XMCD towards the extrems…

ASSOCIATE LABORATORIES

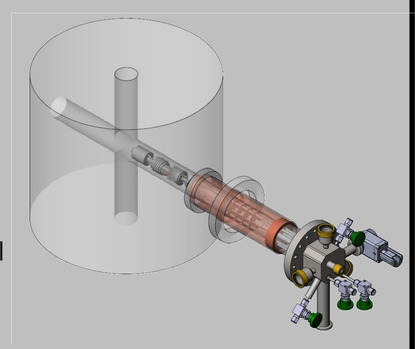
Dedicated to linear and circular dichroic measurements of magnetic and non magnetic samples, DEIMOS beam-line has been optimized to provide high beam stability and sample sensitivity with very fast switching rate of the polarisation.

Towards the very low temperatures…

mK DILUTION INSERT

Technical data:

- 200mK on the sample (50μW at 200mK) (temperature range: 200 - 1500 mK)
- From 300K to 0.2K in ~2 hours.
- Compatible with all the *in situ* preparation tools.



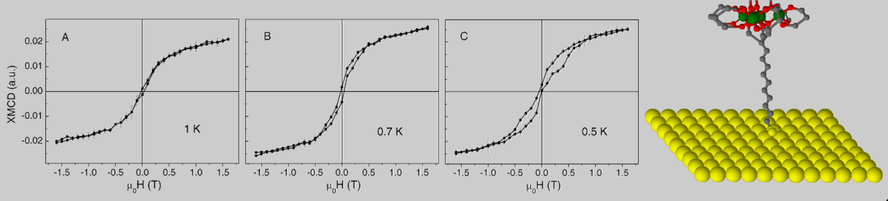
Technical challenge:

- ^{3}He-^{4}He dilution with a horizontal geometry and a small diameter of 2".
- Compatible with TEY detection: sample electrical insulation > 500GΩ.

Scientific interest:

- Molecular magnetism, single molecular magnet, the study of Kondo effect, …

Temperature dependence of hysteresis curves obtained by XMCD measurements at Fe $L_{2,3}$ edges (SAM of Fe^{III}_4 on Au(111)) [2],[3]



[2] results obtained at SLS, SIM beamline
[3] Mannini, M., et al., Magnetic memory of a single-molecule quantum magnet wired to a gold surface. Nature Materials, 2009. 8: p. 194-197.

Towards higher functionalities…

VERSATIL INSERT

Technical data:

- Additional VTI with 12 current leads to the sample.
- Temperature range: 8 - 300K.
- Compatible with all the *in situ* preparation tools.

Technical challenge:

- Bring 12 current leads to the sample while keeping the compatibility with TEY detection: sample electrical insulation > 500GΩ.

Scientific interest:

- Possibility to apply on the sample on the beam several strains (potential, polarized current, …), probes (resistivity measurement, …) or even power-up a *in situ* piezo motor (attocube).
- Huge interest for the multiferroic and spintronic community where system showing magnetic properties controlled by different means are of high interest.

SAMPLE HOLDER FOR LIQUID

Technical data:

- Transparent cell for liquid for fluorescence and transmission detection. Compatible with our end-station.

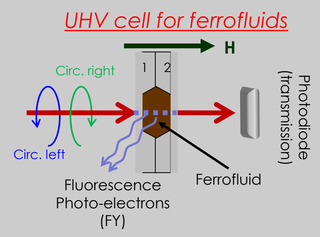
Technical challenge:

- Combined in a single cell the transparency to soft x-rays and the UHV compatibility.

Scientific interest:

- Ferrofluids systems

UHV cell for ferrofluids



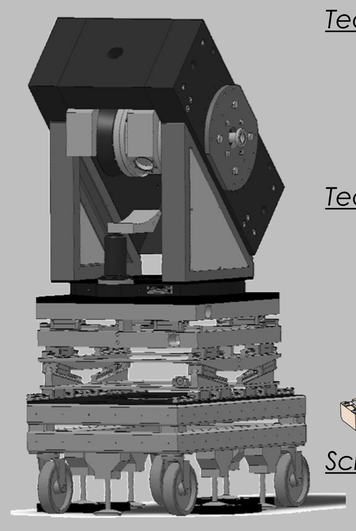
1 & 2: Silicon nitride (Si_3N_4) membranes

Standard experimental conditions:

- **field**: 7T (// beam) & 2T (⊥ beam)
- **temperature**: 1.5 – 370 K
- *In situ* facilities + glovebox

Towards the very high temperatures & magnetic fields

VERY HIGH TEMPERATURES: MilleK

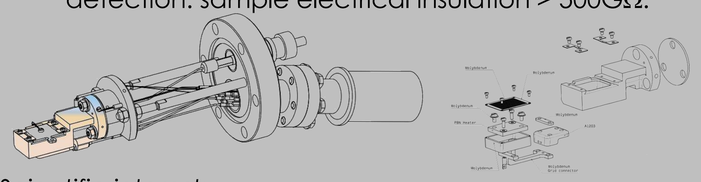


Technical data:

- 2T electromagnet (split coils) with *in situ* bore (Flipping rate around 1Hz).
- Temperature range: 10-1000K.
- Compatible with all the *in situ* facilities.

