

Giant Magnetoresistance with Temperature-dependent Crossover in FeNi₃-graphene Nanocomposites

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A dramatic temperature-dependent crossover from positive room-temperature Giant Magnetoresistance (GMR) to negative Low-field Tunneling Magnetoresistance (LFTMR) below 50 K is observed in FeNi₃-graphene nanocomposites. Two clearly different behaviors have been discovered, being the temperature barrier ca. 50 K. The low-temperature behavior is particularly sensitive to low magnetic fields. The nanocomposites were synthesized by means thermal decomposition of a hybrid sebacate-intercalated layered double hydroxides as single source precursor. The as-synthesized nanocomposites consist on ferromagnetic FeNi₃ nanoparticles embedded in a few-layers graphene matrix. This work represents a straightforward methodology based on chemical synthesis for the preparation of magnetoresistance materials offering great possibilities as GMR sensors.

All of our data suggest that we have a ferromagnetic nanoparticles/carbon matrix nanocomposite whose matrix conductivity can be tuned with temperature, thus offering the possibility of modulate the MR behavior. Moreover, all the rich MR phenomenology occurs under low fields. Our GMR granular nanocomposites can operate at room temperature or low fields in contrast to multilayered GMR materials, where a high magnetic field is required to saturate the MR, suggesting promising applications as GMR sensor

References

[1] Federico García Lorca, *Gypsy Ballads*, (1928)

[2] Washington Irving, *Tales of the Alhambra*, (Carey&Lea, USA, 1832), Chap. 1.1

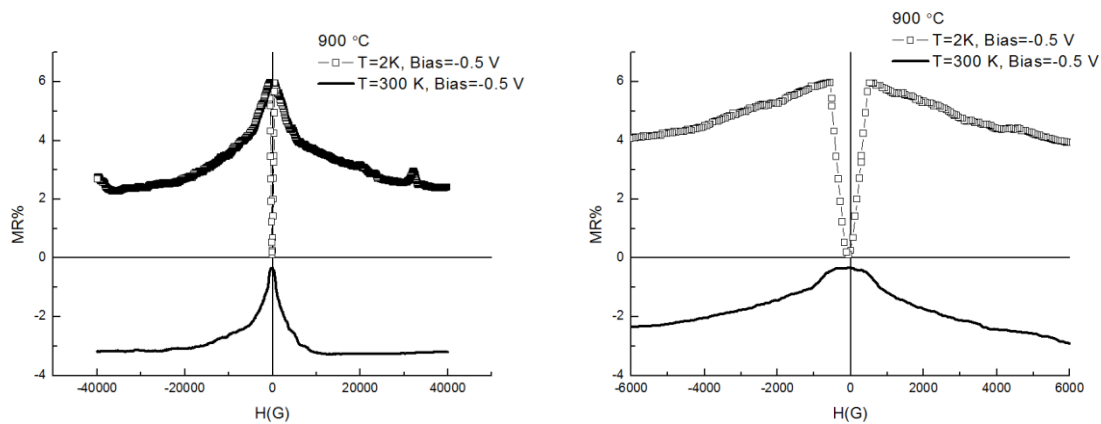


Figure 1: Magneto-Resistance for 900°C nanocomposite, and the zoom of the Low magnetic field range.