Thickness mapping of exfoliated graphene samples using Scanning Transmission X-ray Microscopy (STXM)

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Abstract

Ever since single graphene layers were isolated using the “scotch tape” exfoliation method [1], graphene has been the topic of intense research. Much of this research has been centered on trying to commercialize products which make use of the unique physical properties of graphene. However, since these properties are very sensitive to the number of graphene layers that are present in a sample it is very important to know the thickness and/or the number of graphene layers that are present. The majority of work that has been conducted on thickness measurements of graphene has been done with the use of atomic force microscopy (AFM). Unfortunately, AFM has been notoriously unreliable in determining the thickness of graphene layers. In this talk, I will discuss the use of another technique, Scanning Transmission X-ray Microscopy (STXM), to determine the number of graphene layers in a region of an exfoliated sample prepared on SiN windows. This technique consists of collecting an image by raster scanning a highly focused (40 nm) soft x-ray synchrotron beam [2,3] across a sample at defined incident photon energies. A near edge X-ray absorption fine structure (NEXAFS) spectrum is collected at each pixel by adjusting the energy through the carbon K edge, producing an image “stack”. The optical density obtained in this manner can be used to quantitatively determine the number of graphene layers. In addition, the acquired spectroscopic information is useful for characterizing surface cleanliness of the graphene sample.

References

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