Technical challenge:

- Develop an heating stage compatible with the TEY detection: sample electrical insulation > 500GΩ.



Scientific interest:

- Investigate systems with temperature transitions above RT.

VERY HIGH MAGNETIC FIELDS

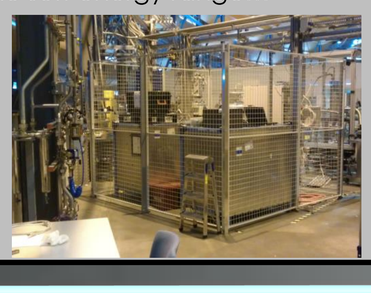
Project led by the IPCMS (Loïc Joly), the first tests have been performed in 2012 at SLS on the SIM beamline.

Technical data:

- 30T pulse field (generate by a Cu coil cooled by LN_2)
- Filed Increase in 4ms decrease in 40ms
- 150kJ power supply.

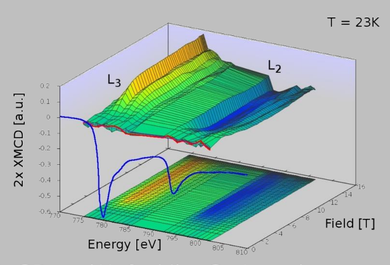
Technical challenge:

- Develop this kind of experiment for XAS in the soft energy range…



Scientific interest:

- Investigate system with high saturation field, break ferrimagnetic or antiferromagnetic configurations or induce spin transition...



XMCD and XAS at the Co $L_{2,3}$ edges measured in transmission for a 30 nm film of $Co(S_{0.88}Se_{0.12})_2$.
The expected transition at ~4 T is clearly evidenced.

Towards the high energies…

AML GRATINGS

Technical data:

The use of alternate multilayers gratings allow to extend the range of the PGM towards higher energies. In our case:

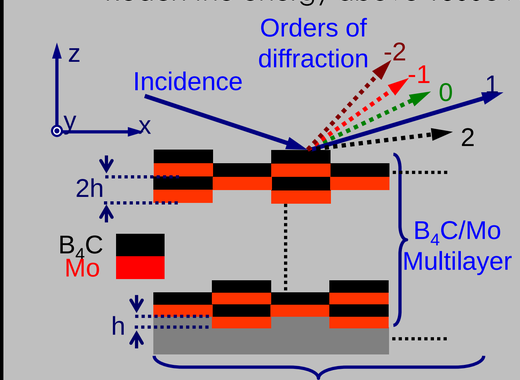
- PGM (1600l/mm): 250 - 1500eV
- AML (2400l/mm): 1000 - 2700eV.

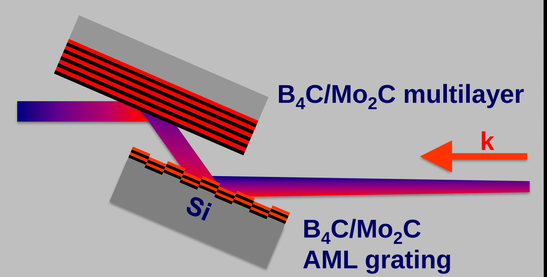
Technical challenge:

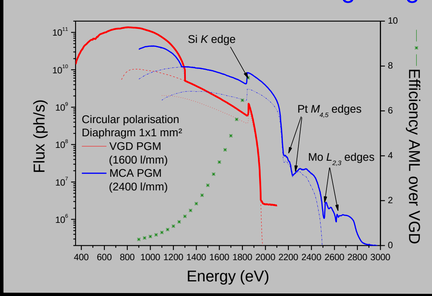
- Fabricate a multilayer with the periodicity exactly tuned to the groove depth of the gratings.

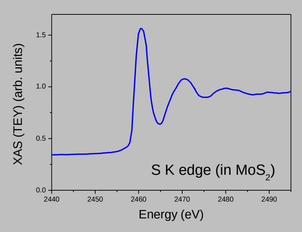
Scientific interest:

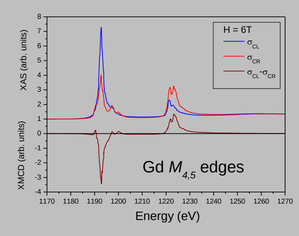
- Reach the energy above 1500eV: heavy RE, S, 4d TM…











First XAS and XMCD measurements with AML.

Towards the femtoseconds…

Project for building a new branch dedicated to the slicing in order to combine the fs time resolution with all the beamline set-ups…