Abstract Submitted
for the MAR10 Meeting of
The American Physical Society

Opening a bandgap in graphene by fluorination BEI WANG, B.J. COOLEY, S.-H. CHENG, K. ZOU, Q.Z. HAO, Physics Department, Penn State University, F. OKINO, 2Department of Chemistry, Faculty of Textile Science and Technology, Shinshu University, J. SOFO, N. SAMARTH, J. ZHU, Physics Department, Penn State University — The zero bandgap of graphene underpins many of its unique electronic properties. A band gap is desirable, however, for many electronic and optical applications. Chemical modifications of the graphene sheet can drastically change its conductivity. Following this strategy, both oxygenation and hydrogenation of graphene have been demonstrated. In this study, we present a reversible method of modifying the band structure of graphene through fluorination. Reacting graphite with fluorine gas at high temperature results in nearly 100% fluorinated graphite fluoride, where each carbon atom is covalently bonded to a fluorine atom. Remarkably, the layered structure and hexagonal in-plane crystalline order are preserved in graphite fluoride. We obtain few-layer graphene fluoride through stamping method and report the optical and transport properties of this extremely insulating 2D compound, which is expected to be a wide band gap semiconductor.

Bei Wang
Physics Department, Penn State University

Date submitted: 19 Nov 2009 Electronic form version 1.4