The Abdus Salam
International Centre for Theoretical Physics

EMAS 2008

8th EMAS Regional Workshop on

Electron Probe Microanalysis of Materials Today

Practical Aspects

including a session on

synchrotron-based microanalysis

19 - 22 April 2008

Adriatico Guesthouse
The Abdus Salam International Centre for Theoretical Physics
Trieste, Italy

Book of Abstracts

ELETTRA MICROSCOPY PROGRAMMES

Maya Kiskinova*

Sincrotrone Trieste S.C.p.A.
Area Science Park, IT-34012 Basovizza-Trieste, Italy
** maya.kiskinova@elettra.trieste.it*

ABSTRACT

The complementary capabilities of different microscopy approaches in terms of imaging, spectroscopy, spatial and time resolution are strongly requested by the multi-disciplinary research programmes at the synchrotron facilities and have motivated continuous investments in development of instrumentation for imaging with spectroscopic analysis.

High spatial resolution and image formation in microscopy are achieved using two different approaches, which classify the instruments as scanning and full-field imaging [1 - 4]. In the scanning approach X-ray photon optics or an aperture (IR) demagnify the incident photon beam to a small spot onto the sample, and an image is acquired by detecting the photon or electron signal while rastering the sample. The microprobe in the scanning x-ray microscopes is formed using reflective (glancing or near-normal-incidence mirror systems) or diffractive (Fresnel zone plate (ZP) lenses) optical elements [5]. The scanning approach offers maximum flexibility for use of different photon and electron detectors, so that in principle scanning X-ray microscopes can work as scanning transmission X-ray microscope (STXM) or scanning photoemission microscope (SPEM). The full-field imaging microscopes obtain a magnified image of the irradiated sample area by projection of the transmitted photons or emitted electrons using appropriate photon or electron tailoring optics. The instruments based on projection of transmitted photons, known as transmission X-ray microscopes (TXM), work similarly to a visible light microscope: a condenser lens illuminates the specimen, and a second objective lens behind the specimen generates a magnified image onto a spatially resolving detector. The instruments based on projection of emitted electrons, called X-ray photoemission electron microscopes (XPEEM), use suitable electron optical imaging system for magnification and projection of the emitted electrons.

ELETTRA has one of the most extensive programs in the field of spectro-microscopy in Europe with three photoemission microscopes using different approaches to get sub-micrometer spatial resolution, transmission scanning and full-field imaging X-ray microscopes and an IR spectro-microscopy [6]. Selected results obtained at ELETTRA will be used to illustrate the recent achievements in identification of spatial variations in the composition of morphologically complex and nano-structured materials, including biological samples,

discrimination of local chemical events and mass transport phenomena involving self-organisation processes.

REFERENCES

[1] J. Kirz, C. Jacobsen and M. Howells (1995) *Q. Rev. Biophys.*, **28**, 33.
[2] B. Niemann, D. Rudolph and G. Schmahl (1974) *Optics Comm.*, **12**, 160.
[3] E. Bauer (1994) *Rep. Prog. Phys.*, **57**, 895.
[4] S. Günther, B. Kaulich, L. Gregoratti and M. Kiskinova (1999) *Progr. Surf. Sci.*, **70**.
[5] D. Attwood (1999) *Soft X-rays and Extreme Ultraviolet Radiation: Principle and applications*. Cambridge University Press.
[6] D. Eichert, L. Gregoratti, B. Kaulich, A. Marcello, P. Melpignano, L. Quaroni, and M. Kiskinova (2007) *Anal. Bioanal. Chem.*, **389**, 1121.