XPS-AES
Kratos AXIS UltraDLD, X-Ray photoelectron Spectrometer

XPS is a surface-sensitive quantitative spectroscopic technique mainly used to analyze the surface chemistry of a material. XPS is capable to measure elemental composition, empirical formula, chemical state and electronic state of the elements that exist within a material. XPS is routinely used in the characterization of polymers, alloys, semiconductors, minerals, inks, adhesives, inorganic materials, glass, thin films, etc. and to study surface effects/process as segregation, diffusion, adsorption and desorption, corrosion, degradation, adhesion, soldering, contamination, cleaning, coating, functionalization, etc.

Typical areas of interest are, among others, the following:

- Thin films and coatings.
- Surface functionalization.
- Polymers and adhesives.
- Mineralogy, geochemistry, and petrochemistry.
- Metalurgy.
- Catalysis.
- Microelectronics and semiconductors.
- Surface characterization of solids.

XPS is a surface-sensitive spectroscopy (first 3 to 10 nm). ARXPS (angle Resolved XPS give us also information about depth profile (distribution of elements, thickness of coatings, multilayers and oxide layers…). Combining XPS analysis and Ar^+ ion sputtering the technique is capable to carry out depth profile studies of several hundred of nanometers.

The expertise of our scientific and technical staff is also offered to researchers from public and private research centers and also to professionals from industrial sectors that require the use of this instrument.

What kind of information can be obtained with XPS?

XPS spectroscopy provides the following information about the sample:

Elemental composition

Quantitative and qualitative elemental analysis

Chemical structure

Quantitative and qualitative analysis of oxidation states of elements

Imaging

Lateral distribution of chemical composition (elements / oxidation states)

Depth profiling (Angle Resolved XPS / sputtering)

Depth profile of chemical composition
Thickness of coatings, functionalized layers and oxide layers

Detection limits

. Sensitive to elements with $Z \geq 2$ (all elements except for H and He)
. Typical minimum detectable concentration: 0.1 – 1% (atomic)
. Typical quantification error: ~10%
. Resolution limit (imaging mode): 3 µm.

Sample requirements

Any sample (conductive, non-conductive, magnetic, organic, inorganic, powder, bulk, viscous) provided it is compatible with high vacuum.

- There is no need of any specific sample preparation or coating process.
- Non-destructive analysis.
- Sampled area from 10 µm (minimum) – 500 µm (standard).
- Analysis depth: 3 – 10 nm (higher is possible by etching).

Technical specifications

- Analysis chamber with base pressure < 10^{-9} Torr.
- Al mono and Al/Mg dual X-ray.
- Multi-detector energy analyser and 2D image in parallel.
- Sample holder for 4-axis high-precision displacements.
- ARXPS – Angle Resolved XPS.
- Electron gun for AES/SEM/SAM.

- Ar^+ ion milling for cleaning and etching (depth profile).
- Charge neutralizer (flood electron gun and magnetic lenses).
- Analysis software and databases.

Images and examples

Fig.1 Martín et al. Chem. Eur. J. 2014, 20, 3421.

