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Effect of sample preparation on charged impurities in graphene substrates[1] K.M. BURSON, Center for Nanophysics and Advanced Materials, University of Maryland, College Park, MD 20742-4111, USA, C.R. DEAN, Columbia University, New York, New York, 10027, USA, K. WATANABE, T. TANIGUCHI, Advanced Materials Laboratory, National Institute for Materials Science, 1-1 Namiki, Tsukuba, 305-0044, Japan, J. HONE, P. KIM, Columbia University, New York, New York, 10027, USA, W.G. CULLEN, M.S. FUHRER, Center for Nanophysics and Advanced Materials, University of Maryland, College Park, MD 20742-4111, USA — The mobility of graphene as fabricated on SiO_2 has been found to vary widely depending on sample preparation conditions. Additionally, graphene mobility on SiO_2 appears to be limited to ∼20,000 cm^2/Vs, likely due to charged impurities in the substrate. Here we present a study of the effect of fabrication procedures on substrate charged impurity density (n_{imp}) utilizing ultrahigh-vacuum Kelvin probe force microscopy. We conclude that even minimal SEM exposure, as from e-beam lithography, induces an increased impurity density, while heating reduces the number of charges for sample substrates which already exhibit a higher impurity density. We measure both SiO_2 and h-BN and find that all n_{imp} values observed for SiO_2 are higher than those observed for h-BN; this is consistent with the observed improvement in mobility for graphene devices fabricated on h-BN over those fabricated on SiO_2 substrates.

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