Surface Analysis Laboratory (SAL)

In our laboratory, we do surface analysis of the materials' surfaces and interfaces in order to get informations of elemental and molecular species. According to the technique that is applied, the surface that is analysed could be varied from the top mono-layer (real surface) or the microns depth. The material is bombarded by X-ray or ions under ultra high vacuum and by those techniques the elemental composition of the material, information about chemical bonding and impurities are obtained. Also in order to see the interfaces and to observe the dopant and the distribution of elemental and molecular species of the materials in different layers, we perform depth profiling.

In the laboratory, wide range of materials are being performed, such as *semi-conductors, polimers, solar cells, organics, inorganics, textiles, glass,paper,metals,ceramics, pharmaceuticals,* ... etc. For those analysis there are two different instruments which are complementary to each other. These are X-Ray Photo electron spectroscopy (XPS) and Time of Flight Secondary Ion Mass Spectroscopy, (ToF-SIMS).

BASIC PRINCIPLES :

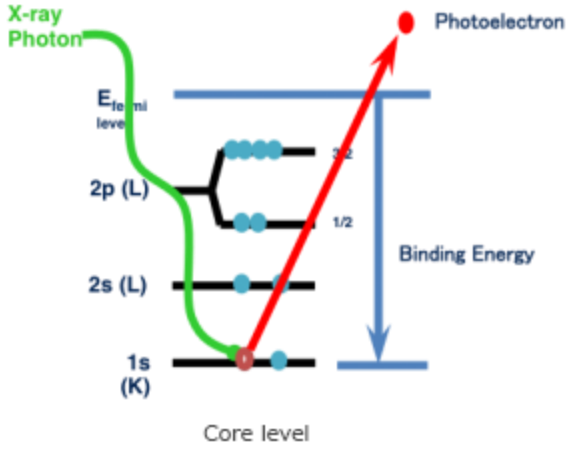
X-Ray Photoelectron Spectroscopy (XPS): X-Ray photoelectron Spectroscopy Electron Spectroscopy for Chemical Analysis, ESCA is an advanced spectroscopy technique to provide information about the chemsitry of the surfaces of solid materials. This method use soft X-ray in order to get a photoelectron from the surface.

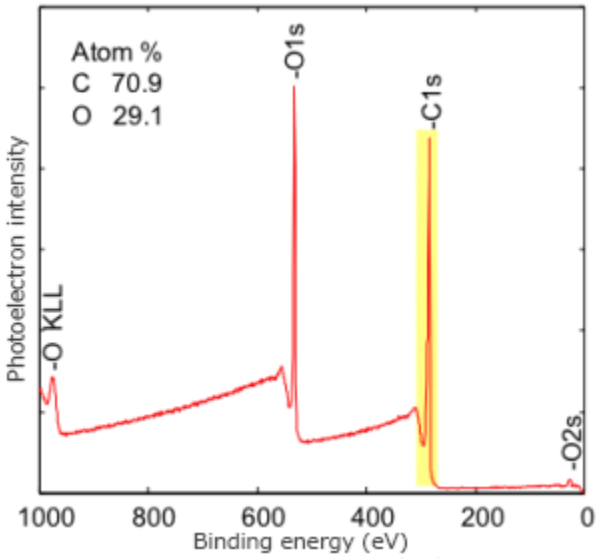
Principle

X-ray Photoelectron Spectroscopy (XPS) or Electron Spectroscopy for Chemical Analysis (ESCA) is a technique which analyzes the elements constituting the sample surface, its composition, and chemical bonding state by irradiating x-rays on the sample surface, and measuring the kinetic energy of the photoelectrons emitted from the sample surface. XPS instrument using Al Kα rays can generally obtain information on elements within a few nms of the sample surface.

Additionally, the change in bond energy (chemical shift) caused by the electron state surrounding the atoms to be analyzed, such as atomic valence charges and interatomic distances, tend to be greater than the chemical shift observed in AES, which makes the relative ease with which the state of chemical bonds can be identified another advantage of XPS.

