Abstract Submitted
for the MAR14 Meeting of
The American Physical Society

Homoepitaxial Graphene Tunnel Barriers ADAM FRIEDMAN, OLAF VAN 'T ERVE, CONNIE LI, Mater. Sci. and Tech. US Naval Research Lab, JEREMY ROBINSON, Elec. Sci. and Tech. US Naval Research Lab, BEREND JONKER, Mater. Sci. and Tech. US Naval Research Lab, AWESOME TEAM
— Tunnel barriers are key elements for spintronic devices. Such devices require mating dissimilar materials, raising issues of heteroepitaxy, interface stability, and electronic states that severely complicate fabrication and compromise performance. Graphene is the perfect tunnel barrier: It is an insulator out-of-plane, possesses a defect-free, linear habit, and is impervious to interdiffusion. Nonetheless, true tunneling between two stacked graphene layers is not possible except under extreme circumstances. However, two stacked graphene layers can be decoupled using chemical functionalization, which would allow tunneling between the two layers and the realization of an all graphene electronic tunneling device. Here, we demonstrate a homoepitaxial tunnel barrier device in which graphene serves as both the tunnel barrier and the high mobility transport channel. Beginning with bilayer graphene, we fluorinate the top layer to decouple it from the bottom layer, so that it serves as a single monolayer tunnel barrier for both charge and spin injection into the lower graphene transport channel. We demonstrate high spin injection efficiency and lateral transport of spin currents in non-local spin-valve structures and determine spin lifetimes with the non-local Hanle effect.

Adam Friedman
Mater. Sci. and Tech. US Naval Research Lab

Date submitted: 14 Nov 2013 Electronic form version 1.4