

Abstract Submitted
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PVA:LiClO₄: a robust, high T_g polymer electrolyte for adjustable ion gating of 2D materials¹ ERICH KINDER, Univ of Notre Dame, SUSAN FULLERTON, University of Pittsburgh, CENTER FOR LOW ENERGY SYSTEM TECHNOLOGY COLLABORATION — 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.

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