Introduction to XPS

January 15-16, 2013 (1.5 day course)
Birck Nanotechnology Center 2001 • 9:00 am

What you should know about X-ray photoelectron spectroscopy?

Course Objectives:

- Learn physics principles of X-ray Photoelectron Spectroscopy (XPS).
- Learn about the analysis of surfaces with XPS and limitations of the technique.
- Learn approaches for qualitative and quantitative analysis of XPS data.
- Learn the types of problems that can be solved with XPS: examples.
- Advanced data analysis: coverage calculation, thin film thickness calculation, etc.

Course Description:

XPS is widely used to determine the chemical composition of a surface (element concentrations, chemical states, lateral and depth distributions, etc.).
Nowadays XPS has become a standard technique for the characterization of solid surface.
The course will teach how and what information can be provided by XPS.

Audience:

The lecture is orientated at a general audience: Scientists, engineers, students, and technicians who would like a detailed understanding of the use of XPS/ESCA for surface analysis.

Instructor:

Dmitry Zemlyanov, Surface Science Application Scientist, Birck Nanotechnology Center, Purdue University.

Total 1.5-Day Cost:

$300

Day 1:

Introduction: terminology, surfaces, types of surfaces.

The Principles of XPS: production of photoelectrons, electronic configuration of atoms and molecules, energy, spectra, peak labeling, Auger process, valence spectra, handbooks, books, surface sensitivity, information depth and attenuation length, spin-orbit splitting, chemical shift, plasmons, multiplet splitting, shake-up. Handbooks and helpful references will be recommended.

Instrumentation: X-ray anodes, monochromatic radiation, electron energy analyzers, energy resolution, spectrum acquisition, energy scale calibration, electron detectors, small area analysis, imaging XPS, vacuum system, samples and sample handling.

Day 2:

Artifacts: radioactive and thermal damage, charging, methods for charge control, ghost peaks.

Qualitative Analysis: identification of elements, changing x-ray sources, charging correction and reference lines, interpretation of chemical shift, relaxation effects, Auger parameter, peak widths, lineshapes.

Quantitative Analysis and Data Processing: sensitivity factors, ionization cross section, asymmetry parameter, analyzer transmission, intensities, background subtraction, satellite subtraction, detection limit, effect of thin overlayers, peak area, lineshapes, curve fitting, deconvolution.

Depth Profiling: non-destructive and destructive methods, angle resolved XPS, elastic and inelastic scattering, sputtering, sputtering depth calibration.

Applications: some further examples of applications of XPS.

Advance Data Processing: coverage calculation, thin film thickness calculation.

Registration at: http://bit.ly/TLWOW3

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