X-ray Photoelectron Spectrometer (XPS)

In 2009, the *Laboratory for Surface Science*, with funds from the Croatian Science Foundation (HRZZ) and the Ministry of Science, Education and Sports (MZOS), acquired an XPS spectrometer from the German manufacturer SPECS, equipped with the following devices:

- FOCUS 500 – monochromatized X-ray source (Al Kα i Ag Lα),
- PHOIBOS 100 MCD-5 – hemispherical electron energy analyzer (diameter 100 mm) with a 5-channel detector,
- IQE 11/35 – ion gun for low-energy ions of inert and reactive gases (0.3 - 5 keV)
- IQE 12/38 – ion gun with focused ion beam and differential pumping,
- precise XYZ sample holder manipulator with controlled heating and cooling (LN2 – 800 °C),
- FG500 – electron gun for surface neutralization,
- Residual Gas Analyzer (Prisma Plus QMG 220).

X-ray Photoelectron Spectroscopy (XPS) or Electron Spectroscopy for Chemical Analysis (ESCA) is an analytical technique for investigating the elemental structure and chemical states on the surface layers of samples. It is applied to a wide range of materials, from metals and semiconductors to organic or biological samples and polymers.

XPS is based on the interaction of X-rays with atoms on the surface of samples, which causes the emission of photoelectrons from the surface. The energies of the photoelectrons analyzed in the electron analyzer are characteristic of certain elements present in the excitation volume. XPS is an extremely near-surface technique with a signal acquisition depth of up to approximately 70 Å. With the addition of ion beam sources that can ablate surface layers in a controlled manner, XPS is widely used for in-depth element profiling of samples and for measuring the thickness and uniformity of thin films. The special feature of the XPS technique is the ability to determine the chemical state of the elements detected on the surfaces, such as distinguishing the oxidation states of different elements.