ARISTOTLE UNIVERSITY OF THESSALONIKI
RESEARCH COMMITTEE

SURFACE ANALYSIS LAB

The Surface Analysis Laboratory,
located in the Department of Physics,
houses a X-ray Photoelectron Spectroscopy system (XPS)
and a Scanning Auger Microscopy and Spectroscopy system (SAM/AES).
The system enables quantitative elemental identification
and analysis of the surface chemical state
with depth information just a few nanometers.
It also has the possibility of surface etching by an argon ion source
and a depth profiling chemical analysis.
Also XPS imaging allows
the mapping of the chemistry of the surface,
with spatial resolution of a few microns.

Application Field

1. Nanotechnology (highly complex nanostructures)
2. Catalytic and Petrochemical (active surfaces)
3. Coating, Thin Film technology and heterostructures (surface-interface and quantitative analysis)
4. Biomaterials
5. Organic and polymeric materials

Services Offered to Third Parties

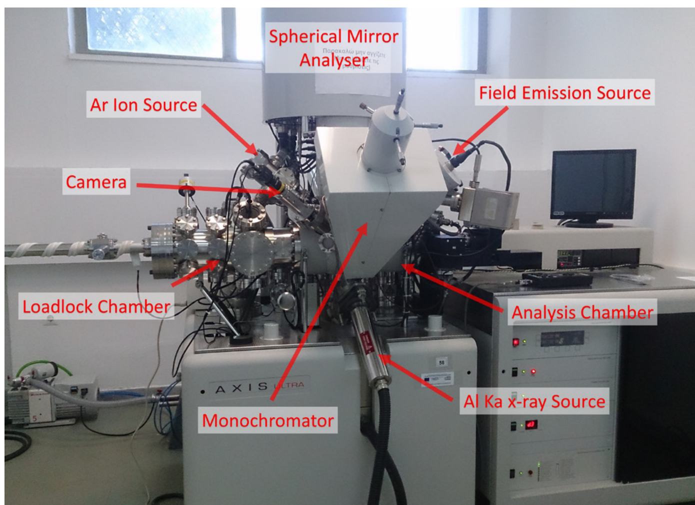
1. Extensive surface and depth profilling study
2. Chemical analysis of high technology samples
3. High demanding systems and composites analysis
4. Provision of analytical reports, audited by a scientific leader.

Surface Analysis Lab

Head of the Laboratory
Konstantinos Chrissafis, Professor

Members of the Lab/Research Team
G. Vourlias, Assoc. Professor
P. Patsalas, Professor
D. Karfaridis, PhD student
N. Pliatsikas, PhD
A. Teknetzi, Phd student

Contact
T +30 2310990305 • **E** dkarfari@physics.auth.gr • **W** surface.physics.auth.gr, xopth.physics.auth.gr



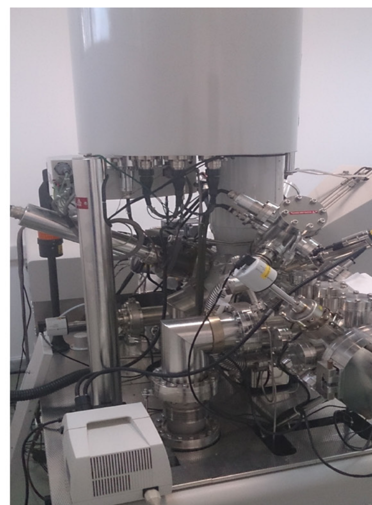


Figure 1
Left: AXIS UltraDLD X-ray Photoelectron Spectroscopy (XPS) and Scanning Auger Microscopy and Spectroscopy System (SAM/AES) by Kratos Analytical.
Right: Back view of the system on the side of the load-lock chamber and of the Ar+ Ion Source. The cluster equips the Surface Analysis Laboratory located in the Department of Physics. The main parts are marked in the figure with the corresponding arrows.

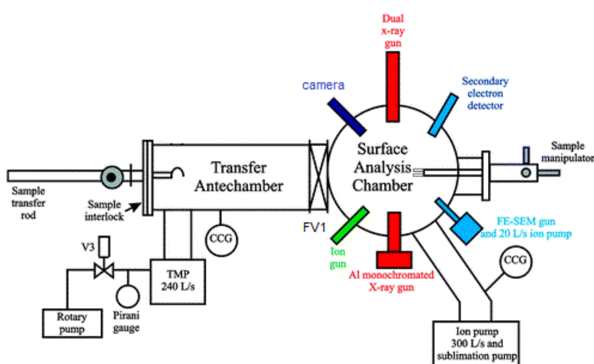


Figure 2 Schematic representation of the cluster's view. The cluster is composed of two chambers; The load-lock (left) chamber and the main analysis chamber (right). Distinguish the Al monochromatic X-ray gun, the rear dual X-ray source, the Ar+ ion gun and the Electron source and detector.

