Abstract Submitted
for the MAR13 Meeting of
The American Physical Society

Study of statistics of magnetization reversal in permalloy($Ni_{80}Fe_{20}$) microwires using planar Hall effect

ARNAB ROY, P. S. ANIL KUMAR, Department of Physics, Indian Institute of Science, Bangalore 560012, India — Planar Hall effect was used to study the switching behaviour of 1mm*100micron*15nm permalloy Hall bars grown in (111) orientation on Si(100). Reversal model was Arrhenius type activation over energy barriers, $p(H) = e^{\frac{-\Delta E(H)}{k_B T}}$. The model proposed by M.P.Sharrock : $\Delta E(H) = KV\left(1 - \frac{H}{H_0}\right)^m$ with H_O =2xK/M was used to find the shape of the energy landscape for the bar undergoing reversal in an applied field. Multiple reversal paths were observed for a given wire under the same conditions, each distribution in very good agreement with the above model, allowing the calculation of : 1. Temperature dependence of the effective anisotropy constant for the bar; K(T)= (1/2)*H_oM(T) (x=1 for applied field at 0^O) 2. Energy barrier landscape: An exponent m= 1.5 to 2 is expected to leading order in the expansion of the energy barrier according to the Stoner Wolfarth model, however, our results give an exponent of 2.8 to 3 for all angles (out of plane) of the applied field for the principal reversal path, pointing to mechanisms other than coherent rotation at work. If domain wall propagation and pinning is the mechanism of reversal, this study determines the energy landscape around the pinning field.

Arnab Roy
Department of Physics, Indian Institute of Science,
Bangalore 560012, India

Date submitted: 28 Nov 2012 Electronic form version 1.4