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Permanent Dipole Moment in a Quantum-Confined Two-Dimensional Metal Revealed by Electric Double Layer Gating

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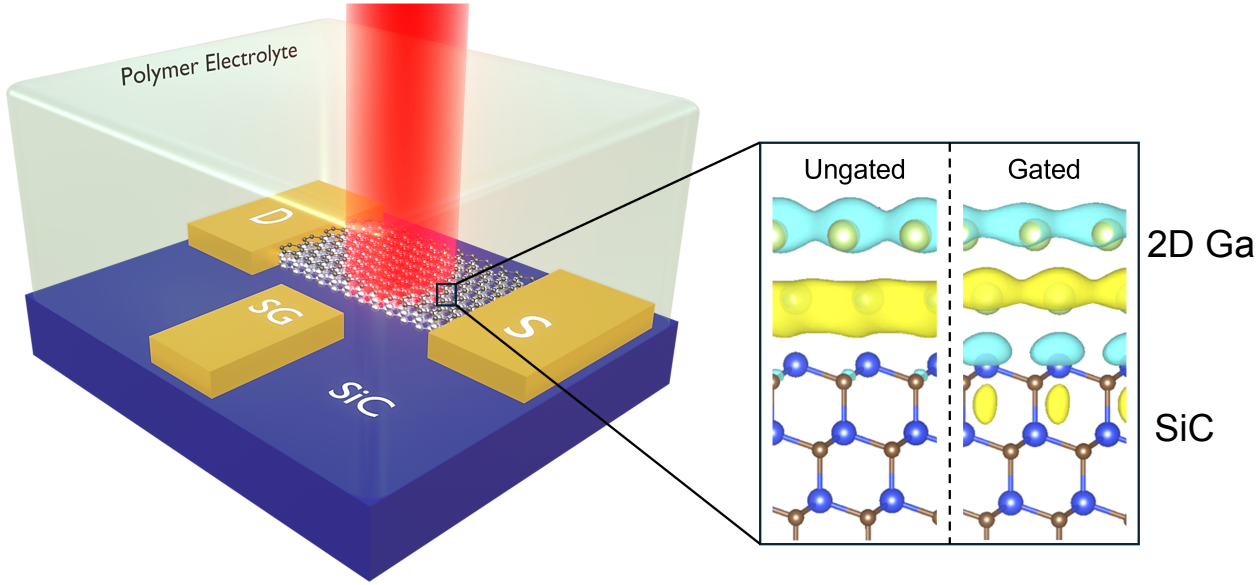
AC electric double layer gating (EDL) periodically applies large electric fields to two-dimensional gallium to enable the detection of a permanent dipole moment in the 2D layer, using microreflectivity. This validates predictions that 2D metals will have a dipole resulting from non-centrosymmetric bonding

The reflectivity signal can be detected in a material that is only two or three atoms thick, and it is the first demonstration of substantial gate modulation in a 2D metal. The work advances the goals of the IRG by clarifying our understanding of electronic structure in 2D metals, and developing a new approach – AC EDL gating) – to access electro-optic properties of materials that are atomically thin.



Electric double layer (EDL) gating is used to create large electric fields (on the scale of volts per nanometer) that enable the detection of a permanent ground-state dipole moment in two-dimensional (2D) Ga through microreflectivity measurements.