

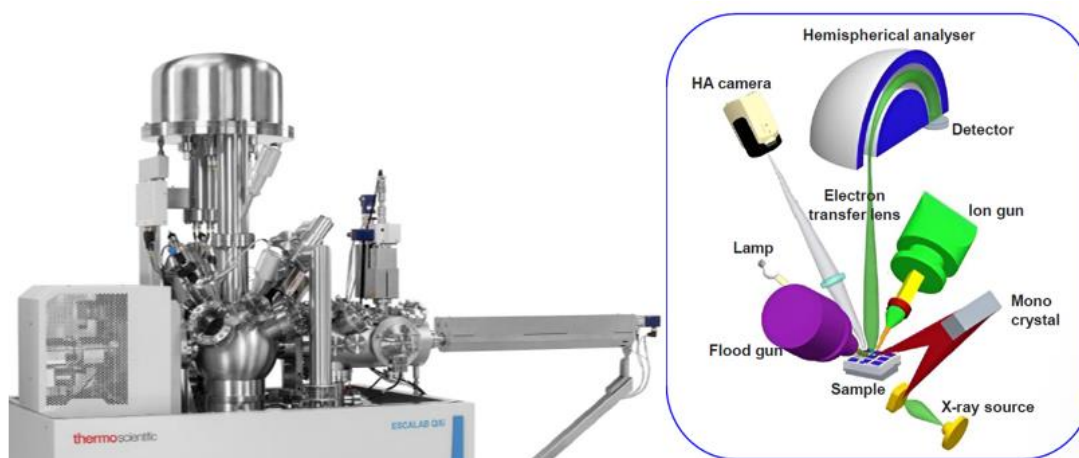
High-Resolution X-ray Photoelectron Spectrometer (HR-XPS)

I. System Specifications and Model:

1. Model: Thermo Fisher Scientific ESCALAB QXi
2. X-ray Source: Monochromated Anode X-ray, Al K α (1486.6 eV)
Variable X-ray Spot Size: 200 μm - 900 μm
3. Electron Energy Analyzer: Hemispherical Analyzer
4. Detectable Elements: Li to U (atomic numbers 3-92)
5. Maximum Sample Size: 1 cm $\times$ 2 cm (thickness < 3 mm)
6. Ion Gun: Argon
7. Charge Compensation System: Flood Gun
8. Ultra-High Vacuum System: $\sim 10^{-9}$ Torr

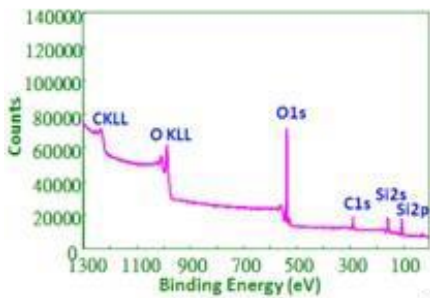
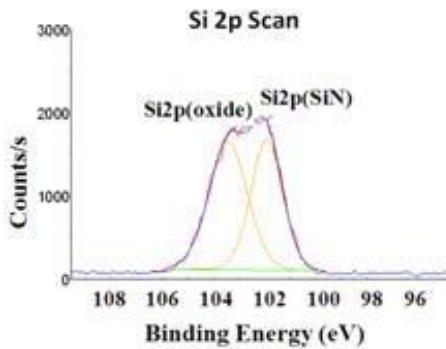
II. System Overview:

The system consists of four main components: (1) X-ray source: provides the incident X-rays for XPS analysis; (2) energy analyzer: analyzes the kinetic energy of photoelectrons emitted from the sample surface; (3) ion gun: used for sample-surface cleaning and depth-profile analysis; and (4) charge compensation system: uses low-energy electrons and ions for charge neutralization. (The system configuration is shown in the figure below.)

