MAR11-2010-003121

Abstract for an Invited Paper
for the MAR11 Meeting of
the American Physical Society

Strain-Induced Pseudo–Magnetic Fields in Graphene: MegaGauss in Nanobubbles

NIV LEVY[1], Department of Physics, University of California & Materials Science Division, Lawrence Berkeley National Laboratory, Berkeley, CA 94720, USA.

Recent theoretical proposals suggest that strain can be used to modify graphene electronic states through the creation of a pseudo–magnetic field. This effect is unique to graphene because of its massless Dirac fermion-like band structure and particular lattice symmetry (C3v). Scanning tunneling microscopy shows that graphene grown on a platinum (111) surface forms nanobubbles, which are highly strained due to thermal expansion mismatch between the film and the substrate. We find that scanning tunneling spectroscopy measurements of these nanobubbles exhibit Landau levels that form in the presence of strain-induced pseudo–magnetic fields greater than 300 Tesla. This demonstration of enormous pseudo–magnetic fields opens the door to both the study of charge carriers in previously inaccessible high magnetic field regimes and deliberate mechanical control over electronic structure in graphene or so-called "strain engineering".

In collaboration with S. A. Burke[§,2], K. L. Meaker[2], M. Panlasigui[2], A. Zettl[2,3], F. Guinea[4], A. H. Castro Neto[5] and M. F. Crommie[2,3]. §. Present address: Department of Physics and Astronomy and Department of Chemistry, University of British Columbia, Vancouver, BC V6T 121, Canada. 2. Department of Physics, University of California, Berkeley, CA 94720, USA. 3. Materials Science Division, Lawrence Berkeley National Laboratory, Berkeley, CA 94720, USA. 4. Instituto de Ciencia de Materiales de Madrid (CSIC), Madrid 28049, Spain. 5. Department of Physics, Boston University, Boston, MA 02215, USA.

[1]Present address: Center for Nanoscale Science and Technology, NIST, Gaithersburg, MD 20899, USA