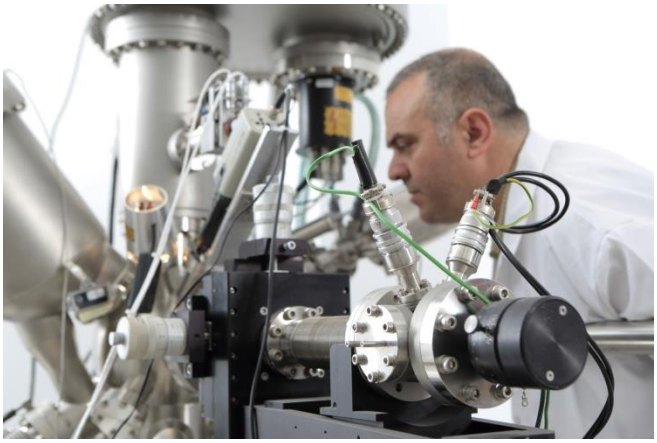
The spectrum provides information about elements' oxidations states, their chemical bondings and also the atomic percentage of the surface.





Sputter ion gun (argon ion gun)

Since the information depth measurable with XPS is in the range of several nms from the surface, when the surface contamination layer is thick, or when evaluating a deeper area, ion sputtering is used to perform surface etching. An element composition or chemical bonding state depth profile can be obtained from the spectrum information gained through alternating between sputtering and measurement. Depth profiles are used for film thickness evaluation of samples with a multilayer structure and cause analysis for discoloration/corrosion of metal.

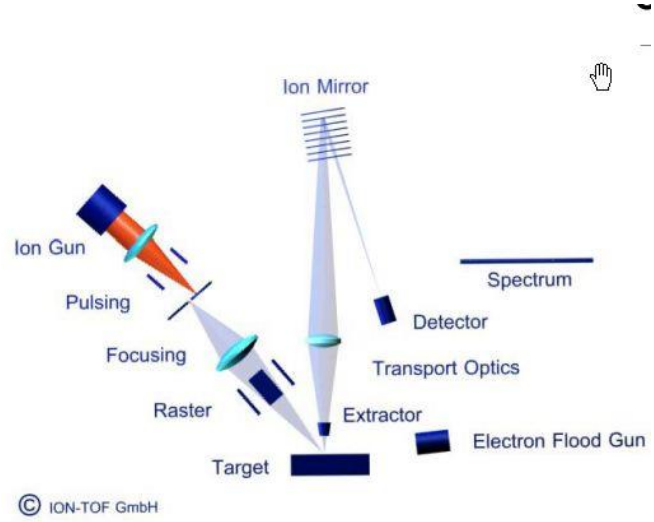


PHI VersaProbe motorize beş eksenli örnek yükleme haznesi ile 25 mm ve 60 mm çapında örnek tutuculara sahiptir. Ayrıca 7 mm kalınlığa sahip örnekler analiz için kabul edilebilmektedir.

Time-of-Flight Secondary Ion Mass Spectrometry (ToF-SIMS):

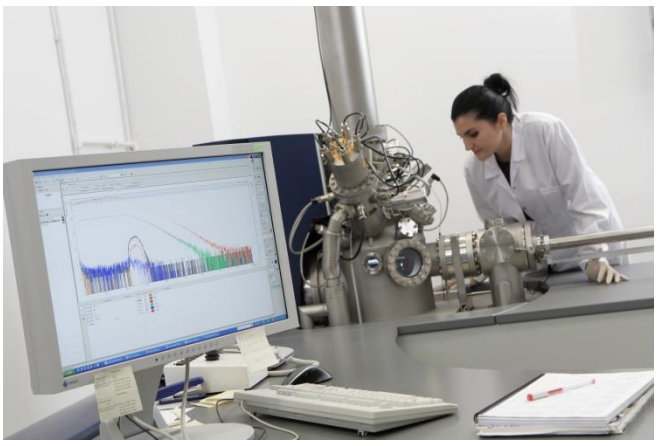
Time-of-flight secondary ion mass spectrometry is a very sensitive surface analytical technique, well established for many industrial and research applications. It provedes detailed elemental and molecular information about surfaces, thin layers, interfaces of the samples. For ToF-SIMS analysis, a solid sample surface is bombarded with a pulsed primary ion beam. Both atomic and molecular ions are emitted from the outer layers of the surface and extracted. Their mass is measured by their time of flight to detector. The analysis cycle is repeated at high frequency to generate the complete mass spectrum with high dynamic range.

- Parallel detection of all os, rcand inrganic,
- Unlimited mass range
- High mass resolution at full tranmission
- High lateral in-depth resolution
- High sensitivity in the ppm/ppb range



In addition to surface analysis, it is also possible to do depth profiling range of microns. In depth profiling, according to the polarity of interested ions either Cs or O ions are used as sputter beam.

- Depth resolution better than 1nm
- High mass resolution
- Sputter speed of up to 10um/h
- Ideally suited for insulators



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