Science@Elettra: selected highlights and perspectives

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Elettra laboratory operates a synchrotron storage ring since 1993 and offers most of the existing spectroscopic and scattering techniques based on interactions of light (IR to X-rays) with matter. Investigations performed using the Elettra storage ring span over all classes of materials: metals, semiconductors, superconductors, catalysts, ceramics, glasses, polymers, magnetic materials, materials for energy, electronic and bio-medical appliances, biomaterials, etc [1]. Elettra synchrotron has one of the most extensive programs worldwide in the development and applications of all types of photoelectron spectroscopies (PES), which include high resolution or time-resolved PES, nano-ARPES, spin-resolved ARPES, scanning and full-field imaging photoelectron microscopy (SPEM and PEEM). Experiments using photon-in/electron-out and photon-in/photon-out techniques span over 2D materials, strongly correlated electron systems, magnetism, surface and interface phenomena relevant to catalysis and electrochemistry. In particular, the response to operating conditions and external stimuli – temperature, radiation, electric and magnetic fields are the main targets. In the field of life sciences, along with protein crystallography experiments, rather extended programs have been focused on assessing potential health hazards of nano-materials and pollutants by means of photon-in/photon-out spectroscopies (XRF, XAS), IR and Soft X-ray Microscopy. Using selected exemplary systems the most recent achievements in basic and applied research will be illustrated with emphasis on in-situ characterization of various systems, where issues of complexity at microscopic length scales should be faced and understood.

**on behalf of Elettra scientists and collaborators.*