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Soft X-ray Imaging

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Soft X-ray Microscopy has rapidly developed into an important spectro-imaging technique for several application fields, from life and environmental science, cultural heritage to material science. It is mostly deployed in synchrotron facilities taking advantage of their tunability and high brilliance characteristics.
X-ray Microscopy coupled with spectroscopy can provide insightful simultaneous morphological and chemical information that help in the understanding of biochemical processes taking place at sub-micron scales.
In the last few years, the TwinMic soft X-ray microscopy station [1] (400-2200 eV) installed at the Elettra synchrotron has been attracting the interests of the several scientific communities thanks to its complementary imaging capabilities (brightfield and phase contrast) combined with low energy X-ray Fluorescence and X-ray absorption spectroscopy. The developed low energy XRF system [2] enables to correlate the specimen morphology with the elemental distribution of light elements (from B till P) and of transition metals with characteristic emission lines in the 180-2100 eV energy range.
The implementation of novel TwinMic imaging modes is in progress and has been demonstrated by ptychography with randomly phased illumination acquiring scans across the L absorption edge of iron on fibroblast cells exposed to cobalt ferrite nanoparticles [3] and with Phase-diverse Fresnel coherent diffractive imaging of malaria parasite-infected red blood cells. TwinMic has also active ongoing research activities for advancing imaging and spectroscopy [4]. A recent example of such contribution is the development of smart, sparse and selecting data acquisition and scanning methods based on compressive sensing [5-7] which allow for fast and very large scans both in the terms of sample size and spatial resolution.

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