ESRF	**Experiment title:** Structure, ordering and properties of FePt films	**Experiment number**: HS 3208
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Shifts: 18	**Local contact(s)**: Dr. Olivier MATHON	*Received at ESRF:*

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Report:

FePt thin films in the 1:1 stoichiometry are continually attracting strong scientific interest because of the exceptional magnetic properties of the ordered $L1_0$ phase of FePt. Ordered $L1_0$-FePt thin films with their c-axis out of the film plane show a high magnetocrystalline anisotropy and saturation magnetization perpendicular to the film plane, thus making them interesting for ultrahigh density magnetic recording. The synthesis of such films however poses some difficulties. At room temperature FePt is deposited as a *fcc*-structured solid solution. Only deposition on heated substrates with appropriate crystal structure and/or buffer layers leads to the development of the ordered $L1_0$ phase.

Since this disorder-order-transition is accompanied by a change from a cubic to a tetragonal crystal lattice, from looking at the short range ordering by means of EXAFS/XANES information about the degree of ordering can be obtained. The normalized absorption spectra at the Pt L3-edge (E =) of two selected samples are shown in figure 1. One sample is almost completely the unordered *fcc* solid solution, whereas the second sample shows a high degree of $L1_0$ ordering. Because of the low layer thickness these measurements were carried out in total electron yield-mode.

For a better illustration of the structural change it is helpful to transform the absorption spectra into R-space as a $|\chi(R)|$ function. For a better comparison the theoretical $|\chi(R)|$ spectrum $L1_0$ FePt was calculated with the IFEFFIT package and is displayed as well. Figure 2 shows the R-space transformation of the two selected samples.

Although the $L1_0$ sample does not show the result of a theoretical 100% ordered $L1_0$ phase a transition from the *fcc* to the $L1_0$ state can easily be seen, thus demonstrating the possibility of determining the ordering state in FePt thin films by X-ray absorption spectroscopy.

