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NEW PERSPECTIVES FOR THE IN-SITU AND OPERANDO INVESTIGATION OF SOLID/LIQUID INTERFACES BY SYNCHROTRON SOFT X-RAY SPECTROSCOPIES

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Mercoledì 16 Novembre 2022 ore 15:00

Piattaforma TEAMS (https://bit.ly/3fTqyUt)

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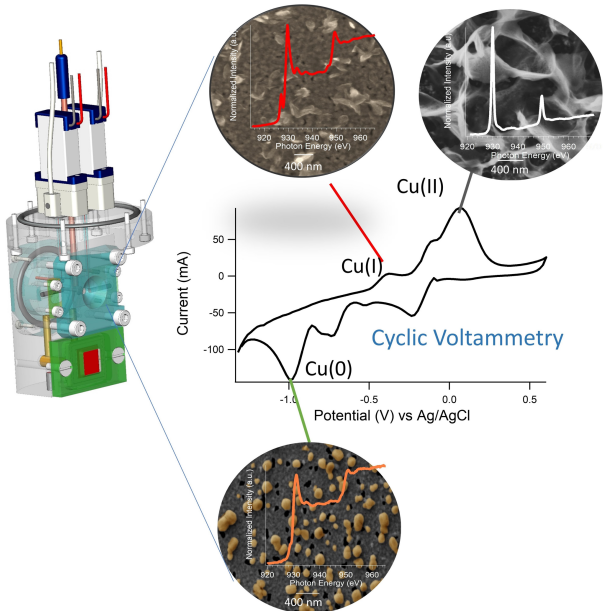
The CNR Beamline for Advanced Circular diCHroism (BACH), operating at the Italian synchrotron radiation facility Elettra in Trieste, works in the VUV-soft x-ray photon energy range with selectable light polarization, high energy resolution, brilliance and time resolution (https://www.elettra.eu/it/lightsources/elettra/elettra-beamlines/bach/bach.html). The beamline offers a multi-technique approach for the investigation of the electronic, chemical, structural, and dynamical properties of materials by X-ray photoemission (XPS) and absorption (XAS) spectroscopies. Recently, different strategies to study electron transfer processes at the solid/liquid interfaces during photocatalytic or electrocatalytic reactions in liquid environment have been developed. Cells, closed with soft X-rays transparent Si3N4 window and electron-transparent graphene membranes to separate the liquid from the UHV region, were successfully employed for spectroscopic investigations in aqueous solutions [1,2]. A new electrochemical flow-cell equipped with a three-electrode set-up for operando X-ray absorption spectroscopy (XAS) measurements was developed to carry out cyclic voltammetry in situ, electrodeposition of catalytic materials and to study solid/liquid interfaces during electrochemical reactions [3]. In the talk I will introduce XPS and XAS techniques and I will show the challenge to apply these methods to carry out experiments under ambient conditions and during electrochemical reactions in liquid environment, as well as the recent technical developments and the perspectives on BACH beamline.



[1] S.Nappini et al. Nanoscale, 9 (2017) 4456-4466
[2] S. Nappini et al. J. Phys. Chem. C, 121, 40 (2017) 22225–22233
[3] S. Nappini et al. Review of Scientific Instruments 92, (2021) 015115