

Ferromagnetic shape memory Heuslers: a journey from bulk to nano (invited)

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Ferromagnetic shape memory materials, introduced in 1996, have constantly shown new emerging properties exploitable in different technological sectors, among which remote actuation and solid state refrigeration. Their excellent responsiveness to external fields, i.e. magnetic field, pressure and stress and their combined application, makes them promising for multifunctional exploitation. This phenomenology arises from the occurrence of a martensitic transformation and a strong coupling between magnetism and structure. Thus, the hysteretic character of the martensitic transformation and its broadness strongly affect the performances of materials, mainly in cyclic applications.

In my talk I will present some recent results on NiMn-based Heuslers, including nano/microscale materials obtained by different fabrication methods, i.e. epitaxial thin films, patterned nanostructures, mechanically-milled particles. Thin films and micro/nanostructures are of particular interest not only for the realization of miniaturized new-concept devices, but also for providing insights into the magneto-structural coupling at the different length scales, suggesting possible strategies for the optimization of material performances. The talk will focus on microstructure tuning and microstructure-related effects on the martensitic transformation, in view of the possible exploitation of this class of materials in smart and energy-related applications.