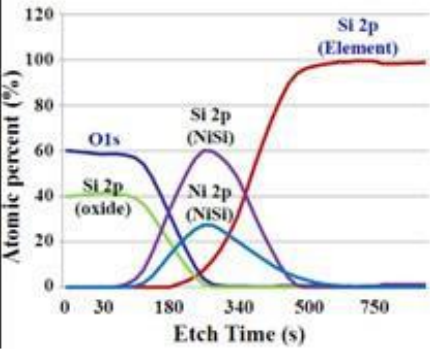
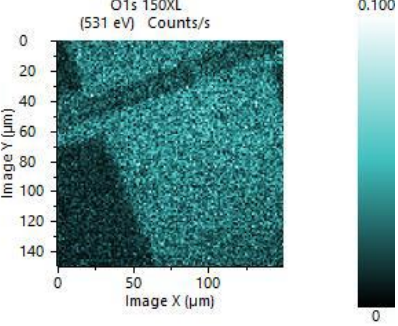
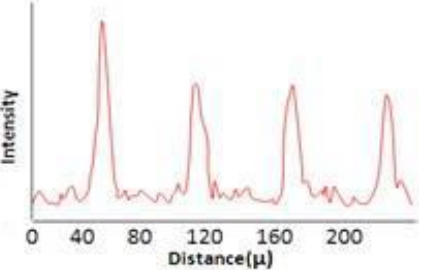


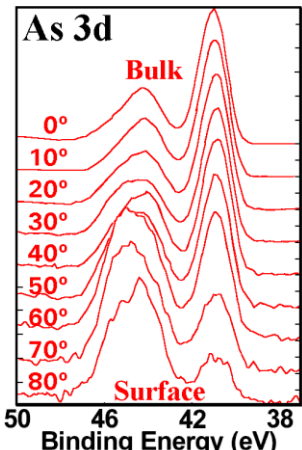
III. Functions and Applications:

When the sample surface is irradiated with an X-ray beam, photoelectrons emitted from the outermost atomic layers can be collected. Analysis of their energies provides information on chemical states and elemental composition. XPS is also known as ESCA (Electron Spectroscopy for Chemical Analysis).

	Analysis Item	Description	Example
1	XPS Survey (Surface Composition Analysis)	Analyzes the elemental composition of the sample surface to a depth of approximately 75 Å.	
2	Surface Chemical-State Analysis (Narrow Scan)	Analyzes the chemical bonding states of elements on the sample surface.	

3	Quantitative Analysis	Converts detected elemental signals into quantitative elemental concentrations.			
			Name	Peak BE	At. %
			Si2p	99.22	68.78
			O1s	531.98	19.12
			N1s	396.86	12.1

4	XPS Depth Profile (Depth Composition Analysis)	By controlled ion-beam sputtering of the sample surface, electron signals from different depths are analyzed to obtain an elemental composition depth profile.	
5	XPS Mapping (Imaging Analysis)	Detects elemental signals within a selected sample area to obtain a spatial distribution image of surface elements.	
6	XPS Line Scan (Line-Scan Analysis)	Detects elemental signals along a selected line on the sample to obtain the surface elemental distribution along that line.	

7	Angle-Resolved XPS (ARXPS)	Performs surface composition and chemical-bonding analysis of thin-film samples (thickness < 7 nm) at multiple detection angles.	
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Analytical Capabilities:

1. Detectable elements: All elements except H and He
2. Detection limit: 0.5-0.01 atomic %
3. Analysis/sampling depth: 5-75 Å
4. Excellent capability for surface chemical-state identification
5. Focused X-ray source spot-size range: 200-900 µm.
6. ARXPS capability, offering advantages such as nondestructive analysis and thin-film analysis for thicknesses < 7 nm.
7. Applicable to conductive and insulating materials, high-k materials, CIGS, polymers, transparent films, and other sample types.
8. Contact Information, Service Fees, and Submission Link

✓ Contact Information:

Contact Person	Extension	Email	Instrument Location
Tung-Yuan Yu	7528/7424	tyyu@nlar.org.tw	R221
Po-Jung Huang	7605/7424	scottiehuang@nlar.org.tw	

✓ Service Fees:

Equipment ID	Equipment Name	Service Fees		
		Self-Operation Rate (NT\$/hour)	Service Operation Rate (NT\$/hour)	Remarks
NM-027	X-ray Photoelectron Spectrometer	11,000 NT\$/hour	14,000 NT\$/hour	Academic Rate: 8% of the Standard Fee
Note: Service-operation time of less than 30 minutes will be charged as 30 minutes.				