CONTROL ID: 2564838
PRESENTATION TYPE: Oral
CURRENT CATEGORY: II. Magnetoelectronic Materials and Phenomena
CURRENT SUB-CATEGORY: c. Complex Oxides (bulk)
TITLE: Magnetostructural Transition and Cobalt Spin Behavior in Metallic $Pr_{0.50}Sr_{0.50}CoO_3$ Perovskite
AUTHORS (LAST NAME, FIRST NAME): Padilla-Pantoja , Jessica[1]; Herrero-Martín , Javier[2]; Bozzo, Bernat[1]; Pellegrin, Eric[2]; Rodríguez-Velamazán, Jose A. [3]; blasco, Javier[4]; Garcia-Muñoz, Jose Luis [1]
INSTITUTIONS (ALL):
1. Institut de Ciència de Materials de Barcelona -CSIC, E-08193 Bellaterra, Barcelona, Spain.
2. ALBA Synchrotron Light Facility, 08290 Cerdanyola del Vallès, Barcelona, Spain.
3. Institute Laue Langevin, 38042 Grenoble Cedex 9, France.
4. Instituto de Ciencia de Materiales de Aragón, CSIC-Univ. de Zaragoza, 50009 Zaragoza , Spain.
STATUS:
Jose Luis Garcia-Muñoz : government
ABSTRACT BODY:
Abstract Body: In half-doped $Pr_{0.50}A_{0.50}CoO_3$ metallic perovskites, the spin-lattice coupling brings about distinct magnetostructural transitions for A=Ca and A=Sr at temperatures close to ~100 K. However, the ground magnetic properties of $Pr_{0.50}Sr_{0.50}CoO_3$ (PSCO) strongly differ from $Pr_{0.50}Ca_{0.50}CoO_3$ ones, where a partial Pr^{3+} to Pr^{4+} valence shift and Co spin transition makes the system insulating below the transition. This work investigates and describes the relationship between the *Imma→I4/mcm* symmetry change at T_{S1} [1] and the original magnetic behavior of ferromagnetic PSCO versus temperature and external magnetic fields [2-4]. X-ray magnetic circular dichroism (XMCD) at the Co $L_{2,3}$ edges was used to analyze the correlation between the spin and orbital components of the magnetization across T_{S1}~120 K. Charge transfer multiplet calculations of the XMCD spectra were performed to model the electronic configuration of Co^{3+} and Co^{4+} species in the system. The projected orbital momentum m_L (about one third of m_S) also presents a positive-step on cooling the sample across the transition [5]. The FM1 and FM2 ferromagnetic phases, above and below the magnetostructural transition have been investigated in ZF and under applied magnetic field [6]. The FM2 phase of PSCO is composed of [100] FM domains, with magnetic symmetry *Im'm'a* (m_z=0). The magnetic space group of the FM1 phase is *Fm'm'm* (with m_x=m_y). Neutron data analyses in combination with magnetometry and earlier reports results agree with a sudden reorientation of the magnetization axis by 45° within the *a-b* plane across the transition, in which the system retains its metallic character. The presence below T_{S1} of conjugated magnetic domains, both of *Fm'm'm* symmetry but having perpendicular spin orientations along the diagonals in the xy-plane of the tetragonal unit cell, is at the origin of the anomalies observed in the macroscopic magnetization. They are not observed with other lanthanides different to praseodymium.

We thank financial support from MINECO under projects MAT2012-38213-C02 and MAT2015-68760-C2, cofunded by ERDF from EU.
References: [1] J. Padilla-Pantoja, J.L. García-Muñoz, et al, *Inorg. Chem.* 53, 12297 (2014). Also *Inorg. Chem.* 54, 6062 (2015).
[2] R. Mahendiran and P. Schiffer, *Phys. Rev. B* 68, 024427 (2003).
[3] N. A. Frey Huls, N. S. Bingham, et al, *Phys. Rev. B* 83, 024406 (2011).
[4] S. Uchida, R. Mahendiran, et al, Appl. Phys. Lett. 86, 131913 (2005).
[5] J. Padilla-Pantoja, J. Herrero-Martín, et al,*Phys. Rev. B* 92, 245136 (2015).
[6] J.L. García-Muñoz, J. Padilla-Pantoja, et al, 2016, *Phys. Rev. B, in press. (*arxiv.org/abs/1606.05147*).*
KEYWORDS: spin reorientation, orbital moment, spin-lattice coupling, cobaltite.
(No Image Selected)
Attendance at Conference (Abstract): I acknowledge that I have read the above statement regarding the requirement that an author of this presentation must attend the conference to present the paper.
Manuscript? (Abstract): Yes
Previous Presentation (Abstract): No – I didn't present a paper at Intermag 2015 or Joint MMM-Intermag 2016
CONTACT (NAME ONLY): Jose Luis Garcia-Muñoz

CONTACT (E-MAIL ONLY): garcia.munoz@icmab.es