

PHI
Quantera II
Scanning XPS Microprobe

Unique Scanning XPS Microprobe

X-ray photoelectron spectroscopy (XPS/ESCA) is the most widely used surface analysis technique and has many well established industrial and research applications. XPS provides quantitative elemental and chemical state information from surfaces and thin film structures. XPS is applied to a diverse range of materials systems including: polymers, metals, thin films, nanomaterials, semiconductors, magnetic storage media, display technology, biomedical devices, and catalysts.

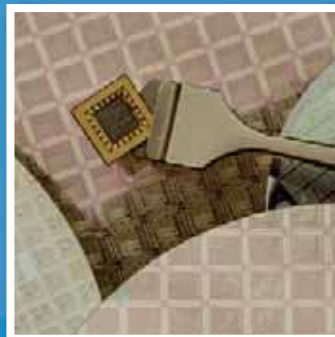
Paints & Polymers



Storage Media



Micro-Electronics



Thin Film Coatings



Monochromatic Scanning X-ray Source

Secondary Electron and XPS Imaging

High Sensitivity Large and Micro-Area Spectroscopy

Superior Inorganic and Organic Depth Profiling

Unequaled Productivity

DESIGNED TO SOLVE YOUR MATERIALS PROBLEMS

The *Quantera II* is built upon the revolutionary technologies Physical Electronics (PHI) introduced with the *Quantum 2000* including: a patented micro-focused scanning x-ray source, patented dual beam charge neutralization technology, a floating column ion gun for XPS sputter depth profiling, flexible robotic sample handling, and a fully automated internet ready instrument platform. The *Quantera II* increases the performance and productivity of these revolutionary technologies, providing the highest performance XPS system available to meet your current and future XPS needs.

Medical Devices



Worry-Free XPS

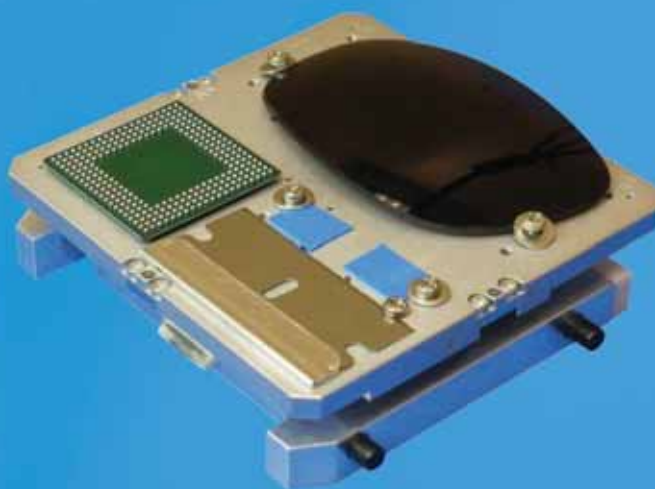
USER FRIENDLY

Whether you are analyzing a thin polymer sheet, a large plastic lens, a steel razor blade, or electrically isolated solder bumps; the instrument set-up is the same. Point and click at an optical image to select the analysis areas. Then start the analysis with the dual beam neutralizer and the auto-Z functions activated to provide automatic sample alignment and charge neutralization. There is no individual sample tuning, no concerns over sample composition and size, and no worries about walking away from the instrument and letting it automatically collect data from all your samples.

