Differential scanning calorimetry under applied fields: entropy changes in caloric materials

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A caloric effect is commonly quantified by the isothermal entropy change that takes place in a material under the application (or removal) of an external field. Among the existing techniques for determining such entropy changes, calorimetry is particularly interesting because it is specifically designed to measure thermal effects taking place in a material, therefore providing the most direct determination of entropy changes.

Giant caloric effects are associated with the occurrence of a first order phase transition, and differential scanning calorimetry (DSC) is the best suited technique to measure heat (and entropy) changes at these transitions. In the recent years a series of DSC calorimeters capable of operating under external fields have been developped. These devices enable an accurate and reliable determination of field-induced entropy changes. Furthermore, they provide an easy way to investigate the reproducibility of caloric effects upon field cycling.

In my talk, I will describe a number of purpose-built DSC calorimeters which operate under magnetic, electric and mechanical fields. Selected illustrative results on a variety of magnetocaloric, electrocaloric and mechanocaloric materials will be presented.

**Key Words:** Caloric effects, Entropy change, Calorimetry.