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Modeling the negative magnetoresistance of Ferromagnet-Graphene-Ferromagnet junctions

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Abstract Submitted
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Charge and spin transport in metal-graphene-metal vertical junctions ENRIQUE COBAS, OLAF VAN 'T ERVE, SHU-FAN CHENG, JAMES CULBERTSON, GLENN JERNIGAN, KONRAD BUSSMAN, BERRY JONKER, U.S. Naval Research Laboratory — We observe negative magnetoresistance(MR) in metallic NiFe(111)|multi-layer graphene|Fe heterostructures[1] consistent with minority spin filtering[2]. The MR is -5 percent at room temperature and -12 percent at 10 K. The transport properties and temperature dependence are metallic. We further investigate the out-of-plane (c-axis) resistivity and magnetoresistance of multi-layer graphene between metal surfaces. We fabricate various metal-graphene-metal vertical heterostructures via chemical vapor deposition directly on lattice-matched crystalline metal films including NiFe(111) and Co(0002) and in-situ electron beam evaporation of NiFe, Co, Ni, Fe, Cu and Au. [1] Cobas, E.D., van 't Erve, O.M.J., Cheng, S-F., Culbertson, J.C., Jernigan, G.G., Bussman, K., and Jonker, B.T, Room Temperature Spin Filtering in Metallic Ferromagnet-Multilayer Graphene-Ferromagnet Junctions, ACS Nano ASAP 2 Nov 2016. [2] Karpan, V.M., Giovannetti, G., Khomyakov, P.A., Talanana, M., Starikov, A.A., Zwierzycki, M., van der Brink, J., Brocks G. and Kelly, P.J., Graphite and graphene as perfect spin filters, Phys. Rev. Lett. (2007) 99, 176602.

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