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High-Mobility Dual-gated Graphene Field-Effect Transistors with Al_2O_3Dielectric[1] SEYOUNG KIM, JUNGHYO NAH, INSUN JO, DAVOOD SHAHRJERDI, The University of Texas at Austin, LUIGI COLOMBO, Texas Instruments, ZHEN YAO, EMANUEL TUTUC, SANJAY BANERJEE, The University of Texas at Austin — The carrier mobility in graphene field-effect transistors (GFETs) is primarily dominated by the extrinsic impurity scattering, such as charged impurities in the dielectric. Therefore, the impact of a top-gate dielectric stack on the transport characteristics of graphene represents a key issue for high-performance GFETs. Here, we present the fabrication and characterization of dual-gated graphene FETs and dual-gated graphene devices with Hall bar geometry using Al_2O_3 as top-gate dielectric. We use a thin Al film as a nucleation layer to enable the atomic layer deposition of Al_2O_3. Our FETs show mobility values of over 6,000 cm^2/Vs at room temperature, a finding which indicates that the top-gate stack does not significantly increase the carrier scattering, and consequently degrade the device characteristics. We propose a device model to fit the experimental data with a single mobility value.

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Seyoung Kim
The University of Texas at Austin

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