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Guest Lecture

Title: "Nanomagnetism: From Magnets to Atoms, and Back"

Speaker: Dr. Fernando Luis Vitalla

Address: Instituto de Ciencia de Materiales de Aragon, CSIC-Universidad de Zaragoza, 50009 Zaragoza (Spain)

Date: Friday, 9th of May 2014

Time: 14:30

Place: Seminar Room CBEG02 (387, Photonics); Gußhausstraße 27

Abstract:

Magnetic materials are omnipresent in our daily life, as they take part in electrical engines, energy generators, hard disks, etc.. Reducing the size of magnets while preserving their potential for applications has been one of the driving forces behind the research in this field. However, the appeal of nanomagnetic systems does not simply arise from the desire of integrating more and more elements in a device. With the reduction of size, the physical properties of materials change and completely new phenomena, not seen at the macroscopic scale, emerge.





The talk will illustrate these ideas with results from the author on two different topics: a) size-dependent magnetic anisotropy of Cobalt nanospheres [1], which are seen as potential classical bits and b) quantum spin dynamics in magnetic molecular clusters [2,3], which provide suitable building blocks of a future quantum computer. Understanding the microscopic origin of these phenomena offers also vast possibilities for the design of new materials using a bottom-up approach, even macroscopic magnets [4].

References

[1] F. Luis, F. Bartolomé, F. Petroff, J. Bartolomé, L. M. García, C. Deranlot, H. Jaffrès, M. J. Martínez, P. Bencok, F. Wilhelm, A. Rogalev, and N. B. Brookes, *Tuning the magnetic anisotropy of Co nanoparticles by metal capping*, Europhys. Lett. **76**, 142–148 (2006).

[2] F. Luis, A. Repollés, M. J. Martínez-Pérez, D. Aguilà, O. Roubeau, D. Zueco, P. J. Alonso, M. Evangelisti, A. Camón, J. Sesé, L. A. Barrios, and G. Aromí, *Molecular Prototypes for Spin-Based CNOT and SWAP Quantum Gates*, Phys. Rev. Lett. **107**, 117203 (2011).
G. Aromí, D. Aguilà, P. Gamez, F. Luis and O. Roubeau, *Design of magnetic coordination complexes for quantum computing*, Chem. Soc. Rev. **41**, 537-546 (2012).

[3] *Molecular Magnets: Physics and Applications*, Nanoscience and Nanotechnology Series, J. Bartolomé, F. Luis, and J. F. Fernández editors, Springer Verlag (Berlin, Heidelberg, 2014).

[4] Miguel Clemente-León, Eugenio Coronado, Carlos J. Gómez-García, Maurici López-Jordà, Agustín Camón, Ana Repollés, and Fernando Luis, Chemistry A Eur. J. **20**, 1669 – 1676 (2014).