

SOLEIL will gradually make 25 beamlines and three support laboratories available to its users.

These facilities include more than 10 sets of microscopy apparatus: a real technological platform giving access to a wide range of analysis techniques, in all energy domains, and for all types of sample.



Specifications of the microscopes available on SOLEIL beamlines

Beamline name	DIFFABS Micro-beam mode	DISCO	LUCIA	Soft x-ray microscopy	Microscopium	SMIS
Imaging type	x ray fluorescence XAS x ray diffraction	UV-visible fluorescence	Spectroscopy and imaging	X-PEEM STXM	X fluorescence XAS X diffraction	Molecular imaging from spectroscopy
Energy domain (eV)	3000 - 18,000	1 - 5	800 - 8000	100 - 2500	4000 - 20,000	0.06 - 0.6
Lateral resolution	Routinely ~ 12 µm, up to 5 µm at lower intensity	Down to 100 nm	2.5 µm x 2.5 µm	Better than 0.04 µm	Routinely ~ 2-3 µm, down to 0.5 µm at lower intensity	1-10 µm depending on the incident energy
Analysis depth	Depends on the sample and the energy of incident and detected photons	Up to 10 µm	0.1 µm to 10 µm depending on detection mode	X-PEEM: between 5 and 10 nm STXM: between 100 and 500 nm	Depends on the sample and the energy of incident and detected photons	1-10 µm
Energy resolution (eV)	$\Delta E/E \sim 10^{-4}$	1/1000	0.3 to 0.7 depending on incident energy	> 0.02 eV at 100 eV > 0.4 eV at 2000 eV	$\Delta E/E \sim 10^{-4}$	1.2×10^{-5}
Sample specifications	No real restriction	Thin; can be hydrated, solid, etc.	No real restriction	X-PEEM: flat and conductive STXM: thin section < 0.5 µm	No real restriction	Thin sections: 5-30 µm
Analysis mode	Transmission, reflection, fluorescence	Fluorescence spectroscopy and lifetime	Transmission, fluorescence, total electron yield	X-PEEM: TEY, XPS, XAS, XPD; STXM: transmission, TEY and reflection	Transmission, reflection, fluorescence	Transmission reflection
Sensitivity	XRF: ~ 0.1 ppm/s/pixel XANES: ~ 1000 ppm	10^{-9} mol/l	A few ppm	X-PEEM: 0.1 monolayer STXM: 1 nm	XRF: ppb/s/pixel XANES: ~ 100 - 1000 ppm	10^{-11} g
Mapping mode	Raster scanning	Raster scanning or full field	Raster scanning	X-PEEM: parallel acquisition; STXM: scanning	Raster scanning	Raster scanning
Sample environment	Air, controlled environment, high-pressure cell	Air, liquid medium, temperature: from 5 to 50°C	Mainly in vacuum; temperature: from 90K to 2000°C; liquid cells	X-PEEM: UHV, 150-1500K; partial vacuum (10^{-5} mbar) STXM: high vacuum; Wet cell; controlled environment; 100-600K; Field: 1 tesla	Air, controlled environment, high-pressure cell	Air, controlled environment, high-pressure cell; from -100 to +400°C
Opening to users in	2009	2009	2009 (currently open to users at SLS)	2010 (currently open to users at ELETTRA)	2010 - 2011	2007

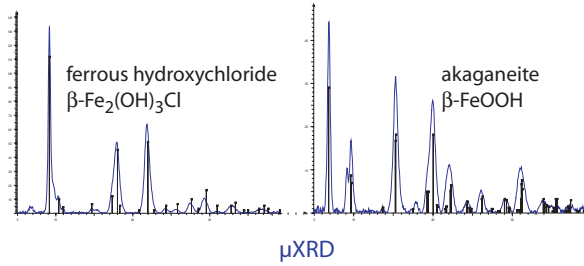
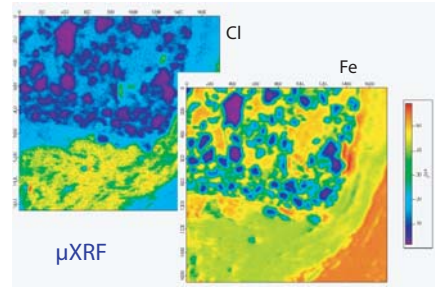
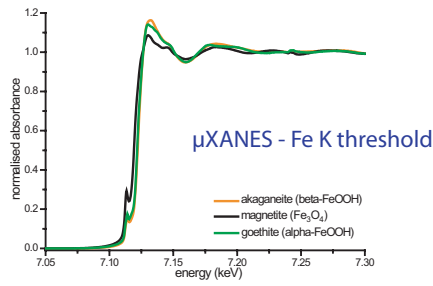
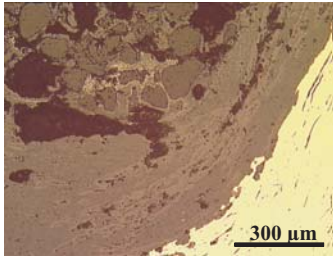
Support laboratories

In addition to the microscopes in the SOLEIL beamlines, the **Surface Laboratory** (LaSu) is equipped most notably with a scanning tunneling microscope as well as the ultrahigh vacuum equipment required for this type of study (mobile UHV chamber for the transfer of samples from LaSu to the beamlines).

