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Life Science Applications of the TwinMic soft X-ray spectromicroscopy beamline at Elettra

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The analysis of biological matrices at subcellular level necessitates the use of multidisciplinary techniques and expertise. Soft 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 Life Science community thanks to its complementary imaging capabilities (brightfield and phase contrast) combined with low energy X-ray Fluorescence and X-ray absorption spectroscopy. Indeed 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 for which the characteristic emission lines fall in the 180-2100 eV energy range.

The most recent outcomes in research fields such as neuroscience-neurodegeneration [3], nanotoxicology [4,5,6], clinical medicine [7,8] and food science [9] will be shown through selected results.

The implementation of novel TwinMic imaging modes is in progress and has been recently demonstrated by ptychography with randomly phased illumination acquiring scans across the L absorption edge of iron on fibroblast cells exposed to cobalt ferrite nanoparticles [10] and with Phase-diverse Fresnel coherent diffractive imaging of malaria parasite-infected red blood cells [11].

References

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