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Fabrication of top gate Graphene Transistor with Atomic Layer Deposited Al_2O_3

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We fabricate and characterize top gate Graphene transistor using aluminum oxide as a gate insulator by atomic layer deposition (ALD). It is found that due to absence of functional group and dangling bonds, ALD of metal oxide is difficult on Graphene. Here we used 4-mercaptopheneol as a functionalization layer on Graphene to facilitate uniform oxide coverage. Contact angle measurement and Atomic force microscopy were used to confirm uniform oxide coverage on Graphene. Raman spectroscopy revealed that functionalization with 4-mercaptopheneol does not induce any defect peak on Graphene. Our device shows mobility values of 4,000 cm^2/Vs at room temperature which also suggest top gate stack does not significantly increase scattering. The noncovalent functionalization method is non-destructive and can be used to grow ultra-thin dielectric for future Graphene applications.

Keywords: ALD, Functionalization, Graphene