Ballistic Magnetoresistance in Electrodeposited Magnetic Nanocontacts

N. Garcia
Laboratorio de Física de Sistemas Pequeños y Nanotecnología (CSIC)
Serrano 144, Madrid 28006

In this work we discuss recent results on the growth of nanocontacts of magnetic materials with applied and non applied magnetic field during the growth process. The aim of this electrodeposition is to study the ballistic magnetoresistance (BMR) between the electrodes through the grown nanocontacts. Of all techniques used to form the nanocontacts the electrodeposition is, in our opinion the most convenient because it permits us to stop the growth for the desired resistance of the contact and this is inversely proportional to the size of the contact, so that there is a good control of the contact size. The size of the nanocontacts range between 1 and 30 nm (resistances ranging between 1000 and 1 Ohms) and BMR values up to 1000% can be obtained. We have made electrodeposition between the following type of electrodes:

i) Micrometer size wires disposed in T shape to take opportunity of the shape anisotropy for the magnetization reversal, as well as to observe the influence of the external field in the growth process in the direction parallel and perpendicular to the wire.
ii) Growth that bridge narrow gaps between thin films grown in the 10^{-7}Toor vacuum.
iii) Growth in microfabricated structures
iv) Growth of clusters through pores existing in tunnel barriers crested by oxidation of atomic layers.

In all the cases we observe a kind of granular structures, like clusters and cluster aggregates that can be smoothed out in some cases by application of external filed during growing. This clustering formation creates problem in the reversal process of magnetization frustrating the magnetization of the clusters. The problems arising from this will be discussed.

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