

Abstract Submitted
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The metastable chemical gallery of the oxide of epitaxial graphene at room temperature¹ SUENNE KIM, SI ZHOU, YIKE HU, CLAIRE BERGER, WALT DE HEER, School of Physics, Georgia Institute of Technology, ANGELO BONGIORNO, School of Chemistry and Biochemistry, Georgia Institute of Technology, ELISA RIEDO, School of Physics, Georgia Institute of Technology — Insights in the chemistry of graphene oxide and its response to external stimuli are crucial to control its electronic and optical properties, thus enabling future applications of this material. Here, we present a combined experimental and density functional theory study concerning the compositional and structural properties of the oxide of epitaxial graphene (OeG) as a function of time[1, 2] and temperature. Our result indicates that OeG synthesized by oxidizing epitaxial graphene grown on SiC via the Hummers method is a metastable material whose structure and chemistry evolve with a notable degree at room temperature. XPS studies reveal, metastable OeG reaches a nearly stable reduced O/C ratio of 0.37 with a featured relaxation time of a month. Initially the most enriched epoxide groups decrease with time while hydroxyl groups increase. In addition to this, further XPS study of OeG as a function of temperature shows heating above 120 C in air can abruptly deteriorate the OeG structure. Our calculations show that the availability of hydrogen atoms could be the key factor in tuning structural and chemical properties at relatively low temperatures. [1] S. Kim et al., Nature Materials 11, 544(2012). [2] Z. Wei et al., Science 328, 1373 (2010).

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