Abstract Submitted
for the MAR13 Meeting of
The American Physical Society

Tunnel magnetoresistance of magnetic junctions based on side-wall epitaxial graphene nanoribbons CHAO HUAN, JOHN HANKINSON, WENLONG YU, RUI DONG, JAMES PALMER, OWEN VAIL, MING RUAN, School of Physics, Georgia Institute of Technology, CLAIRE BERGER, Gatech - School of Physics, CNRS-Institut Neel, EDWARD CONRAD, WALTER DE HEER, ZHIGANG JIANG, School of Physics, Georgia Institute of Technology — We report on tunnel magnetoresistance (TMR) measurements of magnetic tunnel junctions consisting of cobalt, aluminum oxide barrier, and side-wall epitaxial graphene nanoribbons (GNRs). We find that the measured resistance of tunnel junctions exhibits a spin switch behavior when the magnetic field is applied parallel to the cobalt electrode and sweeping between 1 T and -1 T. This observation indicates that the side-wall GNR is magnetic, with a spin component either parallel or antiparallel with respect to the magnetization direction of cobalt. The largest relative change of TMR observed is about 9% at 6.6 K, corresponding to 14% of spin polarization in GNR. In addition, we find that Rashba effect may play an important role in polarizing the electron spins in GNR; the required electric field could be due to the charge transfer between the carbon atoms on the edge of GNR and the Si atoms of the SiC substrate.

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Date submitted: 19 Nov 2012 Electronic form version 1.4