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Effect of charged impurities and morphology on oxidation reactivity of graphene MAHITO YAMAMOTO, WILLIAM CULLEN, THEODORE EINSTEIN, MICHAEL FUHRER, Center for Nanophysics and Advanced Materials, University of Maryland, College Park, MD 20742-4111 — Chemical reactivity of single layer graphene supported on a substrate is observed to be enhanced over thicker graphene. Possible mechanisms for the enhancement are Fermi level fluctuations due to ionized impurities on the substrate, and structural deformation of graphene induced by coupling to the substrate geometry. Here, we study the substrate-dependent oxidation reactivity of graphene, employing various substrates such as SiO_2, mica, SiO_2 nanoparticle thin film, and hexagonal boron nitride, which exhibit different charged impurity concentrations and surface roughness. Graphene is prepared on each substrate via mechanical exfoliation and oxidized in Ar/O_2 mixture at temperatures from 400-600 °C. After oxidation, the Raman spectrum of graphene is measured, and the Raman D to G peak ratio is used to quantify the density of point defects introduced by oxidation. We will discuss the correlations among the defect density in oxidized graphene, substrate charge inhomogeneity, substrate corrugations, and graphene layer thickness. This work has been supported by the University of Maryland NSF-MRSEC under Grant No. DMR 05-20471 with supplemental funding from NRI, and NSF-DMR 08-04976.

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