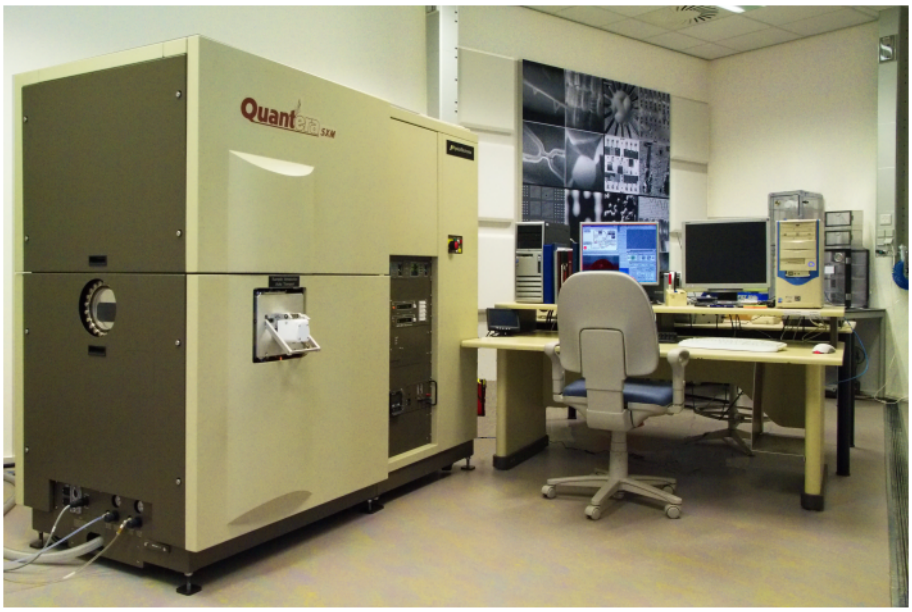
ANALYSIS

MESA+ NanoLab

Scanning X-ray Photoelectron Spectroscopy (XPS)



A monochromatic X-ray beam generates photo electrons in a specimen (mostly solid material, like metals, plastics and papers). Electrons that escape from the surface are detected and their energy measured. The resulting spectrum is a fingerprint of the contents of the specimen. XPS can measure very small amounts of elements, less than one single layer of atoms. It can also give information about the chemical bonding of elements and of the relative depth position. XPS operates in an ultra-high vacuum environment. With XPS it is possible to study the chemical nature of a material surface within the probing depth of approximately 5 nanometer.

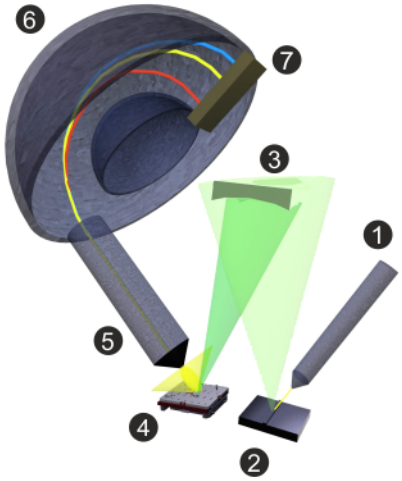
Application

Analysis of the content of very thin, nanometer size, layers at the surface of flat specimens. XPS is of great relevance in many industries, like healthcare. For example, some people need to have metal screws inserted to their bodies, to stabilise their bones. XPS can reveal the chemical nature of these screws, to measure if they are clean and can be used safely.

Photo showing an implant screw, its surface has been studied by XPS to show that the implant is free of contaminations

Schematic overview

1. Scanning electron gun to generate a finely focused beam of 15 keV electrons
2. Aluminium target to generate a broad spectrum of Al X-rays
3. X-ray monochromator, selects and reflects the high intensity Al-Kα line from the broad spectrum
4. Sample on holder, X-rays generate photo electrons
5. Photo electron lens transfers part of the electrons into the analyser
6. Hemispherical analyser assigns different paths to electrons with different energies
7. Multichannel detector counts electrons as a function of their energies.



A computer puts all measurements together into a spectrum, the fingerprint.