ESRF	**Experiment title:** **Signature of short range chemical order in MnPt and FePt alloys grown on Pt(100)**	**Experiment number**: 30-02 1001
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Report:

We succeeded the growth of ultra-thin layers of MnPt coupled to a layers of FePt in chemically ordered $L1_0$ phases. Alternate monoatomic deposition were used to grow both alloys on a Pt(100) substrate.

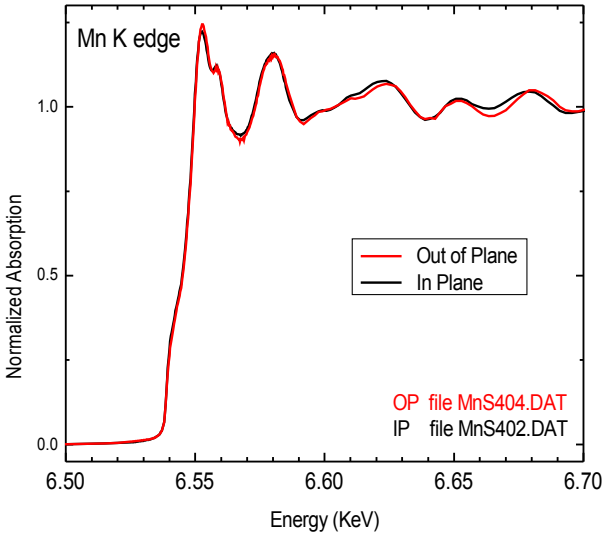
During our *in situ* surface X-ray diffraction experiment at BM32, we combined alternating deposition of Fe and Pt and the high temperature of the substrate (about 600 K) to generate a high-chemically ordered $L1_0$ layers of FePt/Pt(001) with the tetragonal c-axis perpendicular to the substrate. No traces of $L1_2$ FePt phase were found. After growing a 6 bilayer-thick FePt(001) sample, a MnPt layer was deposited following the same method of alternating deposition at a bit smaller temperature (575 K).

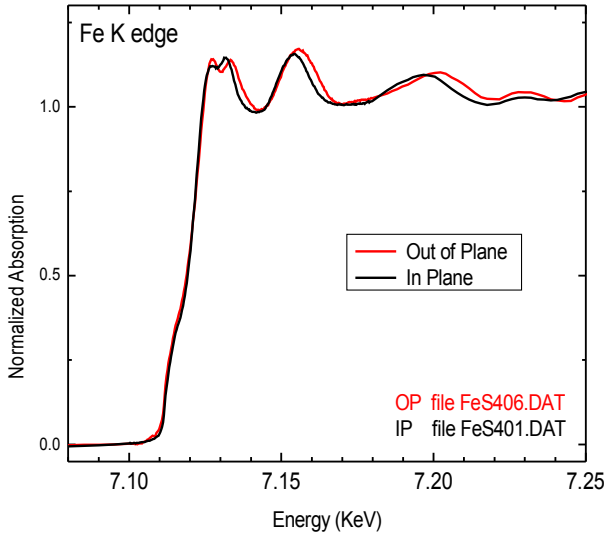
In another experiment, we started by the MnPt deposition directly on Pt(001). It was possible to follow by SXRD the evolution of ordering peak. We observed a clear development of the order peak as the number of layers increased. The growth was stopped when 8 Mn/Pt bilayers were completed. The structure of this layer was studied by exploring the truncation rods in the reciprocal space for many reflections. After that an FePt film was deposited on top of the MnPt film. The FePt was composed of 4 Fe/Pt bilayers.

Both samples were covered by 8 ML of Pt for the actual ex situ XAS studies.

The room temperature perpendicular magnetic anisotropy associated to both samples have already been measured by performing ex situ MOKE experiments. The complete temperature dependence of the magnetic properties of the MnPt/FePt system has been measured, and a strong exchange bias coupling at the AFM/FM interface is found. The coercivity has been found much smaller than for a typical FePt ordered thick layer. This could come either from the degree of order or from the thickness effect on the Curie temperature, which could impose a FM order nearby room temperature. As a preliminary result, we could identify the AFM ordering temperature of the MnPt layer close to 300K and a weak exchange bias shift at 5K. A complete analysis has to be done.

XAS data were collected in fluorescence mode at room temperature. The samples were mounted in a goniometer and aligned at different orientations related to the X-ray beam. In-plane and out-of-plane data were collected at a grazing angle of about 5 degrees. The collected data turn out to be of very good quality, with the noise limited by the photon counting statistical.





Preliminary Results

Electron beam deposited MnPt layers with $L1_0$ structure coupled to Fe layers were studied by XAS. Some features in the spectra indicates the presence of chemical order but a refined analysis, by comparing to first principle calculations, has to be done. A much smaller spectral anisotropy has been observed around Mn atoms when compared to Fe. This behavior indicates that, even though the MnPt layer is well chemically-ordered, the domains have the c-axis oriented either perpendicular to the surface as in the plane surface.

The structural anisotropy observed for the FePt layer has been linked to the magnetic anisotropy observed either by MOKE and XMCD experiments on one of these samples. [1]

[1] M. Soares, HCN Tolentino, M De Santis, AY Ramos, JC Cezar, “Highly anisotropic epitaxial L10 FePt on Pt(100)”, Journal of Applied Physics, accepted (2011)