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The Thickness Dependence of the Graphene Oxidation LI LIU, SUNMIN RYU, NSEC & Department of Chemistry, Columbia University, MICHELLE TOMASIK, NSEC, Columbia Univeristy, ELENA STOLYAROVA, MICHAEL STEIGERWALD, NSEC & Department of Chemistry, Columbia University, MARK HYBERSTEN, Center for Functional Nanomaterials, Brookhaven National Laboratory, LOUIS BRUS, GEORGE FLYNN[1], NSEC & Department of Chemistry, Columbia University — Single-, double-, and triple-layer graphene sheets were heated in an oxygen atmosphere at various temperatures generating nano-sized holes in the sheets. Both AFM topography and Raman spectroscopy indicate that the oxidative reactivity of single-layer sheets is greater than that of thicker sheets. The distribution of hole sizes and STM topography studies suggest that the oxidation reaction is initiated at the pristine carbon surface. Vertical etching of carbon atoms from the graphene surface occurred at a much lower temperature than that from a highly oriented, multi-layer pyrolytic graphite crystal. The mechanism for this thickness dependence of reactivity will be discussed.

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