ESRF	**Experiment title:** Induced magnetism in Ta- and Ir-based ferrimagnetic double perovskites	**Experiment number:** HE-2379
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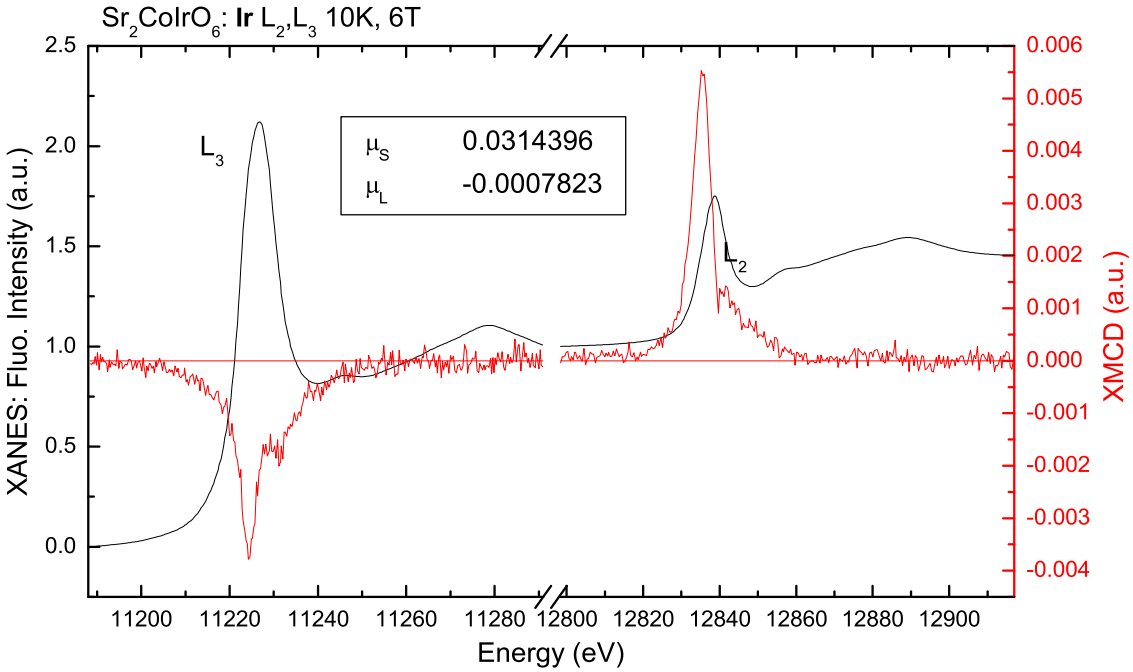
Report:
We have investigated the Fe-K edge in Ba_2FeReO_6, the Fe-K edge and the Ca-K edge in Ca_2FeReO_6, the Ir-$L_{2,3}$ edges in Sr_2CoIrO_6 and the Fe-K edge in Sr_2FeReO_6 by X-ray magnetic circular dichroism (XMCD). The samples are double perovskites of the type $A_2BB'O_6$. XMCD measurements give element specific information on magnetism. In particular, the spin and orbital magnetic moments of the Ir can be determined independently, whereas the investigation of the Fe-K edges give qualitative results on the existence of magentism at the Fe atom.

The spectra were recorded using the total flourescence yield detection mode. The XMCD spectra were obtained as the difference between consecutive XANES scans (X-ray Absorption Near Edge Structure) recorded with opposite helicities of the incoming X-ray beam. To ensure whether the XMCD spectra are free from experimental artefacts the data were collected for both directions of the applied magnetic field of 6 T (parallel and antiparallel to the incoming beam). The measurements were performed at about 10 K. Since the samples measured in backscattering geometry were very thick, the spectra were corrected for self-absorption effects. The edge jump ration L_3/L_2 was normalized to 2.19/1. This takes into account the difference in the radial matrix elements of the $2p_{1/2}$ to $5d$ (L_2) and $2p_{3/2}$ to $5d$ (L_3) transitions.



In the figure we show our results on Sr_2CoIrO_6. First of all, it is confirmed that even for Ir where the t_{2g}-orbital is more than half-filled, a similar mechanism is at work as it the case for ferrimagnetic double perovskites. This is not *a priori* clear. Even more, the new result is, that the magnetic coupling is *positive*, i.e. a positive magnetic moment is induced at the Ir site. The magnetic coupling scenario, thus, has to be refined in such a way, that also positive coupling to the non-magnetic ions is allowed. Furthermore, one could have expected a stronger influence of the spin-orbit-coupling. However, the ratio of spin moment to the orbital moment is about 40, meaning that the spin-orbit coupling is almost negligible.

With respect to the measurements at the alkaline earth site (Ca), we could show (to our knowledge for the first time) that these ions also contribute to the magnetic exchange in the ferrimagnetic double perovskites. So far, this contribution has been neglected in any theory. Our result will be the basis to test currently used band structure calculations, whether they are able to predict the contribution of the alkaline earth elements to the magnetic coupling.

In summary, we have further illuminated the rich magnetic coupling behavior in the double perovskites. Here, we have established the magnetic contribution of the alkaline earth metals for the first time. Also for the first time, a positive magnetic interaction between the magnetic and non-magnetic ion has been observed in an Ir-based double perovskite. Two publications dealing with these new developments are in preparation.

[1] A. Winkler *et al.*, Study of FeRe-based double perovskites. To be submitted to Phys. Rev..

[2] A. Winkler *et al.*, Novel mechanism of magnetic coupling in Ir-based double perovskites. To be submitted to Phys. Rev.