Exploiting molecule-surface interaction to exfoliate few layers graphene in liquid

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Abstract

In this work, we investigated the molecule-surface interaction of highly ordered pyrolytic graphite (HOPG) and few-layer graphene (FLG) grown on a SiC substrate, by exploiting the interaction of the carbon surface with aqueous solutions of methionine and DMSO, both with and without sonication-assisted techniques.

The surface characterization of the samples after interaction with the molecular solutions has been performed by atomic force microscopy (AFM), X-ray photoelectron spectroscopy (XPS) and Raman spectroscopy. AFM analysis allowed us to monitor the morphological changes of the HOPG and FLG surfaces upon interaction with the organic solutions. Sonicated samples show more significant changes with respect tp non-sonicated ones. By XPS, we followed the exfoliation process by monitoring the increase of the bulk signal of the SiC substrate [1]. The structural and defect characterization was probed using Raman spectroscopy[2].

The combined AFM and XPS analysis indicates that sonication-assisted exfoliation results in the presence of defects and graphene flakes on the surface. The interaction of the carbon surface with the organic solution in the absence of any sonication leads to the formation of highly ordered rippled domains that can be interpreted as a precursor step towards graphene exfoliation likely due to the presence of loosely bound graphene layers [3].

References

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