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X-MCD IN THE Cr-Re AND Fe-Re BASED DOUBLE PEROVSKITE AT HIGH PULSED MAGNETIC FIELDS

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Oxide half metals, *i.e.* materials with only one spin direction present in the Fermi level either parallel or antiparallel to the magnetization direction are being actively studied due to their potential applications in Spin Electronics. Among them, ferromagnetic double perovskites (DP's) have attracted a lot of interest due to their high Curie temperature (T_C) and predicted half-metallicity [1, 2]. Re-based compounds are the most promising among the (DP's) family, exhibiting T_C as high as 610 K in the case of Sr_2CrReO_6.

Recently we have performed several experiments using high pulsed and static magnetic fields measuring the bulk magnetization of the Re-based double perovskites [3-5]. Magnetism of these materials was primarily explained on the basis on a spin-only model by the double-exchange-like interaction between Fe (or Cr) and Re ions via the unoccupied oxygen 2*p* orbital. However, a large Re orbital moment of the order of one third of the Re spin moment was revealed by the X-ray Magnetic Circular Dichroism (XMCD) in the A_2FeReO_6 series (A=Sr, Ca and Ba) [6]. Its presence is due to a strong spin-orbit coupling in the Re ion being 5*d* element. It was confirmed that the Re orbital moment contributes significantly to the saturation magnetization of the Re based double perovskites, which makes the spin-only ionic model insufficient for a proper description of the magnetic and transport properties of this kind of compounds [3-5].

We present the results of the first, to our knowledge, XMCD study under high magnetic field (up to 26T) generated using pulsed technique. The measurements were performed on CrRe and FeRe based samples using recently improved set-up installed at dispersive XAFS beamline, ID24, at ESRF [7]. The derived orbital contribution to the magnetic moment proves the higher than spin-only-value of the saturation magnetization to be consistent with the models including spin-orbit coupling in the heavy Rhenium ion (see Fig. 1). In our study we compare the results obtained under low and high magnetic field for the FeRe based compounds being an interesting approach having in mind that only large applied magnetic field allows the magnetic saturation of the material. The data collected also allows the comparison of the orbital moment contribution in Cr and Fe based materials each having different electronic band structure.

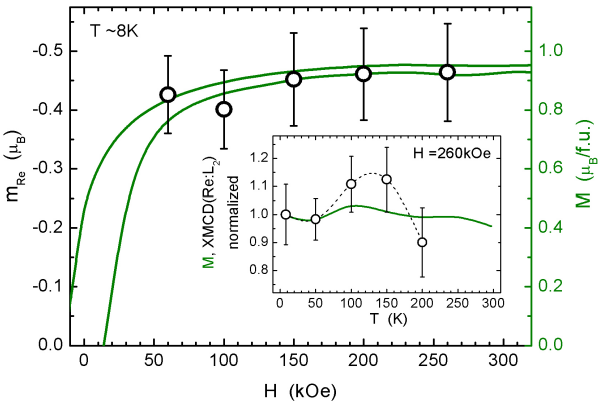

Figure 1. Total derived magnetic moment of Re ion obtained from Sum Rules analysis (left axis, open circles) and the bulk magnetization (right axis, green line) of Sr_2CrReO_6 compound. In the inset the temperature dependence of the normalized L_2 XMCD and bulk magnetization (average value), both measured at 26T.

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