

## María Ángeles Laguna-Marco

Current position: CSIC Tenure Scientist (from 17/11/2021)

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### Affiliations:

1 - *Instituto de Nanociencia y Materiales de Aragón (INMA), CSIC - Universidad de Zaragoza, Spain*

2- *Departamento de Física de la Materia Condensada, Universidad de Zaragoza (UZ), Spain*

### Previous positions:

2007-2009 - postdoctoral fellowship at the Argonne Nat. Lab (Chicago, USA)

2010-2012 - Juan de la Cierva researcher at ICMM-CSIC (Madrid, Spain).

2013-2014 - JAE-Doc researcher at ICMA (CSIC-UZ) (Zaragoza, Spain).

2015-2021 - Contracts associated to research projects at CSIC: ICMA; ICMM and INMA institutes

### Education:

PhD Physics, University of Zaragoza (Spain), 2007

### CV Summary:

Much of my research activity has focused on the study of new magnetic materials: permanent magnets (Ph. D), magnetic nanoparticles for biomedical applications (postdoctoral 2013-2014) and materials for spintronics (postdoctoral and senior scientist). Two pioneering works can be highlighted: a study of ZnO-based systems where the existence of intrinsic ferromagnetism was shown for the first time [Phys Rev. B 82, 064411 (2010) 75 cites; Adv. Funct. Mater. 24, 2094 (2014) 30 cites] and the first direct experimental evidence of the presence of a significant spin-orbit coupling in Ir-based oxides. [Phys. Rev. Lett. 105, 216407 (2010) 115 cites]. My current interest focuses on the study of the magnetic and transport properties of spin-orbit-coupled Ir oxide nanostructures and their potential for the development of novel spintronic devices. Among other results, my recent works on thin films have proposed Sn-doped IrO<sub>2</sub> as one of the most promising materials for spin-current detection [Adv. Funct. Mater., 29, 1806754 (2019)], revealed a thickness-controlled metal-insulator transition on IrO<sub>2</sub> [Nanoscale 13, 17125 (2021)] and reported the first synthesis of magnetic Ir<sub>1-x</sub>Cr<sub>x</sub>O<sub>2</sub> samples as alternative method to stabilize Cr<sup>4+</sup> in the rutile structure [Materials and Design, 196, 109083 (2020)].

The outcome of my work can be summarized in 52 publications in SCI journals. General indicators of quality of scientific production (WOS): times cited (total): 855; average cites in 2017-2021: 71; Q1- articles: 38; h-index: 17; average impact factor in period 2017-2021: 7.2

Invited speaker at the IX edition of the GEFES meeting (2016) and Keynote Lecturer at the SCTE-2016 conference and the CONEXS Conference 2022, with a total of 51 contributions to 38 conferences. I have participated in 16 national (Spanish) research projects. In 2 of them, refs. MAT2010-16022 and PID2020-115159GB-I00, as PI and Co-PI, respectively.

Supervisor of a Ph. D. Thesis (FPI student E. Arias-Egido, UZ, July 2020, "sobresaliente cum laude"). I had teaching duties at the University of Zaragoza (Lab practices of the course "Physics I", 2014-2015). I am currently supervising the realization of two end-of-degree projects. Coordinator of the Univ. of Zaragoza summer school "Los materiales del futuro" (2020 and 2021 editions).

Referee for scientific journals such as Phys. Rev. B, Phys. Rev. Lett. and J. Appl. Phys. Reviewer of R&D projects for the Czech Science Foundation (2016) and the Argentinean Agency for Science and Technology Promotion (2016-2020).

I have a wide experience in synchrotron facilities, carrying out experiments of XAS, XMCD, HP-XRD, XRMR, XRMS and XPEEM. Overall I have performed over 40 experiments. In 20 of them I have been the PI. Co-responsible for the start-up project of the XMCD technique at the BM25 beamline of the ESRF.

My expertise also includes the preparation of samples and the characterization by XRD and XRR, AFM and TEM microscopies, RBS and Mössbauer Spectroscopies, SQUID magnetometry, electrical resistivity, etc. Person in charge of the design and set-up of a home-made sputtering deposition system at the laboratory of synthesis of materials at ICMA (CSIC-University of Zaragoza).

I have actively participated in divulgation activities such as exhibitions and science fairs, Researchers' Night, talks in schools, open days at the lab and divulgative videos ("PlayTools" webseries, FECYT project). I have been coordinator on the "Science Immersion Week" for high school students (Faculty of Science, UZ, 2015 and 2016).

### **Selected Publications:**

Dimensionality-driven metal-insulator transition in spin-orbit-coupled IrO<sub>2</sub>; E. Arias-Egido, M.A. Laguna-Marco\*, C. Piquer, (...) and S. Diaz-Moreno; *Nanoscale* 13, 17125 (2021)

Growth and characterization of novel Ir<sub>1-x</sub>CrxO<sub>2</sub> thin films; E. Arias-Egido, M.A. Laguna-Marco\*, C. Piquer, J. Chaboy, G. Fabbri and D. Haskel; *Materials and Design*, 196, 109083 (2020)

Toward the Optimized Spintronic Response of Sn-Doped IrO<sub>2</sub> Thin Films; E. Arias-Egido\*, M.A. Laguna-Marco, C. Piquer, R. Boada and S. Diaz-Moreno; *Adv. Funct. Mater.*, 29, 1806754 (2019)

Electronic structure, local magnetism, and spin-orbit effects of Ir(IV)-, Ir(V)-, and Ir(VI)-based compounds; M. A. Laguna-Marco\*, P. Kayser, J.A. Alonso, M.J. Martínez-Lope, M. van Veenendaal, Y. Choi and D. Haskel; *Phys. Rev. B* 91, 214433 (2015)

Different response of transport and magnetic properties of BaIrO<sub>3</sub> to chemical and physical pressure; M. A. Laguna-Marco\*, G. Fabbri, N. M. Souza-Neto, S. Chikara, J. S. Schilling, G. Cao, and D. Haskel; *Phys. Rev. B* 90, 014419 (2014)

Fe K-Edge X-ray Absorption Spectroscopy Study of Nanosized Nominal Magnetite; C. Piquer, M. A. Laguna-Marco, A. G. Roca, R. Boada, C. Guglieri, J. Chaboy\*; *J. Phys. Chem. C*, 118, 1332-1346 (2014)

Evidence of Oxygen Ferromagnetism in ZnO Based Materials; C. Guglieri, E. Cespedes, A. Espinosa, (...) and J. Chaboy\*; *Adv. Funct. Mater.* 24: 2094–2100 (2014)

Structural determination of Bi-doped magnetite multifunctional nanoparticles for contrast imaging; M. A. Laguna-Marco, C. Piquer, A. G. Roca, (...) and J. Chaboy; *Phys. Chem. Chem. Phys.*, 16, 18301–18310 (2014)

XMCD Proof of Ferromagnetic Behavior in ZnO Nanoparticles; C. Guglieri, M. A. Laguna-Marco, M. A. García, N. Carmona, E. Cespedes, M. García-Hernandez, A. Espinosa and J. Chaboy\*; *J. Phys. Chem. C*, 116, 6608 (2012)

Orbital magnetism and spin-orbit effects in the electronic structure of BaIrO<sub>3</sub>; M.A. Laguna-Marco, D. Haskel, N. Souza-Neto, (...) and M. van Veenendaal; *PRL* 105, 216407 (2010)

Experimental determination of the R (5d) – T (3d) hybridization in rare-earth intermetallics; M.A. Laguna-Marco, J. Chaboy, C. Piquer; *Physical Review B* 77, 125132 (2008)