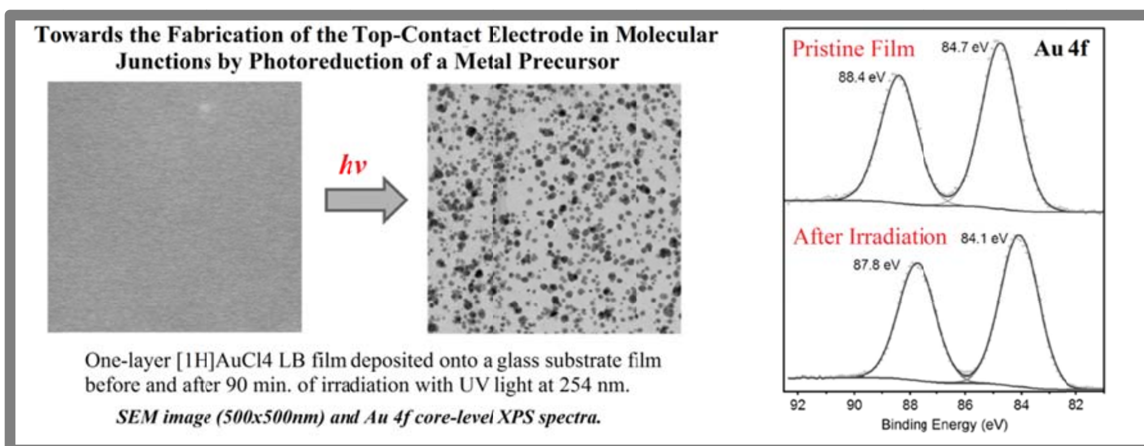

Fig.2 Lucía González et al. Chem. Mater., 2013, 25 (22), pp 4503–4510

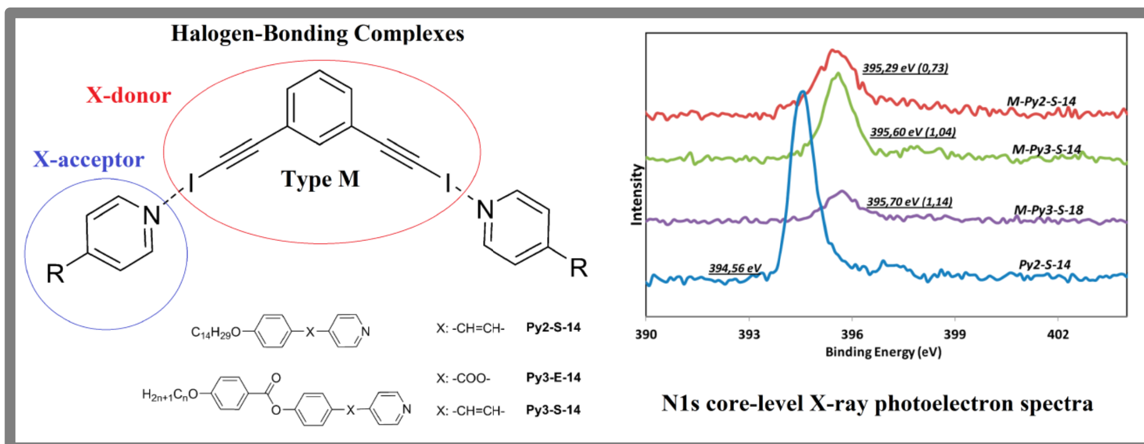

Fig.3 Mizrahi et al. Langmuir 29 (2013) 10087-10094

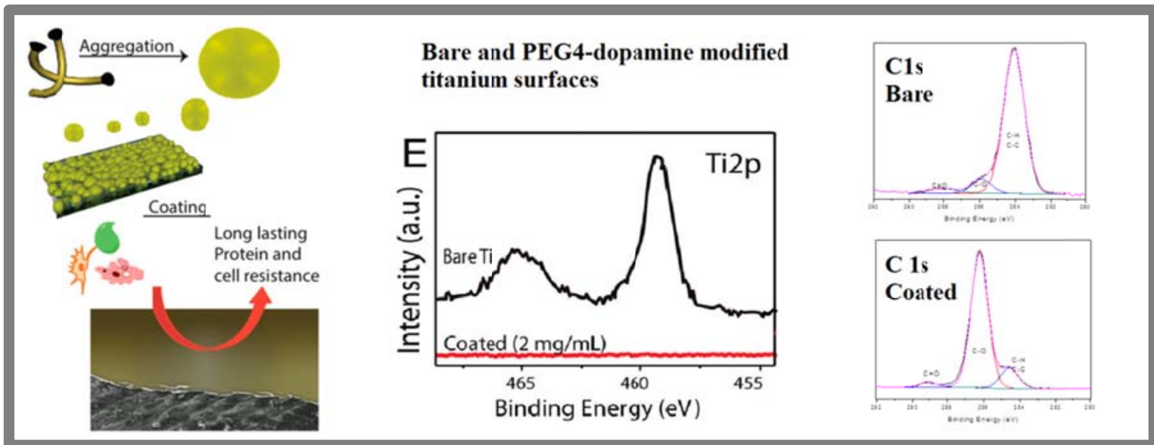

Fig.4 Ballesteros et al. Langmuir 2011, 27, 3600–3610