve (“envelope”) show clear surface changes after the treatment.

Reference: B. Lynch et al., J. Electrochem. Soc. 2020, 167, 141509

EXAMPLE 2: Light-Induced Chemistry of Photovoltaics

XPS analysis easily captures surface changes before and after light exposure in photovoltaics. After being exposed to light lead-halide perovskite surface shows a peak at 136.7 eV indicating the transformation of Pb^{2+} ions into their metallic form. This is driven by the loss of iodide from the material. XPS analysis reveals that structural changes often accompany these chemical shifts, leading to noticeable physical changes consistent with light-induced transformations.

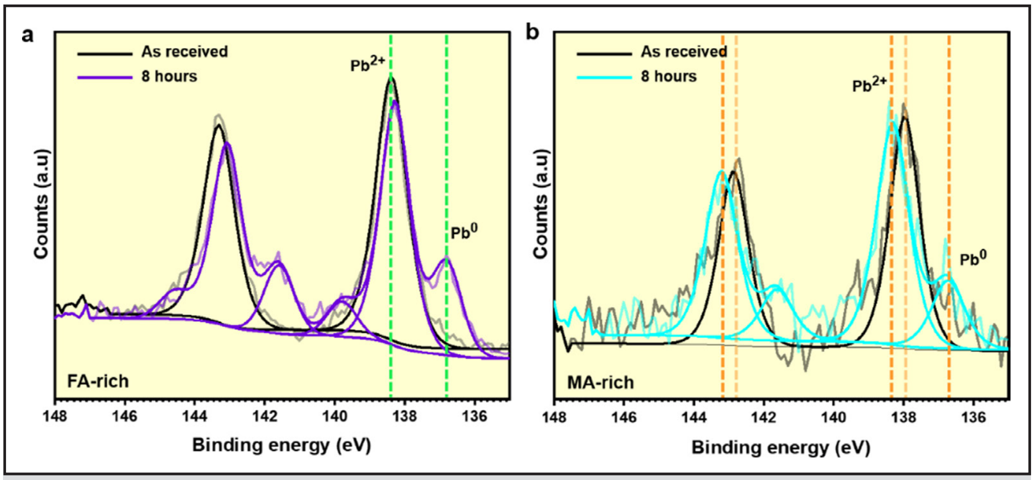


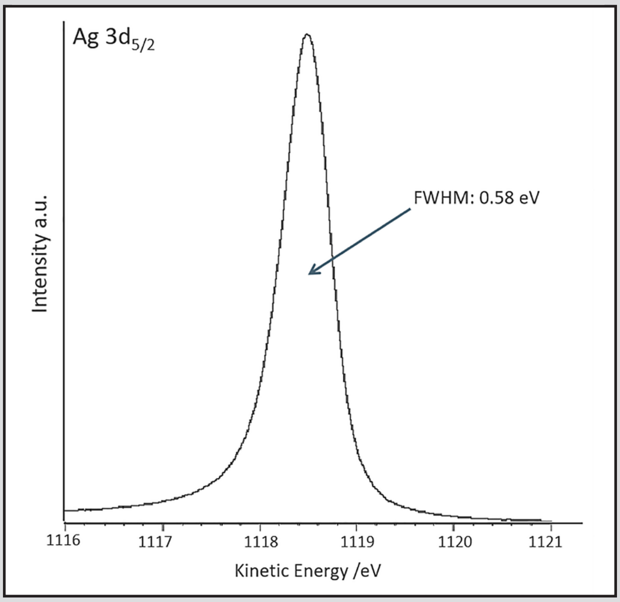
Figure 3. Pb 4f spectra of FA-rich (a) and MA-rich (b) perovskite surface on as-received sample (black) and after light exposure (purple and cyan, respectively). We see a new peak formed at ~136.7 for Pb^0 after light exposure in both samples, implying that the perovskites degrade under light.

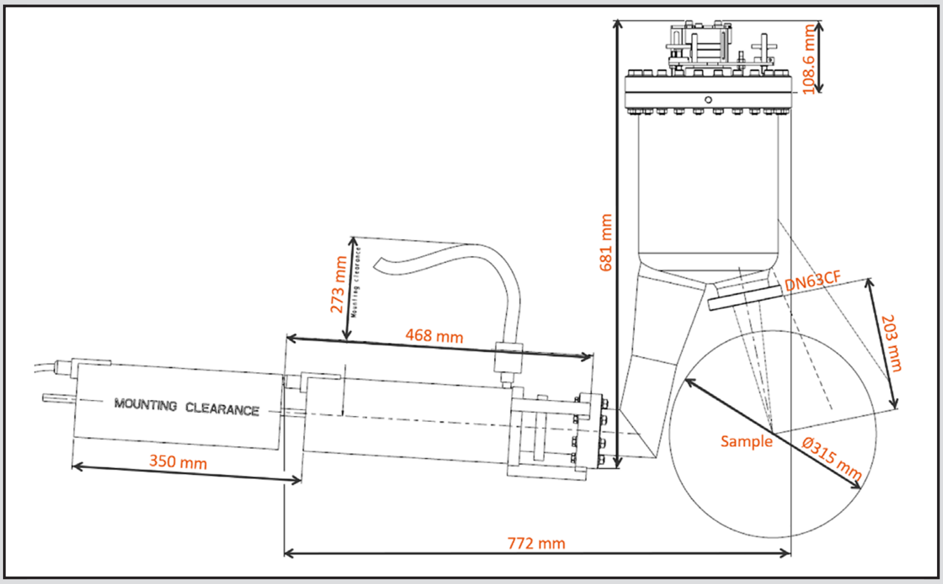
Reference: R. O. Nughays et al. Adv. Sci.,2024, 11, 2404468

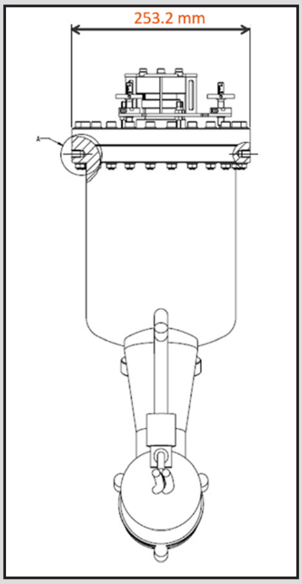
Technical Data

Anode material:	Al Kα: 1486.6 eV)
Maximum anode voltage:	15 kV
Maximum anode current:	20 mA
Rowland circle diameter:	500 mm
Spot size:	ca. 1 mm (circular)
Photon linewidth:	0.25 meV
Max continuous power:	300 W
Bake-out temperature:	120 °C
Flange to sample distance:	203 mm
Mounting port:	DN63CF

All dimensions in mm.







Get in touch with us at **scientaomicron.com/SX300**