Influence of Nanoparticle Doping on Electronic Properties of MgB_2 Bulk Samples

L. Gozzelino[1], R. Gerbaldo[1], G. Ghigo[1], F. Laviano[1], G. Lopardo[1], E. Mezzetti[1], G. A. Ummarino[1], G. Giunchi[2], E. Perini[2], L. Saglietti[2], E. Bassani[3] and B. Minetti[1]

[1]Dept. of Physics, Politecnico di Torino, C.so Duca degli Abruzzi 24, 10129 Torino, Italy
[2]EDISON SpA, R&D Dept., Foro Buonaparte 31, 20121 Milano, Italy
[3]CNR-IENI, Lecco Labs., Corso Promessi Sposi 29, 23900 Lecco – Italy

E-mail: laura.gozzelino@polito.it

Abstract - Superconducting and normal-state properties of MgB_2 polycrystalline samples with non-magnetic (SiC) and magnetic (Co) dopant addition were analysed in order to study the doping influence on the magnetic anisotropy of MgB_2 polycrystalline samples and to correlate this influence with the doping-induced changes in band scattering processes. Both doping typologies result in a decrease of the MgB_2 upper critical field anisotropy factor. For SiC-doped samples this result is joined to an upper critical field (B_{c2}) shift toward higher temperatures whereas Co doped samples exhibit a B_{c2} decrease. To guide the application road map a theoretical approach to the analysis of the normal state resistivities (SiC doping) and of the upper critical field dependence on temperature (SiC and Co dopings) was performed. According to the anisotropy reduction scenario, band scattering rate as well as electron diffusivity values obtained by these analyses showed for both the investigated doping typologies an increase of intraband scattering processes in the more anisotropic σ band whereas the conductivity of π band remains almost unaffected.

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