Direct-current induced magnetic switching in Au- Fe/Si multilayers point contact

J. Baszyński, T. Luciński, and P. Wandziuk
Institute of Molecular Physics, PAS, Smoluchowskiego 17, 60-179 Poznań, Poland

9.7 cm

The magnetic switching processes in point contacts (PC), made from Au tip - Fe/Si multilayers involving no lithography, are studied at RT as a function of the DC current passing through these nanoconstrictions. The nanocontacts were obtained by pressing Au wires (0.05 mm in diameter) into Fe/Si multilayers. The antiferromagnetically coupled $[Fe(3nm)/Si(1.1nm)]_{15}$ multilayers were deposited in UHV by magnetron sputtering at RT onto oxidized Si wafers. The crystalline structure of our samples and their multilayer periodicity were examined using the high- and small-angle X-ray diffraction, respectively. The $I-V$ characteristics of these nanocontacts at RT exhibit a non-linear variation. By fitting of the $I-V$ curves to the Simmons theory the barrier width (0.3-0.8) nm and height (0.4-0.7) eV of the junctions and their effective area (1-100)$\times 10^{-12}$ cm^2 were estimated. In the high intensity of the DC current (above 10^6 A/cm^2) passing through PC, a hysteretic jump in the resistivity was observed - a clear evidence for a current induced magnetization reversal of one of the magnetic multilayers. The present results are likely to raise interesting fundamental questions. At the same time, the observation of a high magnetoresistance effect at zero external fields is exciting from the viewpoint of the technological applications.

13.4 cm

Subject category :
2. Magnetic Films, Surfaces, Multilayers and Nanostructures

Presentation mode :
poster

Corresponding author :
J. Baszyński

Address for correspondence :
Institute of Molecular Physics
Polish Academy of Sciences
Smoluchowskiego 17
60-179 Poznań
Poland

Email address :
jbasz@ifmpan.poznan.pl