Nano-scale Photoelectron Spectroscopy at Elettra

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The power of photoelectron spectroscopy for the chemical analysis of sample surfaces is well known. In a traditional experimental setup, the sample is homogeneously illuminated by a x-ray spot with a typical diameter of 1 mm. Therefore traditional photoelectron spectroscopy yields averaged information (typically over a 1 mm^2 sample area). However, many samples are not sufficiently homogeneous to allow such a spatial averaging; for example polycrystalline or biological specimen or nanostructured semiconductor devices.

Therefore, on such samples it is highly desirable to perform photoelectron spectroscopy with a spatial resolution better than the structure size of the samples, which often is in the sub-µm range. However, this kind of nano-scale photoelectron spectroscopy is very demanding; in particular it requires a very bright light source. The high brilliance and intensity of the x-rays produced by third generation storage rings has therefore led to a strong increase of nano-scale spectroscopy activities over the last decade.

The beamlines at Elettra which provide spectroscopy with sub-µm lateral resolution are the ESCA-microscopy, the Spectromicroscopy, and SPELEEM at the nanospectroscopy beamline. All three are located at the exits of undulator beamlines. In my seminar I will give a comparison of their performance and some recent results.