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Electric Field Effect in Epitaxial Graphene Devices XUEBIN LI, XIAOSONG WU, MICHAEL SPRINKLE, FAN MING, CLAIRE BERGER, RAGHUNATH MURALI, FARHANA ZAMAN, JAMES MEINDL, WALTER DE HEER, Georgia Institute of Technology — The electric field effect has been observed on epitaxial graphene multilayers grown on SiC substrates by thermal decomposition of SiC. Carriers mobilities up to $2.5\times10^4 cm^2/Vs$ have been measured. Both side-gated and top-gated graphene field effect transistors (FETs) have been fabricated using standard semiconductor processes on both the Si and the C face of the SiC substrates. In side-gated FETs, the gates are located on both sides of narrow graphene ribbons; source-drain resistances decrease by several percent with a gate bias of several volts. For top-gated FETs the resistance swing reaches a factor of 25. At the gate voltage corresponding to the maximum source-drain resistance, the Hall voltage changes sign indicating a transition from hole- to electron- carried transport, consistent with the graphene band structure. These results indicate the potential of epitaxial graphene as a platform for large-scale graphene based electronics.

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