Abstract Submitted
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Reduction of graphene oxide to graphene, A study of changes in the atomic structure[1] A. MITTAL, A. WAGNER, Univ. of Minnesota, C. MATTEVI, Rutgers Univ. , A. CHOV, K. LIAO, C. MACOSKO, Univ. of Minnesota, M. CHHOWALLA, Imperial College, K. A. MKHOYAN, Univ. of Minnesota — An economic method for large scale production of graphene is based on exfoliation of graphite into 1-atom thick sheets by oxidation, creating graphene oxide (GO) and subsequent reduction of GO into graphene. Reduced GO sheets approach the highly desired properties of graphene, such as electrical conductivity and mechanical strength, to various degrees, but not completely. To understand why, we must understand the nanostructure of the sheets. Different methods of reduction result in products that are similar to graphene, but these products retain some oxidized areas or contain regions with sp^3 bonded carbon. The concentration and distribution of these defects on the reduced GO sheet affect the properties of the 2D material. Here, we have characterized the atomic structure of GO and reduced GO via high resolution transmission electron microscopy, electron diffraction, and electron energy loss spectroscopy. Spectroscopic data taken during thermal reduction of GO shows changes in the fine structure of carbon K-edge as the carbon changes from an oxidized form to elemental amorphous carbon to graphite like form, clearly delineating the process of reduction of GO to graphene. Products of several other reduction methods are also characterized revealing information on electronic environment surrounding carbon atoms, distribution of crystalline areas, and oxygen removal from GO.

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