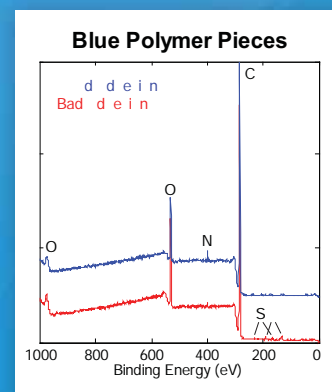
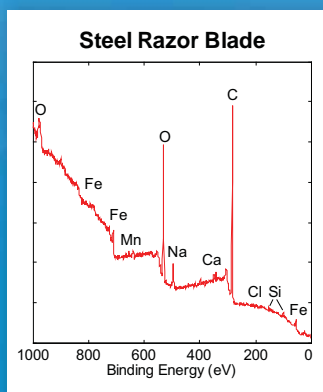
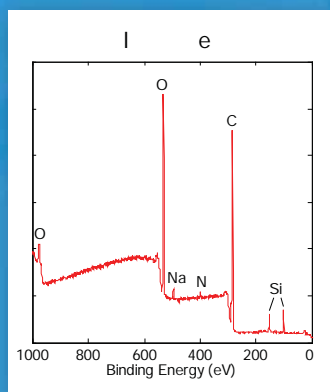
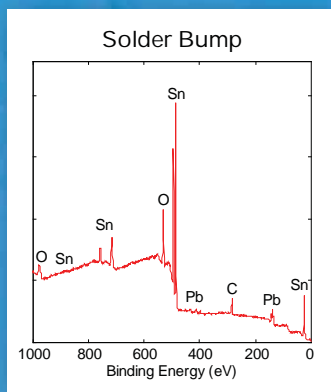
Robust Automatic Sample Alignment ("Auto-Z")

Hands-Off Charge Neutralization

No Special Sample Mounting or Masking



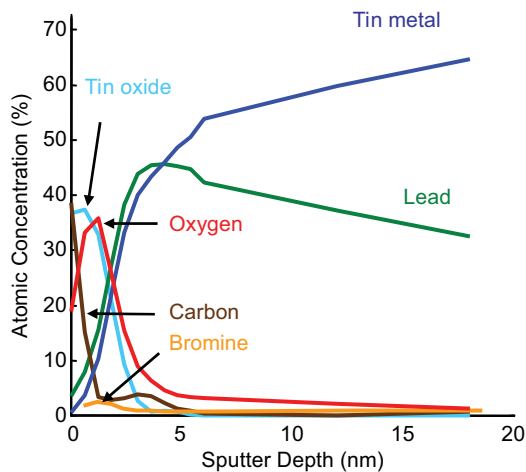
Fully Automated Unattended Analysis



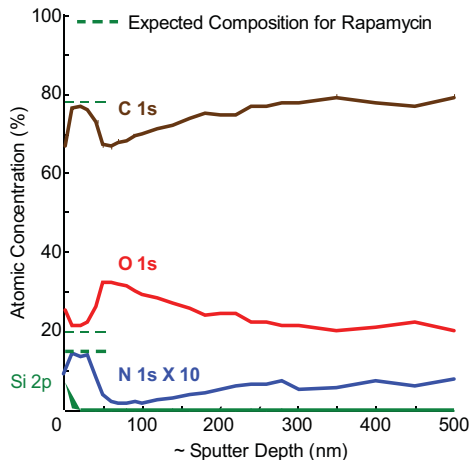
Thin Film Analysis

OPTIMIZED CONFIGURATION

A focused x-ray beam, high sensitivity spectrometer, high performance floating column ion gun, turnkey dual beam charge neutralization, compucentric Zalar rotation, and advanced data reduction algorithms provide the highest performance XPS depth profiling capability available. Applications include: semiconductor thin film structures, magnetic media thin films, optical coatings, decorative coatings, wear coatings, and with the optional C_{60} sputter ion gun polymer and organic thin films such as time release drug coatings and organic LED films.



2 keV sputter depth profile of the surface species on a solder ball used for semiconductor packaging



10 keV C_{60} depth profile of a 50/50 rapamycin and PLGA film showing segregation of the rapamycin to the surface of the coating.

INORGANIC THIN FILM ANALYSIS

- 0-5 kV floating column ion gun
- Low voltage depth profiling for ultra thin films
- Bend in column to stop neutrals
- Compucentric Zalar rotation
- Effective dual beam charge neutralization
- Micro-area depth profiling
- Multi-point depth profiling

