STUDIES OF ELECTROCHEMICAL SYSTEMS WITH RUNNING FARADAIC REACTIONS BY IN SITU SPEM

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Advanced studies in anodic and cathodic electrochemistry require dynamic position-dependent compositional, morphological and structural information at the submicrometric and mesoscopic scales (0.1÷25 μm), regarding the reactive interface involved in faradaic processes. The zone-plate based scanning photoemission microscopy, allowing different detection modes and variable fields of view, currently gives the possibility of: (i) applying external potentials, (ii) probing samples with rough surfaces and (iii) dosing gases in the analysis chamber: electrochemical science and technology can greatly profit of these capabilities,.

This presentation will address three key issues in the field of in situ electrochemical SPEM: (1) briefly review the state of the art regarding in situ electrochemical SPEM and XPS experiments carried out with both synchrotron and conventional sources; (2) report original SPEM results obtained by the authors at the ESCAmicroscopy beamline at Elettra and (3) discuss the perspectives of SPEM-based approaches for the in situ investigation of cutting-edge electrochemical materials science problems.

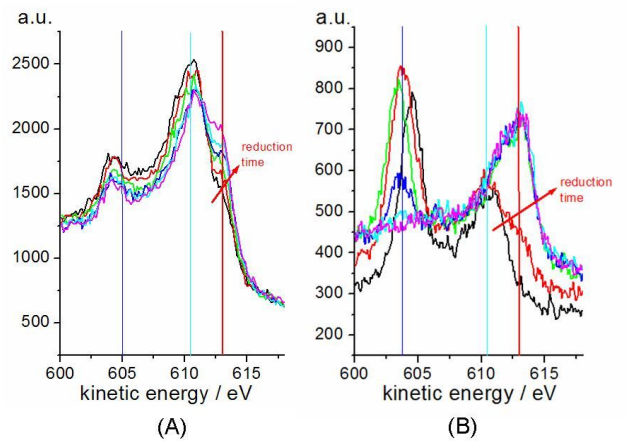

Figure 1

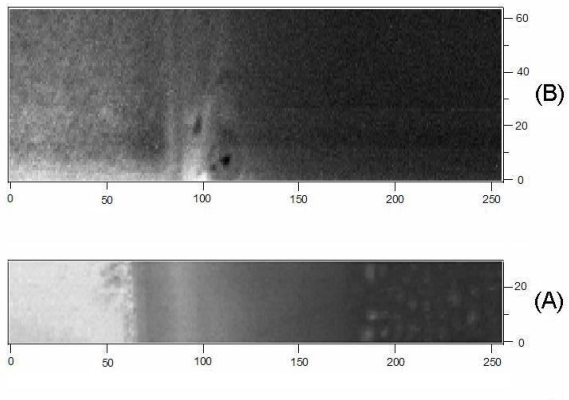

Figure 2

Figure 1: Dynamic Ni 3p XPS spectra during reduction at (A) -625 mV_{cell} and (B) -3000 mV_{cell}. Red mark: elemental Ni, light blue mark: Ni(II), blue mark Ni satellite peak.

Figure 2: SPEM images of (A) cathode (Ni electrode on the left, 30×256×2 μm) and (B) anode (Ni electrode on the right 64×256×2 μm), at the Ni 3p energy (611 eV), under electrochemical polarisation (-625 mV_{cell}).