

Abstract Submitted  
for the MAR07 Meeting of  
The American Physical Society

**Structural and mechanical properties of ‘graphene oxide’-based paper** DMITRIY A. DIKIN, ERIC J. ZIMNEY, SASHA STANKOVICH, RICHARD D. PINER, GEOFFREY H. B. DOMMETT, RODNEY S. RUOFF, Northwestern University, Evanston, IL — Free standing membranes (GO paper) were produced by exfoliation of graphite oxide in water to individual ‘graphene oxide’ sheets (as a colloidal suspension) followed by their re-assembly by vacuum filtration. Study of the structure and morphology of the GO paper revealed that it is composed of highly packed and ordered layers of graphene oxide sheets separated by water molecules. Measurements of the mechanical response under tensile load revealed elastic deformation for small strain, followed by plastic deformation again for a relatively small region of strain, and then fracture without pullout of individual sheets or multi-layer stacks. GO paper possesses high modulus values of about 40 GPa and strength values around 130 MPa; each much higher than modulus or strength values for Bucky-paper or Grafoil. The experimental results support the conclusions of very effective load distribution and good binding between the GO sheets in which the self-adjusted amount of interlayer water plays a central role. After the deoxygenation of GO sheets the fabricated paper becomes a tunable semiconductor. Support from NASA (Award # NCC-1-02037) through the University Research, Engineering, and Technology Institute on Bio-inspired Materials is appreciated.

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Date submitted: 02 Dec 2006

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