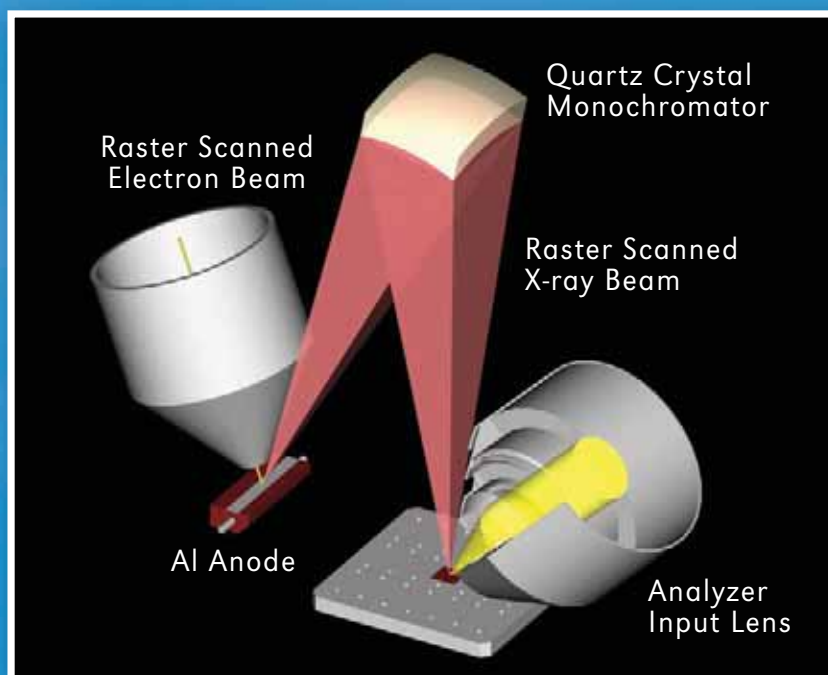
ORGANIC THIN FILM ANALYSIS

- Optional 10 kV and 20 kV C_{60} sputter ion guns
- Mass filtered C_{60} ion beam
- Bend in column to stop neutrals
- Sputters many polymer and organic materials without damaging their chemistry

Scanning XPS Microprobe

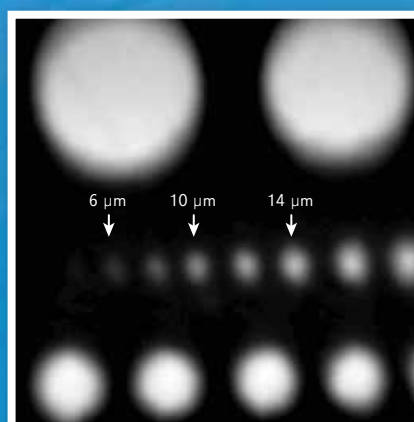
UNIQUE TECHNOLOGY

PHI's patented scanning x-ray source provides a scanning microprobe environment for performing micro-area XPS analysis. An electronically raster scanned micro-focused electron beam strikes an aluminum anode creating a point source of aluminum x-rays. The ellipsoidal shaped monochromator delivers a scannable focused beam of monochromatic aluminum x-rays to the sample surface. When the electron beam is scanned on the aluminum anode, the x-ray beam is scanned on the sample surface. The diameter of the x-ray beam can be adjusted from less than $7.5\ \mu\text{m}$ to $300\ \mu\text{m}$ in diameter.



PATENTED TECHNOLOGY

- US Patent 5,315,113
- US Patent 5,444,242
- JP Patent 3752252B2
- JP Patent 3754696B2
- EP Patent 0590308B1
- EP Patent 0669635B1
- EP Patent 1220280B1



SPATIAL RESOLUTION

X-ray beam induced secondary electron image of an MRS-3 magnification standard shows the ability to resolve features as small as $6\ \mu\text{m}$ in diameter.

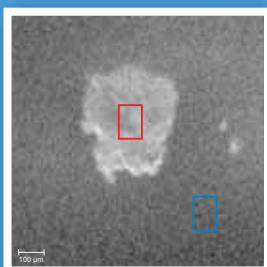
Micro-Area Spectroscopy

UNEQUALLED PERFORMANCE

The *Quantera II* Scanning X-ray Microprobe provides the ability to routinely obtain XPS spectra from small patterned features and localized contaminants. Its unique scanning x-ray source provides real time secondary electron images to locate features for analysis and the sensitivity needed to quickly obtain micro-area spectra from them. In the example shown below, multiple contaminants were quickly located and identified by the *Quantera II* with no prior knowledge of their location and composition.

