ESRF	**Experiment title:** Origin of the tunable intrinsic giant exchange bias in $Mn_{3-x}Pt_xGa$	**Experiment number**:
Beamline: ID12	**Date of experiment**: from: 20.04.2016 to: 25.04.2016	**Date of report**:
Shifts: 15	**Local contact(s)**: Fabrice Wilhelm	*Received at ESRF:*
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Report:

The aim of this experiment was to study the intriguing material $Mn_{3-x}Pt_xGa$ with the help of high field XMCD. As samples we studied samples with the concentrations x=0.1, x=0.3, x=0.5 and x=0.6. While samples x=0.1, x=0.3, and x=0.6 were prepared in a way that no exchange bias is expected the x=0.5 samples was prepared differently to exhibit exchange bias. By comparing the XMCD of these samples at the Mn, Pt and Ga we aimed to investigate the magnetic properties of the individual constituents. In figure 1 the Pt L_2 edge is shown as an example. As is can be seen clearly in the XANES (figure 1 left) the Pt atoms are structurally ordered in a similar way for the different samples since the XANES is very similar. The XMCD decreases with increasing Pt concentration. This behavior is observed systematically für all samples without phase separation and reflects a decreasing net magnetic moment carried by the Pt atoms which are polarized by the neighboring Mn atomes which occupy two different lattice sites with opposite orientation of the magnetic moments.

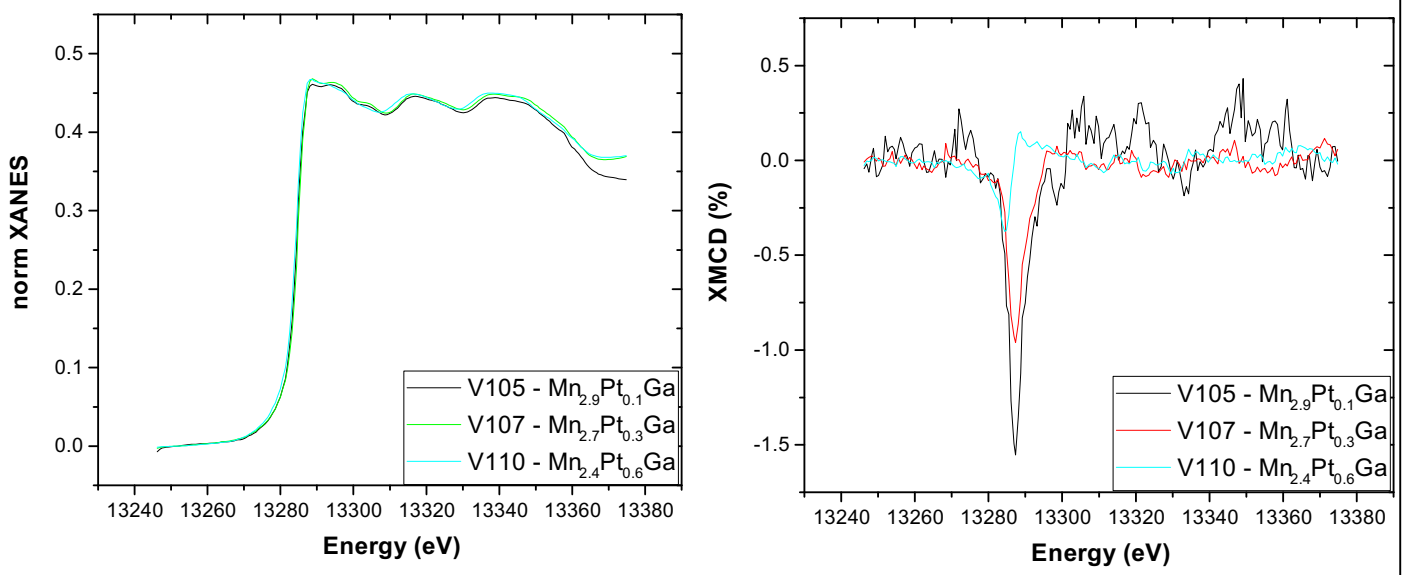

Figure 1: Pt L_2-edge XANES (left) and XMCD (right) recorded at 4K with 17T applied magnetic field

In figure 2 expemplary XANES and XMCD spectra are depicted for two different samples (x=0.6 (left) and x=0.1 (right)) recorded at the Ga K-edge. All samples display a sizable magnetic polarization of the Ga in Mn and Pt environnement which was not taken into account up to now. Furthermore the size of the recorded XMCD scales inversely with the Pt content in the samples (similar to what has been observed for the Pt)