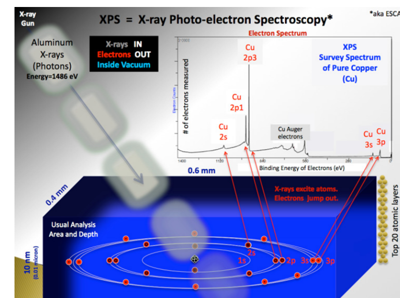


Figure 3 The Photoelectric Effect using as an excitation source an Al-Ka, X-ray anode and an electron spectrum (widescan) obtained from a measurement showing the XPS peaks from the surface's elements.

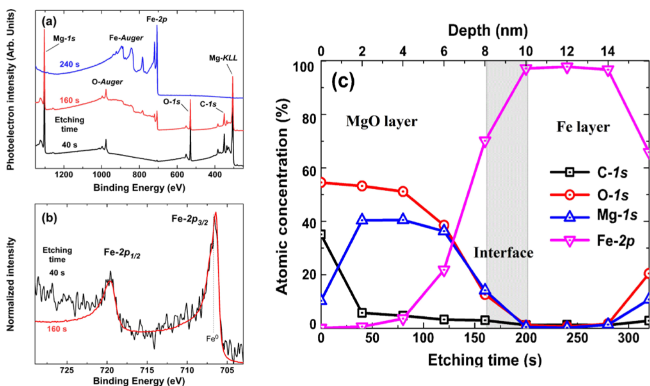


Figure 4 XPS measurements with etching process (etching rate ~ 0.38 Å/sec) on MgO(10nm)/Fe(6nm) thin bilayers. (a) Representative widescan spectra in 3 different depths from the initial surface. (b) Indicative high resolution (HR) XPS peaks from the Fe-2p orbitals during the etching process. (c) Diagram of the percentage elementary concentration as a function of the analysis depth. XPS depth profiling proved the existence of a sharp interface between the layers.

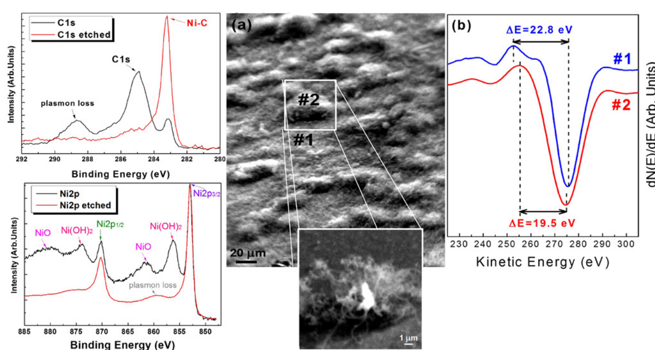
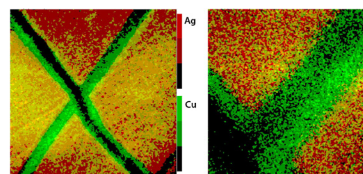


Figure 5 HR XPS measurements of nanocomposite catalysis of DLC:Ni for the growth of carbon nanotubes (CNTs) before and after the Ar+ ion etching of the surface. FEG AES measurements and quality tests of CNTs carried out from two different spots as shown in the SAM images. Spot #1 indicates CNTs of excellent quality because of the nano-scale Ni particles presence as substrate for the growth of CNTs. Spot #2, on the other hand, shows CNTs of bad quality.the layers.



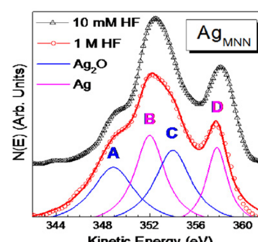


Figure 6
Upper figure: XPS imaging technique for the examination of the component allocation on the surface of a self-patterned Ag-Cu sample. The color matching reveals the concentration of each material in 2D as recorded.
Lower figure: Observation of the oxidation states of Ag plasmonic NPs by means of XAES, through a 4-profile deconvolution peak analysis.