X-ray Photoelectron Spectroscope (XPS) (ULVAC-PHI Quantum 2000)

XPS provides chemical state analysis at a detection limit down to 0.1 atomic percent. It allows evaluation of valence states, bonding and molecular composition of a sample surface.

Features and capabilities:

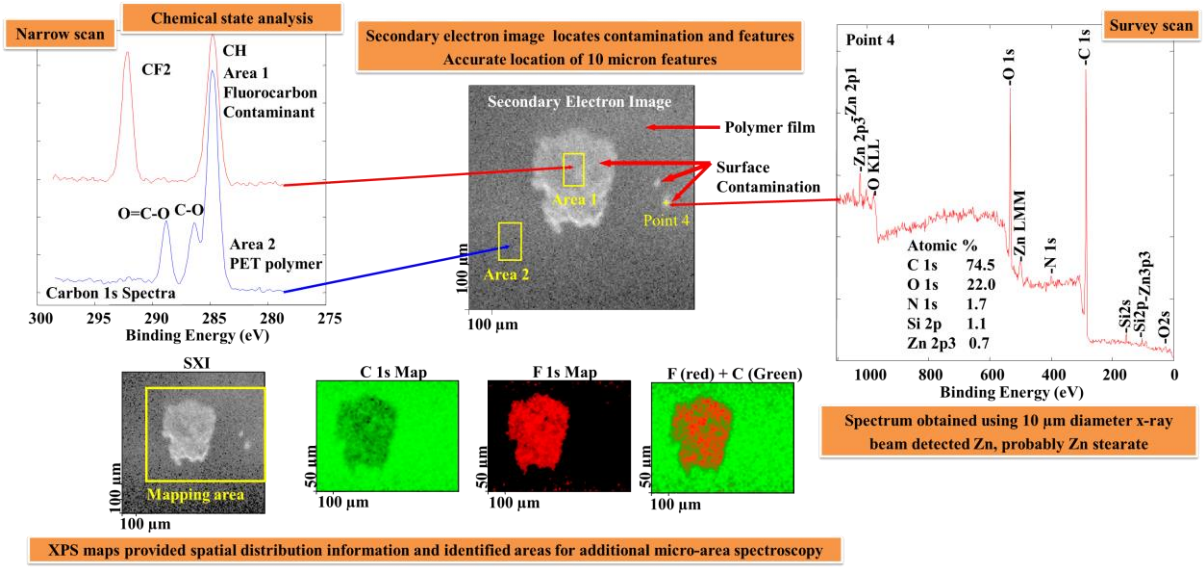
- Analyze the topmost 5-10nm layer of the material (a powerful surface analytical technique)
- Quantitative elemental composition and chemical state analysis (Non-destructive)
- Bulk material composition analysis (Depth profiling)
- Elemental and chemical mapping analysis across surface
- Multi-sample automated analysis
- Suitable for both conducting and insulating materials

Industrial applications including:

- Detection of surface contamination
- Failure analysis of adhesive bond failures
- Identification of causes of corrosion or material degradation
- Surface and near-surface characterizations of process-dependent material compositions
- Stoichiometry of deposited films or chemistry of reacted particle surfaces
- Materials surface composition changes due to heating, radiation, or absorption
- Evaluation of surface cleaning processes
- Semiconductor materials problems for epitaxial materials, bonding pads, barrier and oxide layers
- Nanomaterials surface and interface characterizations
- Metal Oxide composition as a function of depth, such as check for oxide enrichment by Cr in stainless steels
- Hard disk drive surface characterization and delamination problems
- Coating analysis, including surface chemistry difference from the bulk coating chemistry

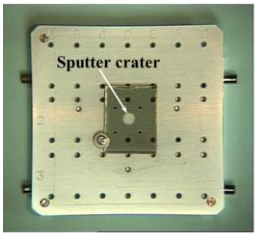
Application examples

Contamination study on polymer film



Chemical Analysis of Multi-layer Thin Films

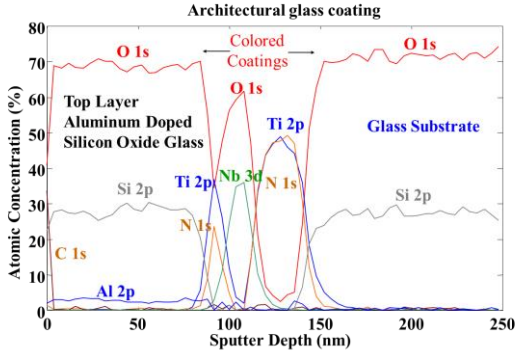
Depth profile of Insulating Thin Films



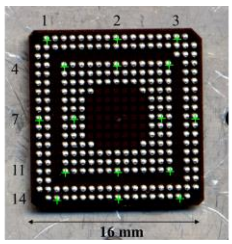
Sample platen 75 X 75mm

Sample:
100nm multi-layer coating on
5mm thick architectural glass

- ***Quantitative Chemical Analysis of Layer Structures of Films***
- ***Thickness measurement of each layer***



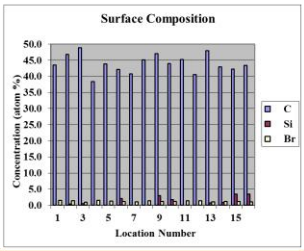
Automated Solder Ball Characterization



16 solder balls were selected for analysis

Element	Average Concentration (%)	Standard Deviation (%)
Carbon	43.9	2.9
Nitrogen	1.1	0.6
Oxygen	34.0	1.8
Silicon	1.0	1.3
Bromine	1.2	0.2
Tin	16.8	1.6
Lead	2.0	0.3

- ***Surface composition plays a critical role in bonding***
- ***With the Quantum 2000 it is a simple task to locate and analyze multiple solder balls***
- ***With the exception of silicon, solder ball surface composition is uniform across the package***



Carbon and bromine concentration is relatively constant, but silicon concentration varies significantly with location