The Scanning Photoemission Microscope at Elettra: recent results and developments

L. Gregoratti, L. Aballe, A. Barinov, P. Doudine, M. Kiskinova

Sincrotrone Trieste ScPA, Area Science Park, SS14-Km163.5, 34012 Trieste, Italy

With respect to the other photoelectron microscopy techniques a Scanning PhotoEmission Microscope (SPEM) uses the most direct approach to photoelectron spectromicroscopy which is the use of a small focused photon probe to illuminate the surface. The SPEM at the Elettra synchrotron light source can operate in two modes: imaging and spectroscopy. In the first mode the sample surface is mapped by synchronized-scanning the sample with respect to the focused photon beam and collecting photoelectrons with a selected kinetic energy. The second mode is photoelectron spectroscopy from a microspot. The SPEM on the ESCAmicroscopy beamline at Elettra has a lateral resolution of 150 nm; and an overall energy resolution which is now better than 200 meV [1]. Samples can heated and cooled (liquid N2) during the measurements. More than 70% of the available beamtime is dedicated to national and international users; two call for proposals of experiment per year are available. In order to offer the maximum flexibility for the preparation of the experiments three sample preparation chambers are available. One is equipped with standard surface sensitive analysis techniques (AES, LEED, PEEM) and all needed for the preparation of surfaces (heating, sputtering, atomic gas plasma deposition). A second chamber is dedicated to gaseous exposures up to 1 bar. The most recent fields of investigation deal with the oxidation and reduction processes of Rh thin films and single crystal, mass transport studies on multiwall carbon nanotubes, spatially resolved chemical analysis of Manganites. Industrial collaborations are encouraged aiming to enlarge the potential user community of the photoemission microscopy techniques. The formation of dark spots in commercial emitting OLED responsible for the degradation of these devices has been recently investigated [2].

[1] S. Gunther, B. Kaulich, L. Gregoratti and M. Kiskinova, Progress in Surface Science 70 (2002) 187–260

[2] P. Melpignano, A. Baron-Toaldo, V. Biondo, and S. Priante, R. Zamboni, M. Murgia, S. Caria, L. Gregoratti, A. Barinov, and M. Kiskinova, Appl. Phys. Lett. 86, 041105 (2005)