9.7 cm

Tunnel magnetoresistance in planar junctions with ferromagnetic barriers

M. Wilczyński[a], J. Barnaś[b], R. Świrkowicz[a],

[a]Faculty of Physics, Warsaw University of Technology
Koszykowa 75, 00-662 Warsaw, Poland
[b]Faculty of Physics, Adam Mickiewicz University, 61-614 Poznań, Poland

Electron tunnelling in planar junctions with ferromagnetic barriers has been studied theoretically. Experimentally examined double junctions consisting of nonmagnetic PbS layers and ferromagnetic EuS barriers can be an example of the system analysed. The calculations have been performed in the free-electron-like one-band model. It has been assumed, that the barriers have trapezoidal shape and the Airy functions have been used to describe electron wave functions in the barriers. A tunnel magnetoresistance effect (TMR), i.e., the dependence of the tunnelling current on the relative orientation of magnetic moments in ferromagnetic components of the junction has been found. The variation of TMR with the thickness of the barriers has been analysed. The highest value of TMR has been obtained for double barrier junctions with the barriers of similar thickness. In such systems TMR significantly increases with increasing thickness of the barriers. In double junctions with strong asymmetry in the barrier thickness, TMR drops to zero. The influence of the Fermi level position and the barrier height on the TMR effect has been studied in detail. The bias dependence of TMR has also been analysed.

13.4 cm

Subject category :

2. Magnetic Films, Surfaces and Multilayers

Presentation mode :
poster

Corresponding author :
M. Wilczynski

Address for correspondence :
Politechnika Warszawska
Wydzial Fizyki
Koszykowa 75
00-662 Warszawa, Polska

Email address :
wilczyns@if.pw.edu.pl