Energy Dispersive X-ray spectroscopy

Purpose of the practicum: acquiring hands-on experience in EDX spectroscopy, understanding of the principles of qualitative EDS analysis, evaluation of EDS data.

Results to be achieved: setup the proper TEM condition for getting EDS spectra, evaluation of structure and composition of complex semiconductor device.

Background

General

http://www.microscopy-analysis.com/download/449/XRayMicroanalysisTutorial_MAJuly06.pdf

High energy electron interaction with the matter and origin of characteristic X-rays.

http://www.microscopy.ethz.ch/xray_spectrum.htm
http://seallabs.com/hiwedx.htm
http://microanalyst.mikroanalytik.de/info1.phtml
http://microanalyst.mikroanalytik.de/info2.phtml

Working principles and construction of EDX detector.

http://microanalyst.mikroanalytik.de/info3.phtml
http://www.x-raymicroanalysis.com/pages/tutorial1/system1.htm
http://www.x-raymicroanalysis.com/pages/tutorial1/system2.htm
http://www.x-raymicroanalysis.com/pages/tutorial1/system3.htm

Content of the practicum and consequent report

All the steps of practical operation of the instrument will be explained and shown by demonstrator at place. Participants will follow up instructions and obtain their own data for further evaluation. It is advised to have a memory stick for data pick-up.

The students will be provided with a cross sectional sample of a complex electronic device (transistor). The task for the practicum will be to describe the structure of the device and to unravel a chemical composition of its components.

Report will include TEM images, EDS spectra and a written evaluation of the findings.

Content of the experiment is as follows:

1. Column alignment
   http://www.rodenburg.org/RODENBURG.pdf
2. Sample orientation and optimization of conditions for imaging and spectra acquisition.
3. Acquisition of the images and identification of principal components of the device.
4. Acquisition of local EDX spectra from different parts of the sample.
5. Qualitative evaluation of images and spectra using TEM and EDX software.