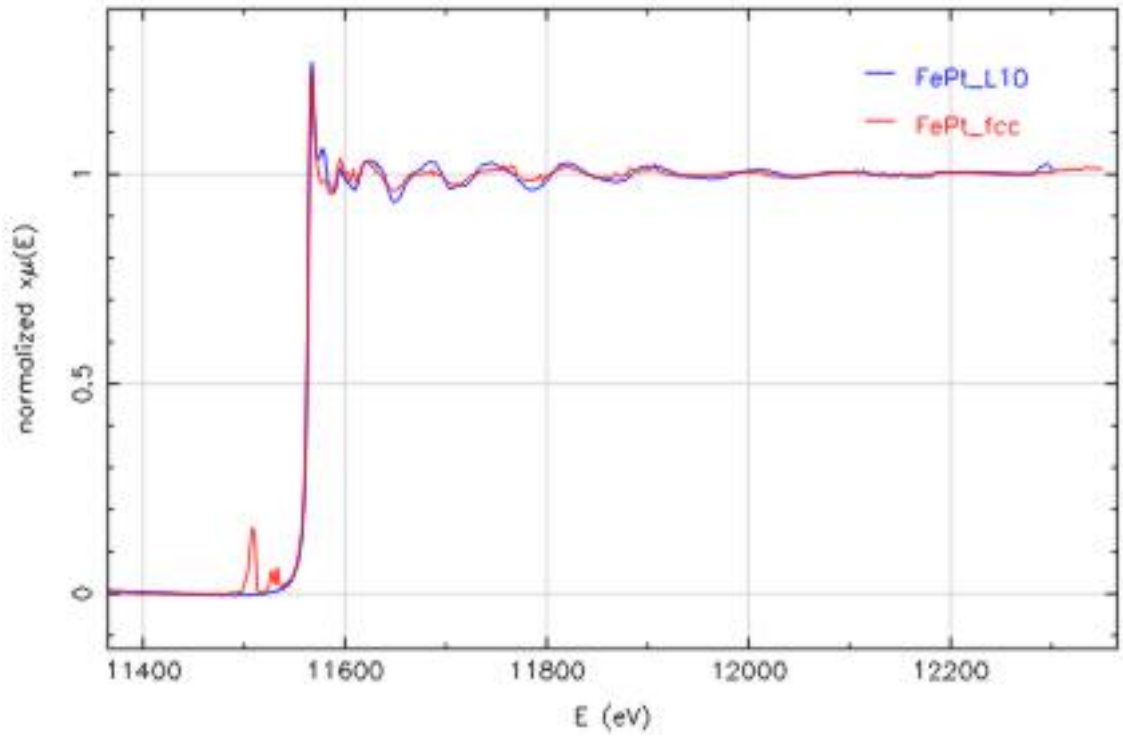

***Fig. 1*:** Normalized μ(E) spectra of a mostly unordered and a highly $L1_0$ ordered FePt sample.

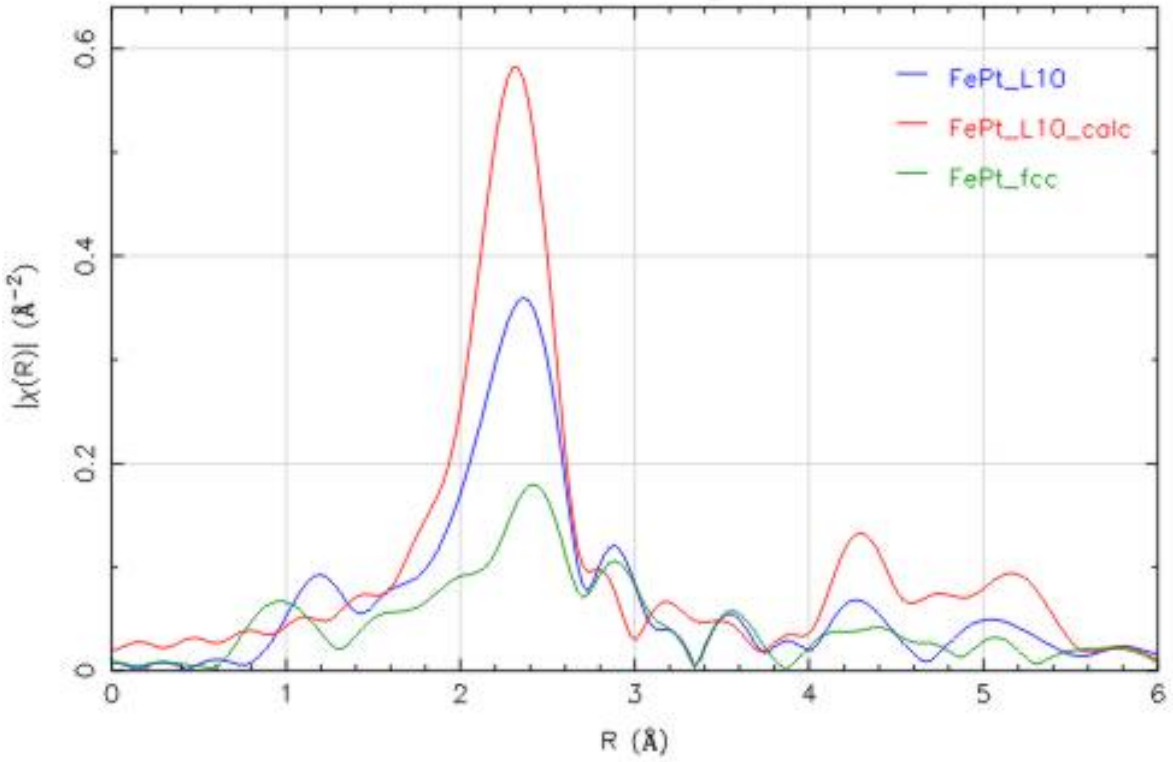

Fig. 2: R-space transformations of a mostly unordered (FePt_fcc) and a highly ordered (FePt_L10) FePt thin film. The theoretical calculation for a completely ordered FePt- $L1_0$ structure is also shown (FePt_L10_calc).

Several publications out of this beamtime in November 2006 are in preparation and will be submitted soon. Proper credits to ESRF will be given.