Abstract Submitted
for the MAR10 Meeting of
The American Physical Society

Dissolution of Graphite into Graphene and Formation of Liquid Crystals NATNAEL BEHABTU, JAY LOMEDA, MICAH GREEN, ALEXANDER SINITSKII, AMANDA HIGGINBOTHAM, A. NICHOLAS G. PARRAVASQUEZ, DMITRY V. KOSYNKIN, Rice University, JUDITH SCHMIDT, ELLINA KESSELMAN, YACHIN COHEN, YESHAYAHU TALMON, Technion University, JAMES M. TOUR, MATTEO PASQUALI, Rice University — Graphene is a promising new material with a wide number of potential applications, including electronics and nanocomposites, which often require that the graphene be dispersed and processed in a fluid phase. Here we show that in chlorosulfonic acid, graphene is spontaneously exfoliated from graphite into graphene, and dissolved at isotropic concentrations as high as 2 mg/ml, without covalent functionalization, surfactant stabilization, or sonication. STEM and cryo-TEM show that graphene in chlorosulfonic acid acts as rigid platelets. Thus, at higher concentrations, a liquid-crystalline phase forms spontaneously. The dissolution mechanism in superacids is protonation forming charge transfer complexes facilitating electrostatic repulsion, similar to nanotubes in superacids. Novel forms of graphene such as carbon nanoribbons can be dispersed as well. The isotropic phase is processed into conducting and transparent films.

Natnael Behabtu
Rice University

Date submitted: 11 Dec 2009 Electronic form version 1.4