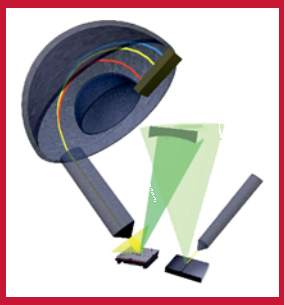
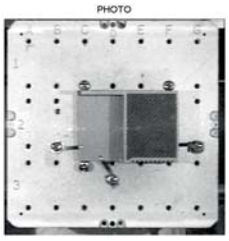


MAPPING XPS

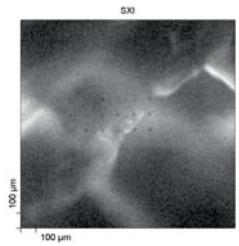
Using the scanning X-ray beam to make images of the elemental composition of very thin layers.

The PHI Quantera XPS has a patented system for generating X-rays with a **rastering beam** of electrons on a steady aluminium anode. The excited spot on the anode acts as a source for X-rays in all directions. The size of the spot is limited by the size of the electron beam. A strained silicon crystal acts as a monochromator and reflector for a part of the x-rays. Like a concave mirror for normal light, the monochromator not only singles out just 1 peak of the aluminium X-ray spectrum but also converges the X-rays onto a small almost circular area on the sample. Photoelectrons from the illuminated area are captured by a detector. This signal is synchronized with the rastering electron beam and an image will be generated. The image intensity depends on the number of electrons that can be freed from the underlying material. There is a relation between the sum of the sensitivity factors of all peaks of an element in the measurable range of binding energies and the intensity. Rule of thumb, a heavier element will appear brighter than a light element.

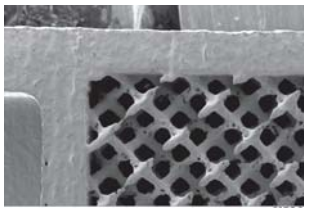
The so called **SXI image**, that can be taken after the neccessary height alignment of a sample with respect to the focal point of the X-ray beam, can be used to find regions of interest on samples. Sample edges and areas with varying electron escape intensities in the top layer can be readily distinguished.



Standard optical picture. 75000x75000µm^2

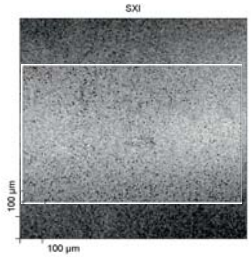


SXI: Photo electron picture generated with scanning X-ray beam. 1000x1000µm^2

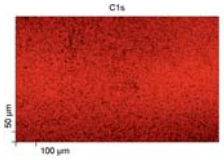


SEM picture, much more electrons available and thus less noise. 8000x6000µm^2

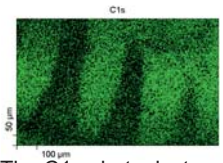
The mapping can also be made with **selected binding energy peaks** only. On samples where structured areas are expected, mappings can show them. For instance a mixture of silicon containing polymers and fluorocarbons.



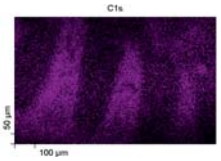
Total SXI, all electrons are counted as function of position.



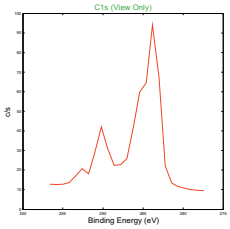
The C1s photoelectron SXI.



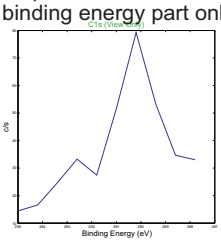
The C1s photoelectron map. Fluorocarbon binding energy part only.



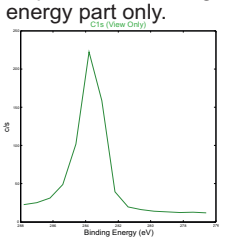
The C1s photoelectron map. Silicone binding energy part only.



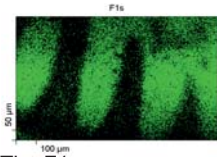
The C1s photoelectron spectrum. The Eb range 277 - 297 eV.



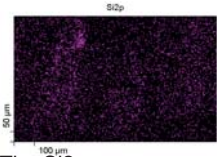
The C1s photoelectron spectrum. The Eb range 288 - 297 eV. Special to fluorocarbons



The C1s photoelectron spectrum. The Eb range 277 - 288 eV. Special to silicones



The F1s map.



The Si2p map.