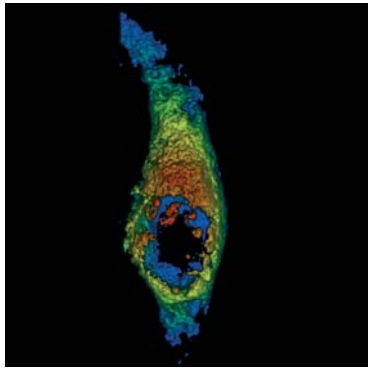
A phase shift microscope and an atomic force microscope with useful characteristics for the observation of samples from mm to nm size are also available in the **Optics Group Metrology Lab** (LMO).

A few examples of images obtained with the various devices

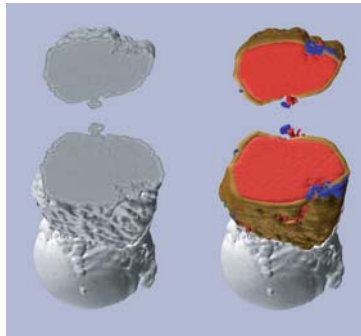
Micrography



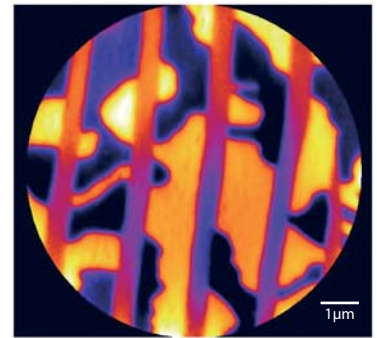
Study of corrosion in archaeological iron artefacts combining $\mu\text{-XAS}$, $\mu\text{-XRD}$ and $\mu\text{-XRF}$ techniques. Work performed on LUCIA at SLS and D15 at LURE, and, soon, on LUCIA, DIFFABS and Microscopium beamlines at SOLEIL



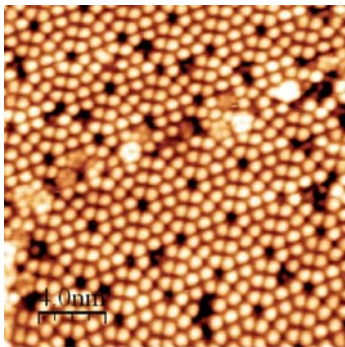
Cancerous cell treated with a light-activated cancer-drug (hypocrellin). Image obtained at CBM, Orléans, and, soon, on DISCO beamline at SOLEIL



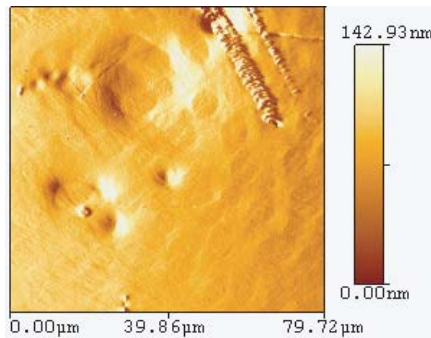
Transmission tomography (left) and distribution of Rb (red), Mn (brown) and Fe (blue) within an individual fly ash particle determined by X-ray fluorescence tomography. Images obtained at ESRF (beamline ID22) and, soon, on Microscopium beamline at SOLEIL



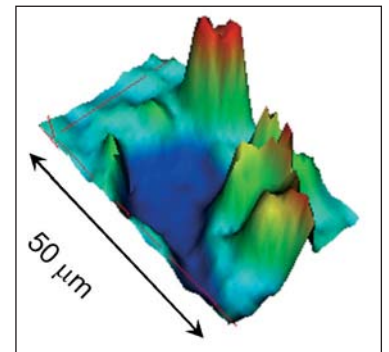
Structure of ferromagnetic and antiferromagnetic domains in thin layers of MnAs/GaAs(100). Work performed at Mn L threshold. Image obtained at ELETTRA and, soon, on Soft X-Ray Microscopy beamline at SOLEIL



Reference sample: silicon. LaSu - scanning tunneling microscope



Defects on a mirror used in astrophysics applications. LMO - atomic force microscope



Chemical image of lipids distribution around a blood vessel in an intestine cross section. SMIS beamline