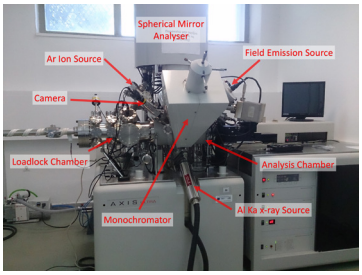
SURFACE ANALYSIS LAB

Short Description

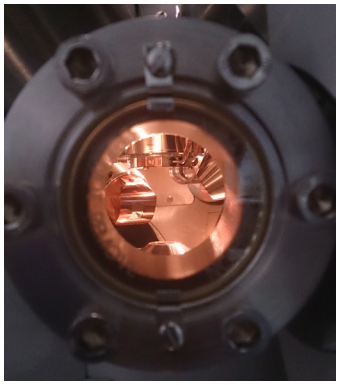
X-Ray Photoelectron Spectroscopy (XPS) and Scanning Auger Microscopy and Spectroscopy (SAM /AES) represent surface chemical state analysis methods of paramount importance for material science and nanotechnology. The Surface Analysis Laboratory, located in the Department of Physics, houses Kratos AXIS ULTRA DLD system. The spectrophotometer enables quantitative elemental identification and analysis of the surface chemical state with depth information just a few nanometers. Also XPS imaging allows the mapping of the chemistry of the surface, with spatial resolution of a few microns.

Application Field

Nanotechnology (characterization of highly complex nanostructures) / Catalytic and Petrochemical (characterization of active surface) / Coating and Thin Film technology (surface and quantitative analysis) / Biomaterials /Organic and polymeric materials

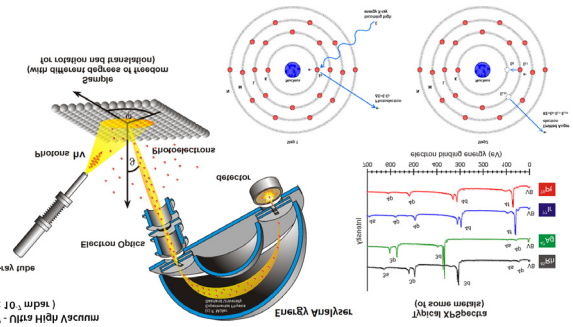


AXIS UltraDLD X-ray Photoelectron (XPS) and Scanning Auger Microscopy and Spectroscopy System (SAM/AES) by Kratos Analytical. The cluster equips the Surface Analysis Laboratory located in the Department of Physics. The main parts are marked in the figure with the corresponding arrows. Distinguish the monochromator and the Al-Ka anode in the center of the analysis chamber, the Spherical Mirror Analyser (SMA) at the top and the Ar+ Ion Gun and Electron sources at left and right respectively.

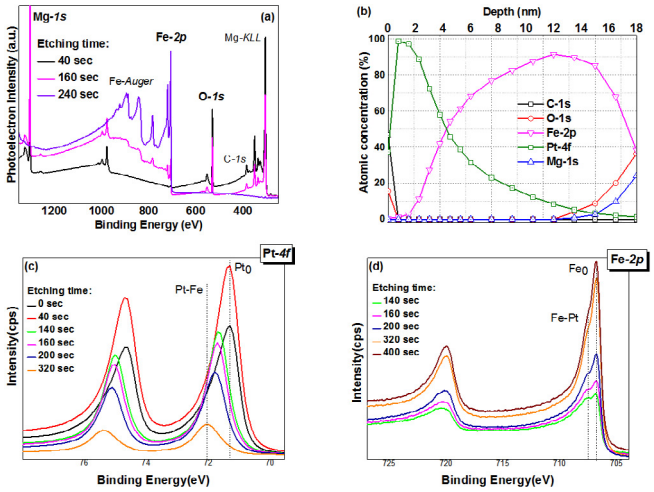


Front Mo-based window of the Analysis chamber. Inside the analysis cluster the head of Dual X-ray source, the input of the SMA and the head of the Field Emission source are distinguished.

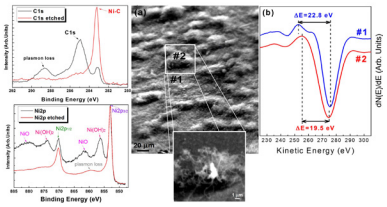
Back view of the system on the side of the Load lock chamber and of the Ar+ Ion Source.



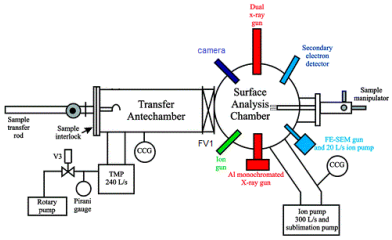
The Photoelectric Effect using an X – ray tube as the excitation source. The Energy Analyzer collects the emitted electrons and the detector through the computer calculates the binding energy from the kinetic energy that the electrons retain. Thus spectra (widescans) from the components are obtained, showing the XPS or Auger peaks coming from the surface.



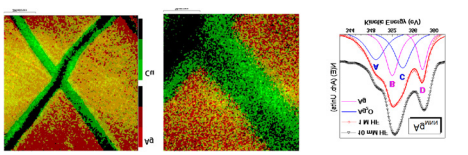
XPS measurements with etching process on Fe(12nm)/Pt(6nm) thin bilayers for spin to charge conversion applications. (a) Representative widescan spectra in 3 different depths from the surface. (b) Depth profiling of the elementary atomic concentration as a function of the depth analysis. (c) High resolution (HR) XPS peaks of the Pt-4f orbitals starting from the surface till the near interface area (etching rate ~ 0.38Å/sec). (d) HR XPS for the Fe-2p orbitals from the near interface area till the MgO substrate. The analysis proved the diffusion of the Pt atoms inside the Fe film and the existence of the Fe-Pt bonding.



HR XPS measurements of nanocomposite catalysis of DLC:Ni for the growth of CNTs before and after the Ar Ion etching of the surface. FEG AES measurements and quality tests of CNTs on two different spots as shown in the SAM images. Spot #1 indicates an excellent quality of CNTs because of the nano-scale Ni particles as substrate for the growth of CNTs. Spot #2, on the other hand, shows bad quality CNTs.



Schematic representation of the cluster's view.



Left: 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. Right: Observation of the oxidation states of Ag plasmonic NPs by means of XAES, through a 4-profile deconvolution peak analysis.

SURFACE ANALYSIS LAB
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