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Polymer Electrolyte Gated Inorganic Transistors ANOOP SINGH DHOOT, Cavendish Laboratory, University of Cambridge, CASEY ISRAEL, XAVIER MOYA, STUART WIMBUSH, Department of Materials Science and Metallurgy, University of Cambridge, TIM BENSEMAN, Cavendish Laboratory, University of Cambridge, JUDITH MACMANUS-DRISCOLL, Department of Materials Science and Metallurgy, University of Cambridge, JOHN COOPER, Cavendish Laboratory, University of Cambridge, NEIL MATHUR, Department of Materials Science and Metallurgy, University of Cambridge, RICHARD FRIEND, Cavendish Laboratory, University of Cambridge — Electric field-induced charge at the interface between gate dielectric and semiconductor is the basis of current semiconductor technology. We report that it is possible to use polymer electrolyte to gate inorganic materials, and to achieve field-induced 'doping' equivalent to a full surface coverage of charged ions per unit cell area. Very high field-induced carrier densities, $\sim 10^{15}$ cm^{-2}, in the transistor channel of $La_{0.8}Ca_{0.2}MnO_3$ devices enable modulation of the Curie temperature of over 30 K. We have also used electrolyte gating of the superconductor $YBa_2Cu_3O_{7-x}$ to modulate the onset of superconductivity. This creates an exciting opportunity for use of the electrolyte as gate dielectric in a wide variety of inorganic materials to explore formerly inaccessible band-filling regimes without the need for chemical substitution and additional disorder.

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