Investigation the binding of Graphene nanomaterials with small drug molecules

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Abstract

Graphene, whose unique morphological, mechanical, electrical, and chemical properties offer tremendous potential for applications in biomedicine, has been identified as a potential nano-carrier for trafficking of various biomolecules [1, 2]. Graphene has attracted considerable research interest due to its extraordinary properties. However, the structural and electronic nature of graphene nanomaterial with small aromatic molecules and biomolecules in water are unclear and misunderstood. It has been reported that the hydrophobic and π-π stacking are the forces responsible for the binding of graphene with other molecules. Where water has been included in fewer studies, very different behaviour is reported [3, 4]. Therefore, here we prepared in one-step graphene nanomaterials with various functionality and sizes ranging from 200 nm to 3 nm. Then, the binding of these graphene nanomaterials with small drug molecules has been investigated using NMR spectroscopy and developing a mechanistic model from the acquired NMR experimental data to understand the edge and surface binding. On exposure to graphene, the aromatic compounds showed considerable 1 H-NMR signal broadening, accompanied by decreases in the peak heights of 1 H-NMR signals, we also detected a considerable decrease in the overall peak area. As graphene size decrease the relative binding of the aromatic compounds to graphene is decreased. Different nature and affinity of chemically diverse structures towards graphene surface and edges.

References

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