

Very large Magnetoresistance in ferromagnetic (Ga,Mn)As wires with Nanoconstrictions

C. Rüster, C. Gould, T. Borzenko, G. Schmidt, L.W. Molenkamp

Physikalisches Institut EPIII, Universität Würzburg, Am Hubland, D-97074 Würzburg, Germany

e-mail: Gould@physik.uni-wuerzburg.de

Flatté and Vignale recently pointed out [APL 78, (2001) 1273] that a very large magnetoresistance should be observable for transport through domain walls in (Ga,Mn)As. We have fabricated (Ga,Mn)As nanostructures in with sub-10 nm constrictions that can be used to not only to pin the domain wall, but also to reduce the wall thickness and therefore increase the size of the effect. Making use of shape anisotropy, we can switch the regions on either side of the constriction to have either parallel or antiparallel magnetization.

All our samples show a strong positive magnetoresistance consistent with domain wall trapping at the constriction. For samples in the metallic transport regime, we find a magnetoresistance up to 8%, which can be understood from spin accumulation. In samples where, due to depletion at the constriction, a tunnel barrier is formed, we obtain a magnetoresistance of up to 2000 %.