

## Discovering materials with synchrotron light: research opportunities at Elettra

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Synchrotron facilities bring together a large and diverse research community, encompassing the fields of physics, chemistry, materials science, biology, cultural heritage and many others. Since the early '90s, the enormous progress in the quality of light sources and instrumentation has given impetus to both academic and industrial research, favouring important discoveries and applications. The extraordinary and unique properties of synchrotron light, namely the broad spectrum of energy, tunability, brilliance, high flux, constitute a very powerful tool for probing the state of matter and thus improve our understanding of a plethora of phenomena.

Elettra, the 3rd-generation synchrotron in Trieste, is the only facility routinely operating at two different energies, 2.4 and 2.0 GeV, thus optimizing conditions for experiments in the VUV, soft or hard X-rays regimes. Elettra operates 28 versatile beamlines, which house a multitude of experimental stations. Equipped with state-of-the-art instrumentation, they enable to perform the most advanced, spectroscopy, scattering, diffraction and imaging techniques, utilising photons with energy ranging from the far infrared up to several tens of keV.

The talk will focus on applications in physics and materials science. The capabilities of synchrotrons methods to approach and solve relevant scientific issues will be illustrated by a variety of examples, focusing on nanomaterials, two-dimensional materials, metal-organics frameworks, and energy materials, batteries in particular. The emphasis will be placed on the recent demonstration of *in-situ* and *operando* methods, which are opening up new pathways for studying liquid-solid interfaces, and on advanced x-ray photoelectron spectroscopy experiments, which uniquely disclose the morphology, chemical and electronic structure of the matter.

The talk is addressed to a young audience, composed by PHD students and postdocs, as well as to those willing to exploit the great opportunities opened by collaborative research.