Abstract Submitted
for the MAR15 Meeting of
The American Physical Society

PVA:$LiClO_4$: a robust, high T_g polymer electrolyte for adjustable ion gating of 2D materials[1] ERICH KINDER, SUSAN FULLERTON, Univ of Notre Dame, Dept. of Electrical Engineering, CENTER FOR LOW ENERGY SYSTEMS TECHNOLOGY TEAM — Polymer electrolytes are an effective way to gate organic semiconductors and nanomaterials, such as nanotubes and 2D materials, by establishing an electrostatic double layer with large capacitance. Widely used solid electrolytes, such as those based on polyethylene oxide, have a glass transition temperature below room temperature. This permits relatively fast ion mobility at T = 23 °C, but requires a constant applied field to maintain a doping profile. Moreover, PEO-based electrolytes cannot withstand a variety of solvents, limiting its use. Here, we demonstrate a polymer electrolyte using polyvinyl alcohol (PVA) with T_g >23 °C, through which a doping profile can be defined by a potential applied when the polymer is heated above T_g, then "locked-in" by cooling the electrolyte to room temperature (<T_g) to limit ion mobility. Current-voltage measurements of a graphene field effect transistor verify the "lock-in" process, showing constant drain current regardless of the applied electrolyte gate bias. Hall bar measurements are used to quantify the charge carrier density. Owing to PVA's chemical stability, photolithography can be performed directly on the polymer electrolyte, which allows for the deposition of a patterned, metal gate directly on the electrolyte, as well as the ability to pattern the electrolyte itself.

[1]This work was supported in part by the Center for Low Energy Systems Technology (LEAST), one of the six SRC STARnet Centers, sponsored by MARCO and DARPA.

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Date submitted: 14 Nov 2014 Electronic form version 1.4