ESRF	**Experiment title:** "XMLD and XMCD investigation of Ironbased Single Molecule Magnet monolayers"	**Experiment number**: HE-2692
Beamline: ID8	**Date of experiment**: from: 18/06/2008 to: 24/06/2008	**Date of report**: 23/02/2008
Shifts: 18	**Local contact(s)**: Júlio C. CEZAR	*Received at ESRF:*

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Report:

The time shifts dedicated to this experiment were spent to investigate a series of monolayers of tetranuclear iron-based Single-Molecule Magnets (SMMs) at the gold interface. This class of compounds, hereafter denoted as Fe4, are able to bind to the gold surface *via* a sulphur function incorporated on its ligands. Their possible orientation on a surface is of great interest, in fact if the clusters are oriented with respect to an external magnetic field their magnetic anisotropy can be fully exploited.

Taking advantage of our experience in the field of SMM organisation on surface and the skilful help of the ID8 resident team, we were able quickly to optimise the setup to obtain XAS and XMCD spectra on drop cast samples at first, then on the single layers of our compounds, in such a way that radiation damage was avoided by controlling the photon flux; the XAS and XMCD spectra of the bulk samples (drop cast) were regarded as our standard to ascertain that Fe4 units were not damaged by x-ray exposure.

In addition, the preparation of the samples was carried out under the inert atmosphere of a portable glove bag setup which was moved to the fast entry of the cryostat in order to minimise the environmental perturbation on the monolayers.

Different Fe4 derivatives were studied during the allocated shifts for each of them a set of XAS and XMCD spectra of the monolayer were acquired, then horizontal polarised light was used to probe the linear dichroic properties of the monolayers.

The gathered data show quite clearly that the whole family of investigated samples appears to be stable on surface and exhibits a clearly evident XMCD component (see Fig. 1).

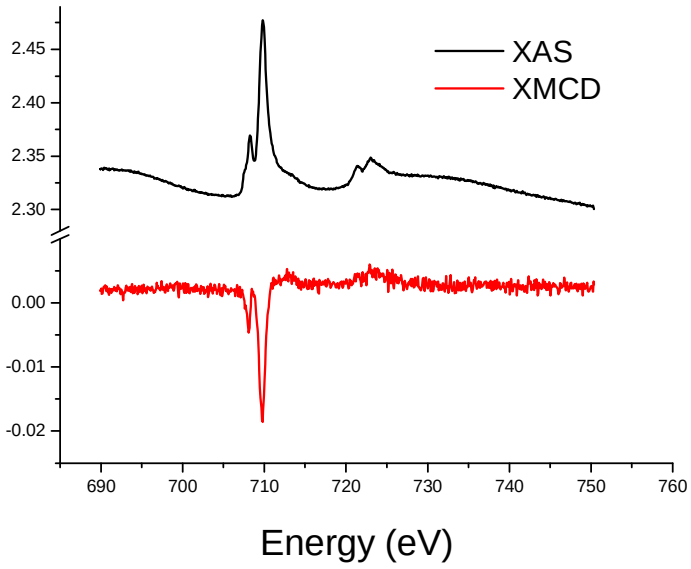

Figure. 1. A representative Fe $L_{2,3}$ edge XAS and XMCD spectra obtained at ID08 with an induction of 5T and at 10K on the Fe4 monolayer deposit on gold.

In the second part of the experiment we investigated the linear natural dichroism on these monolayers in order to clarify if an order is present on surface. We carried out these experiments either by playing on the orientation of the sample or by varying the polarization of the linear polarized light. Preliminary analysis of the data confirms that an orientation of the monolayer is present and that this effect depends on the chemical structure of the grafted molecules. A detailed and careful analysis of the recorded data within the Ligand Field Multiplet approach is currently on going in order to confirm this evidence.

At the end of the experiment we spent a small amount of time to different preparation methods for deposing SMMs on surface. The obtained information completed the set of data, thus defining the characteristics for sample optimization and we are confident that quantitative analysis concerning magnetic properties of each type of magnetic ion can be extracted from these set of data.

The obtained results confirm the capability of XMCD and XNLD in characterizing monolayers of Single Molecule Magnets and provide information concerning chemical magnetic and structural properties. An extension of this kind of characterization carried out on different derivatives of Fe4 molecules as well as on different derivatives is envisaged in order to understand key parameters involved in the SMM behaviour at the monolayer level.

Two papers have been recently published by the team. These are complementary to the new information gained from the present ESRF experiments:

Mannini et al. Chem. Eur. J. 14, 7530-7535 (2008)
Mannini et al. Adv. Matter in press.