Abstract Submitted
for the MAR13 Meeting of
The American Physical Society

Study on Metal/Metal oxide/Graphene Tunnel Junctions KE CHEN, YING FENG, RAJA KHALID ZAHIR, Department of Physics, Temple University, Philadelphia, Pennsylvania 19122, USA — Metal/metal-oxide/graphene (Metal = Al, Ti, Hf, Zr) tunnel junctions were fabricated by transferring single-layer graphene grown by chemical vapor deposition on Cu onto metal strips by either a wet or dry approach. The metal strips were prepared by dc magnetron sputtering through a shadow mask and were exposed to air for about 10 minutes for native oxides to grow prior to the transfer. Good tunneling properties were observed for all the junctions fabricated by either means of graphene transfer. The zero-bias resistance of these junctions all increases with time to a final value, indicating continuing oxidation of the metals with a self-limited oxidation rate. Some junctions show the final area-normalized zero-bias resistances and self-limited oxidation time scales for Al, Ti, Hf, Zr are about 0.15, 0.2, 6000, 1000 kΩcm^2 and 25, 90, 6, 9 hour, respectively. The tunneling spectra were studied at various temperature down to 4.2 K and analyzed by the Brinkman-Dynes-Rowell model to get the height and width of the tunnel barriers, taking into account the electron structure of graphene. The junctions are good candidates for chemical sensing applications.

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Date submitted: 28 Nov 2012 Electronic form version 1.4