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Nondegradative Dielectric Coating of Graphene using Thermal Evaporation of SiO[1] SEIYA SUZUKI, Graduate School of Engineering, Toyota Technological Institute, CHIEN-CHUNG LEE, Department of Physics, University of Colorado at Boulder, TAKASHI NAGAMORI, School of Engineering Department of Advanced Science and Technology, Toyota Technological Institute, THOMAS SCHIBLI, Department of Physics, University of Colorado at Boulder, MASAMICHI YOSHIMURA, Graduate School of Engineering, Toyota Technological Institute — Deposition of dielectrics onto graphene is a challenging technique due to the difficulties of fabricating high quality oxide on pristine graphene without introducing atomic defects. Here we report on a novel method to fabricate silicon oxide layer on graphene by vacuum thermal evaporation of silicon monoxide (SiO). Raman spectroscopy and mapping showed the present method did not degrade graphene, in contrast to the e-beam evaporated SiO_2 coating method previously reported. We fabricated graphene field effect transistor devices with four metal electrodes to measure gate voltage dependence of sheet resistance of the graphene, and deposited a top coating of SiO on the graphene channel. The electrical measurements before and after the top-coating revealed that the top coating suppressed chemical shift of the graphene from strong p-dope to nearly undoped. Since SiO is transparent for visible and infrared light, the coating can be available as a protection layer for optical devices of graphene such as photodetectors and electro-optic modulators. Since the SiO top coating is a simple vacuum evaporation, it is much easier than atomic-layer-deposition which requires additional functionalization of graphene, and compatible with industrial use.

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