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Low Temperature Atomic Layer Deposition of Thin HfO_2 Film as Top Gate Oxide in Graphene Field Effect Transistors K. ZOU, Department of Physics, Penn State University, D. KEEFER, Department of Chemistry, Beloit College, X. HONG, J. ZHU, Department of Physics, Penn State University — We explore the possibility of using HfO_2 as top gate oxide in graphene field effect transistors (FETs). Graphene flakes are obtained by mechanically exfoliating HOPG graphite on SiO_2 (300nm)/doped Si substrates. We fabricate graphene FETs using e-beam lithography and metal electrodes deposition. A second e-beam writing is used to define the area of the HfO_2 over-layer. It is followed by an atomic layer deposition (ALD) of 30 nm HfO_2 film at low temperature without the use of an adhesion layer. This low-temperature recipe produces smooth HfO_2 films with RMS roughness of 2-3Å over a 1x1 μm area. These films exhibit a dielectric constant of $\sim$12-15 and a breakdown field of $\sim$0.8 MV/cm. Carrier mobility in HfO_2-covered FETs is comparable to that of uncovered graphene. We report and discuss the influence of the HfO_2 over-layer on the transport properties of graphene.

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