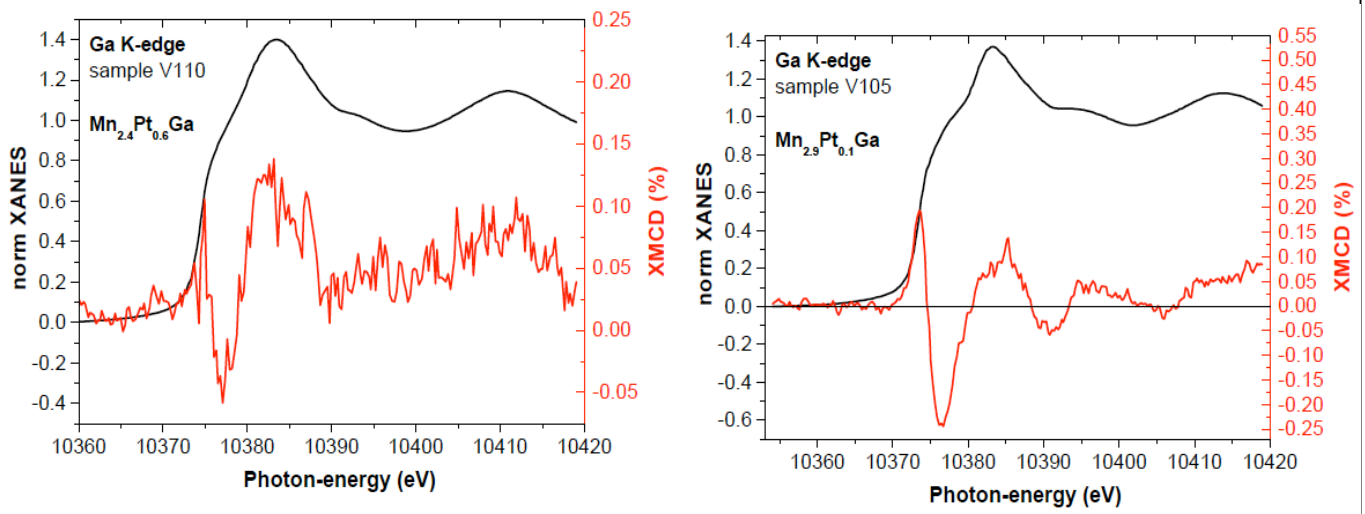

Figure 2: Exemplary XANES and respective XMCD spectra at the Ga K-edge recorded for two samples with x=0.6 and x=0.1 Pt content (at 4K an with 17T applied magnetic field, measured in normal incidence of the x-ray beam)

XANES and XMCD were also recorded at the Mn K-edge (depicted in figure 3) to investigate the effect of Pt concentration on the net Mn moments and their compensation point. In addition to that XMCD hysteresis were recorded on all measured samples (not shown here) to compare with macroscopic hysteresis curves.
For the phase separated (exchange bias) sample the cooling to low temperatures was performed with an applied magentic field of 17T. However we were not able to detect an exchange bias in the XMCD. This might due to an insufficient magnetic field amplitude (as previous measurements were performed in a higher cooling field). However the results obtained help to understand the intrinsic properties of this materials and are currently investicated by theoretical calculations to corroborate our findings.

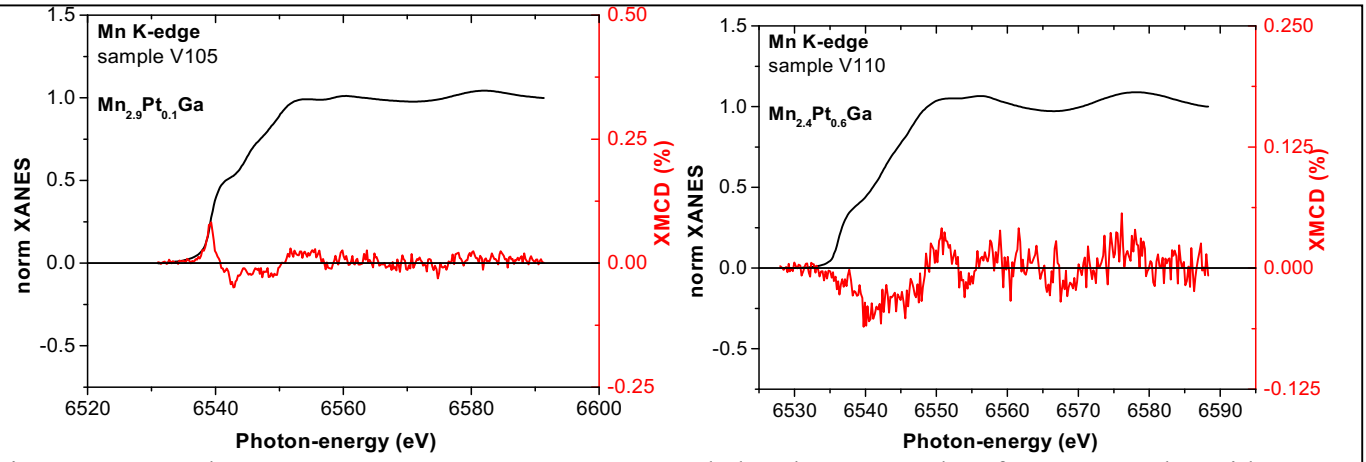

Figure 3: Exemplary XANES ans XMCD spectra recorded at the Mn K-edge for two samples with x=0.6 and x=0.1 Pt content (at 4K an with 17T applied magnetic field, measured in normal incidence of the x-ray beam)