

**IMEM-CNR, Sala A – 08/02/2018, ore 15.00**

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## **Studying Phase Transitions and Critical Phenomena via Magnetocaloric Studies**

### **Abstract**

The increasing concern of our society about energy efficiency, together with the fact that temperature control accounts for a large portion of the energy consumption at homes and commercial buildings, has fostered research on the applicability of magnetocaloric materials for magnetic refrigeration [1]. Most of the current studies on magnetocaloric materials focus on the optimization of their properties for room temperature magnetic refrigeration. The aim of this talk is to show that MCE can also be used for characterizing magnetic phase transitions. We will present examples in which universal scaling of the magnetic entropy change is used to determine critical exponents and transition temperatures [2] (even when standard techniques could not be applied). We will also show that the scaling nature of MCE can be used to determine the order of a phase transition and helps us to identify the composition of the so-called tricritical point [3]. The study of magnetocaloric materials with a first order phase transition will be tackled by the use of temperature-FORC and applied to Heusler-type alloys [4].

- [1] V. Franco, J.S. Blázquez, J.J. Ipus, J.Y. Law, L.M. Moreno-Ramírez, A. Conde, *Progress in Materials Science*, 93 (2018) 112.
- [2] V. Franco, A. Conde, *Int. J. Refrig.* 33 (2010) 465.
- [3] V. Franco, J.Y. Law, A. Conde, V. Bravander, D. Y. Karpenkov, I. Radulov, K. Skokov, and O. Gutfleisch, *J. Phys D: Appl. Phys.* 50 (2017) 414004.
- [4] V. Franco, T. Gottschall, K. P. Skokov, and O. Gutfleisch, *IEEE Magnetics Letters* 7 (2016) 6602904.

**Victorino Franco** is a Professor at the Condensed Matter Physics Department, Sevilla University, Spain. He obtained his PhD in Physics from Sevilla University in 1999. His research interest focuses on magnetic materials for energy applications, including soft magnetic and magnetocaloric materials. He published over 165 papers in international journal, receiving more than 3100 citations (excluding self citations) and has an h-index of 32. He has been visiting professor at numerous universities and research labs worldwide and has been recipient of Young Scientist Awards from the Spanish Royal Physical Society (2000) and from the Royal Order of Chivalry & Royal Academy of Sciences of Sevilla (2005). He is currently Chair of the Spain Chapter of IEEE Magnetics Society and was the Chair of the Magnetic Materials Committee of the Minerals Metals and Materials Society (TMS) (2012-2014). He has been the Publication Chair for MMM-2017 (Pittsburgh) and will serve in the same role for the Joint MMM-Intermag 2019 and MMM 2019. He has been elected as the General Chair for the Joint MMM-Intermag that will take place in New Orleans in 2022.