ESRF	**Experiment title:** ***Short-range order and linear dichroism properties of ultra-thin MnPt/FePt exchange-coupled bilayers on Pt(100)***	**Experiment number**: 30-02 950
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Names and affiliations of applicants (* indicates experimentalists):

ALINE RAMOS / INSTITUT NEEL CNRS

HELIO TOLENTINO / INSTITUT NEEL CNRS

MAURIZIO DE SANTIS / INSTITUT NEEL CNRS

MARCIO SOARES / INSTITUT NEEL CNRS

Report:

We synthesized MnPt films with different degrees of structural and chemical orders using the UHV chamber at the French CRG BM32 beam line. At room temperature, these films showed a rough surface that made difficulty the growth of chemically ordered layers perpendicular to the surface. Even after annealing at temperatures as high as 550°C, only very short range ordered domains showed up. These $L1_0$ domains turn out to be oriented both out-of-plane and in-plane, with a short coherence length of about 1.6 nm. Growing at a higher temperature of about 230°C, then annealing, gave rise to larger (about 6 nm) out-of-plane chemically ordered domains. The in-plane domains were still of the same size (1.6 nm). In spite of such small domains, these thin films displayed antiferromagnetic order at lower temperatures (<100K). This evidence demonstrated that even short-range ordered structures are coupled antiferromagnetically and may give rise to exchange bias when coupled to ferromagnetic materials. This was demonstrated by magnetic-optic Kerr effect (MOKE).

In our experiments using XAS at the FAME beam line, we studied these samples with short range ordered domains, prepared at room temperature and at 230°C. These samples were coupled to a 3 nm Fe layer, with in-plane magnetic anisotropy, and protected by a 2 nm Pt layer. We observed features in the Mn K-edge X-ray absorption spectra that could be related to chemical order. A more deep analysis has to be done to confirm that. However, we did not observe any anisotropy in Mn local structure, even for the samples where the L10 domains with perpendicular orientation were larger. This result indicates the presence of an equivalent number of very small domains, not seen by X-ray diffraction, oriented along the surface plane.

XAS data were collected in fluorescence mode at room temperature. The sample was 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.

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. Unexpectedly, no anisotropy has been observed around Mn atoms, indicating that the same amount of in-plane and out-of-plane L10 domains exist. We intend to complement this study by measuring long range chemically ordered MnPt and FePt thin films, which we have recently synthesized.