Structural and magnetotransport properties in granular Co(c=0.8)Bi(1-c) thin films

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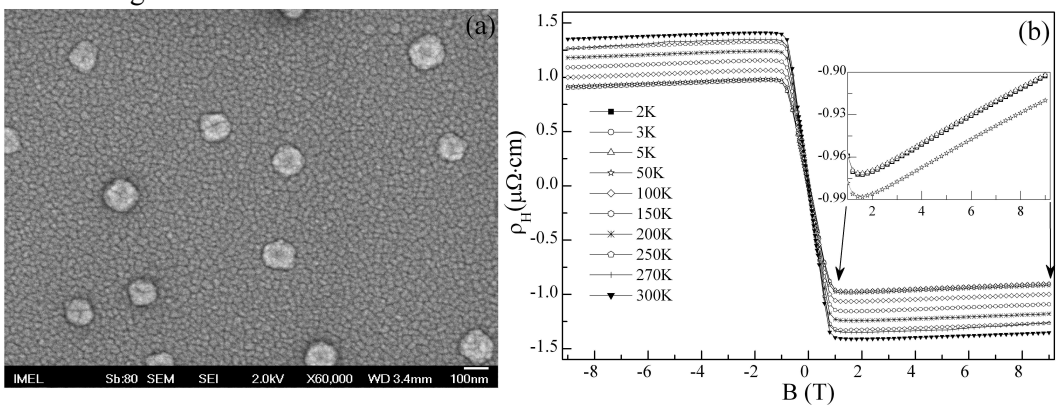
In this work we present Semimetal/Magnetic granular thin film nanostructures with structure of Co(c=0.8)Bi(1-c) which were grown by magnetron sputtering.
X-ray diffraction (XRD) measurements reveal that the structure is polycrystalline. The predominant texture with (00*l*) indices *(l=3, 6),* that observed in pure Bi films, decrease towards to zero intensity as Co thickness increases, indicating a progressive change in texture of Bi layers depending from the thickness of Co. Field Emission Scanning Electron Microscopy (FESEM) (figure a) show a bimodal distribution of grain sizes with average values of 95 nm for the embedded structures, and 10 nm for Co-rich nano-grains in the background.



AHE loops (figure b) exhibit a significant increase of the anomalous Hall (AH) coefficient R_S by 50%, from 2K up to 300K. It shows that the conduction mechanism in these films is not due to tunneling effect through grain boundaries, or variable-range-hopping (VRH) mechanism. A first explanation is that Hall resistance measures the amount of electrons trapped by magnetic gradients in boundaries between magnetic Co nano-grains and Bi surface states. It can be considered that Hall resistance measures channeling by snake and cycloid orbits in the regions of high magnetic gradient, as reported in ref. [1].

References

[1] A. Nogaret, D. N. Lawton, D. K. Maude, J. C. Portal, and M. Henini, Phys. Rev. B, **67**, 165317 (2003).

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