Direct observation of sub-domains in the GO single layer

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Abstract

Chemically synthesized graphene oxide (GO) is an oxidized single graphitic monolayer that has traditionally served as a precursor for graphene, but has a considerable potential of application for its own characteristics. It has been experimentally proved that GO monolayer consists of randomly distributed regions, aromatic regions (sp^2 carbon atoms) and oxygenated aliphatic regions (sp^3 carbon atoms) by raman spectroscopy [1], scanning tunneling microscopy (STM) [2] and high-resolution transmission electron microscopy (HR-TEM) [3]. However, these methods have disadvantages such as complicated and time-consuming preparation process and narrow region (a few nanometer) being measured.

Here, we investigated the structural, chemical, and electrical properties of synthesized GO simple by using a conductive atomic force measurement (C-AFM) analysis in a few micrometer range. GO monolayer is composed of two different sub-domains, the first one corresponding to a high friction and low conductance domain (sp^3 carbon domain) and the other corresponding to a low friction and high conductance domain (sp^2 carbon domain) [4-5]. At each position of two domains, local I-V characteristics also showed different behaviors depending on the chemical properties. To confirm presence of sub-domains of GO, scanning transmission electron microscopy (STEM), HR-TEM analysis, and oxygen electron energy loss spectroscopy (EELS) mapping were conducted.

References

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Figures