Abstract Submitted
for the MAR12 Meeting of
The American Physical Society

Adhesive interaction between graphene membranes and amorphous substrates RUI HUANG, WEI GAO, University of Texas at Austin — To integrate graphene in functional devices, it is essential to understand interfacial adhesion between graphene and surrounding materials for mechanical support and encapsulation. In complement with recent efforts aiming to measure the adhesion energy experimentally, we present a theoretical model for adhesive interaction between a graphene monolayer and an amorphous substrate. The model is extended to analyze the morphological stability of a graphene membrane on an oxide substrate. It is found that the bending modulus, which increases drastically from monolayer to multilayered graphene, plays an important role in the transition from conformal to non-conformal morphology of the graphene membranes on a corrugated surface. Furthermore, the work of adhesion is predicted to drop considerably from monolayer to bilayer graphene, in good agreement with recent measurements. The theoretical results suggest that tunable adhesion of graphene can be achieved by controlling the surface roughness of the substrate.

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Date submitted: 29 Nov 2011 Electronic form version 1.4