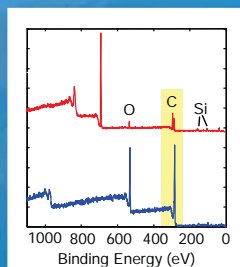
SCANNING XPS MICROPROBE

SE IMAGING

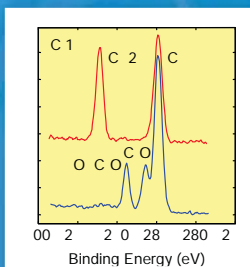


Secondary Electron Image

MULTI-AREA SPECTROSCOPY



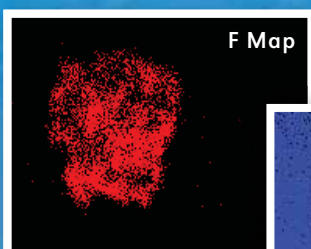
Survey Spectra



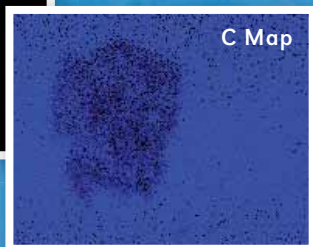
Carbon 1s

No contaminants were visible with an optical microscope on the surface of this transparent polymer film. A secondary electron image immediately revealed the presence of unexpected localized contaminants on the polymers surface. Micro-area spectra obtained with a 20 µm diameter x-ray beam identified a fluorocarbon contaminant in a few minutes.

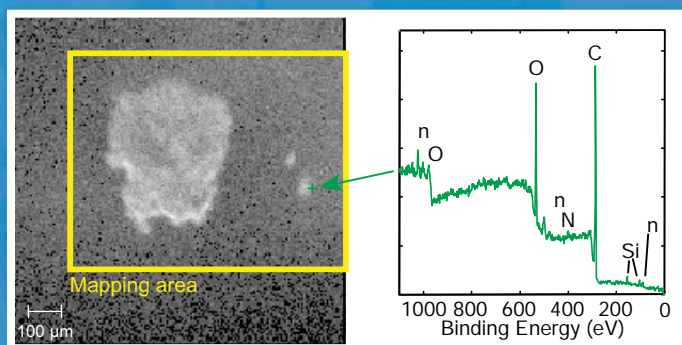
CHEMICAL IMAGING



F Map



C Map



Mapping area

Elemental maps show the smaller features in the secondary electron image do not contain fluorine.

A micro-area spectrum from the smaller features, obtained using a 10 µm diameter x-ray beam, identifies the presence of a second contaminant that contains Zn.



Quantera II's Features and Accessories

FEATURES

- X-ray microprobe with $\leq 7.5 \mu\text{m}$ spatial resolution
- High sensitivity electrostatic detection optics
- Dual beam charge neutralization
- Robotic sample handling
- Samples up to 100 mm diameter and 25 mm thick
- Two internal sample parking stations
- High performance floating column ion gun
- High speed snapshot depth profiling mode
- Quantitative chemical state mapping
- Automated angle dependent profiles
- PHI *MultiPak* data reduction software

OPTIONAL ACCESSORIES

- Sample Positioning Station
- Hot/Cold sample stage
- Cold sample introduction apparatus
- Sample transfer chamber to external test stations
- C_{60} sputter cleaning and depth profiling apparatus

PHI MULTIPAK

PHI *MultiPak* is the most comprehensive data reduction and interpretation software package available for electron spectroscopy. The tasks of spectral peak identification, extracting chemical state information, quantification, and detection limit enhancement are addressed with an array of powerful and easy-to-use software tools. *MultiPak* can be used on the instrument PC to process data in real time or on an off-line PC for report generation. Important features of *MultiPak* include:

- Intuitive point-and-click user interface
- Complete set of standard data reduction tools provides accurate quantitative and chemical state information
- Powerful advanced numerical analysis tools
- Batch processing of large data sets
- Copy and paste report generation support
- Easy export of numerical results

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