The use of the magnetocaloric effect as a technique to determine the characteristics of phase transitions

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The aim of this talk is to show that the study of the magnetocaloric effect is not only interesting for developing new technological applications, but it can also be used to determine some properties of the phase transitions of materials, even in the cases when the conventional techniques do not give appropriate results. We will separate the talk in three interrelated cases:

- While it is relatively straightforward to determine the critical exponents of materials with a single phase transition, the usual methods like the Kouvel-Fisher method do not work in the cases in which there are several magnetic phases in the material. We will show that the field dependence of the magnetocaloric effect can be used to make this kind of determination [1].
- Although there are purely-magnetic methods for determining the order of the phase transition, like the Banerjee criterion, there are specific cases for which this criterion gives contradicting results. The second part of this talk will show that the analysis based on the scaling properties of the magnetic entropy change can be used to correctly determine the order of the phase transition [2].
- The development of composite materials has the unavoidable consequence that the magnetic phases in the system may interact among them. In order to determine the strength of those interactions between phases, we have compared the experimental magnetic entropy change curves with the results of models incorporating different degrees of interactions [3].

References:

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