

# MISTRAL - the soft X-ray microscope at the ALBA Synchrotron Light Source

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The Mistral beamline dedicated to soft X-ray full-field microscopy (TXM) is designed to provide constant magnification at the exit slit for photon energies between 270 and 2600 eV [1]. The current setup allows the TXM experiments in energy range from carbon K-edge up to nickel L3-edge (*i.e.* 270-810 eV, respectively). The monochromator, a variation of the Petersen plane grating type, is used to maintain the beam focused at the exit slit, independently of the fixed focus constant, and to cancel aberrations [1]. The Mistral cryo-TXM at the ALBA Synchrotron Light Source has been opened for users since February 2013.

The soft X-ray cryo-tomography is rather new complementary microscopic approach in bio-medical and material science in general. In life science it can provide answers on the cellular organelles organization at medium resolution between visible light- and electron microscopy (around 30-40 nm) [2] in whole intact and unstained cells [3, 4]. The single cell intrinsic sample thickness does not limit X-ray microscopy, thus soft X-ray tomography collect data without cell sectioning, or chemically fixation, which in classical microscopy introduce artifacts in cellular compartmentalization [5]. In addition, the correlation of information with visible light- and electron- microscopy has become an important issue to study biological events at different levels. Combining all imaging techniques, including different X-ray microscopies, allow us deeper structural and molecular insight into modification on the cellular/organelles level [5].

More than 70% of experiments at the Mistral TXM are devoted to cryo- soft X-ray tomography of large cellular volumes in the water window energy range [2]. In addition the beamline is used for the imaging with circular magnetic dichroic absorption contrast, as well as for spectroscopic imaging. For example the spectroscopy around O-edge on lithium-oxygen batteries can provide valuable information on the chemical state of oxygen, giving clear hints on the composition of the investigated products.

Here it will be presented three typical experiments at Mistral beamline: *i*) the biological example – 3D-insight into cellular change during parasite-host interaction, *ii*) magnetic dichroic absorption experiment on magnetic domains, and *iii*) an example regarding spectroscopic investigation on the Li-oxide battery products.

## References

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