Transport properties of HfO\textsubscript{2} top-gated bilayer graphene field effect transistors

K. ZOU, J. ZHU, Department of Physics, The Pennsylvania State University — We present the fabrication and electrical transport studies of SiO\textsubscript{2}/HfO\textsubscript{2} double-gated bilayer graphene field effect transistors (FETs). The top gate dielectric layer is formed by depositing 30nm HfO\textsubscript{2} onto graphene FETs fabricated on conventional SiO\textsubscript{2}/doped Si substrates, using low temperature atomic layer deposition without the use of an adhesion layer. The top gate has an excellent gating efficiency of \( \sim 2.8 \times 10^{12}/\text{cm}^2 \text{V} \), which is 40 times larger than that of the Si backgate and can reach carrier density \( 1.4 \times 10^{13}/\text{cm}^2 \). We observe electron mobility up to 6,000 \text{cm}^2/\text{Vs} in double-gated bilayers. Pristine bilayer graphene on SiO\textsubscript{2}, on the other hand, exhibits \( \mu = 12,000 \text{ cm}^2/\text{Vs} \). We report and discuss the temperature-dependent conductivity in double and single-gated bilayer graphene at different densities and bias electric fields.

K. Zou
Department of Physics, The Pennsylvania State University

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