Abstract Submitted
for the MAR13 Meeting of
The American Physical Society

Mg/MgO/Graphene Tunnel Junctions Made by Dry Transfer of Graphene in Vacuum YING FENG, KE CHEN, Department of Physics, Temple University, Philadelphia, Pennsylvania 19122, USA — Mg/MgO/Graphene junctions were fabricated by dry transfer of single layer graphene film grown by chemical vapor deposition on Cu Mg strips were deposited onto Si/SiO_2 or glass substrates by thermal evaporation through a shadow mask. The tunnel barrier MgO was formed by exposing deposited Mg for about 10 minutes in air prior to the graphene transfer. To prevent degradation of MgO by liquids, a dry transfer technique is used. First a graphene film was transfer onto a free-standing 4μm-thick Cu film using the traditional wet method, then pressed onto a transparent and flexible PDMS stamp followed by etching away the Cu film in $FeCl_3$ solution, and finally stamped onto the Mg strips in vacuum to prevent any gas bubbles that may form between graphene and Mg strips. The dry-transferrd graphene has similar properties to traditional wet-transferred graphene, characterized by scanning electron microscopy, atomic force microscopy, Raman spectroscopy, and transport measurements. It has a sheet resistance of $1.6 \sim 3.4$ k$\Omega/\Box$, charge carrier density of $4.1 \sim 5.3 \times 10^{12}$ /cm^2 and mobility of $460 \sim 760$ cm^2/Vs without doping at room temperature. Mg/MgO/graphene junctions show good tunneling characteristics at temperatures down to 4.2 K. The barrier height and width were obtained by fitting with the Brinkman-Dynes-Rowell trapezoid-shaped barrier model with consideration of graphene electron structure.

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Date submitted: 19 Nov 2012 Electronic form version 1.4