SURFACE SPIN-VALVE WITH AN EXCHANGE BIAS

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Magnetoresistance $R(H)$ at $V=0$ and differential resistance $R(V)$ ($R=dV/dI$) at $H=0$ of
point contacts between nonmagnetic Cu tips and single ferromagnetic films (FM - Co)
echange-pinned by antiferromagnetic films (AFM Fe50Mn50) have been investigated. Analysis of measured $R(V)$ and $R(H)$ characteristics confirms recently proposed model
of the point contact surface spin-valve (SSV). Magnetoresistance $R(H)$ of SSV in the
point contacts to ferromagnetic films exchange-pinned by antiferromagnets shows an
exchange offset that depends on a mutual orientation of the applied magnetic field in
respect to a pinned magnetization of the AFM/FM layer. We have found that switch-
ing of this ferromagnet bulk occurs at lower fields than switching of surface spin layer.
Origin of such higher switching field can be caused by a higher coercivity due to
morphological imperfections and defects in the contact core. In addition, it has been shown
that point contact SSVs based on an amorphous alloy Co40Fe40B20 (3,6,9,20 nm) also
have the same properties as spin-valves with a geometrically controlled structure. The
experiments showed that an increase of an exchange bias under decreasing of CoFeB
films thickness is observed both at the surface and in the SSV bulk. A negative magne-
toresistance of such point-contact SSVs based on CoFeB was also observed.

Subject category:
4. Spin Electronics and Magneto-Transport

Presentation mode:
poster

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