

## Exfoliation of graphene in solvent free conditions by ball-milling

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Graphene, a single thick perfectly two-dimensional lattice of  $sp^2$  carbon atoms, has emerged in recent years as a novel class of nanomaterial with remarkable electronic and mechanical properties. However, a major obstacle of graphene materials is the preparation of a single-layer graphene and its inherent lack of solubility. These two handicaps make difficult the handling and manipulation during processing.

We present a scalable and easy technique for exfoliation of graphite flakes in the presence of melamine. This methodology permits the exfoliation of single- and few-layer graphene sheets by ball-milling processes under absence of solvent. Afterwards, the materials were suspended in a variety of aqueous solutions and organic solvents by means of soft sonication conditions. This procedure presents a powerful approach in order to form stable dispersions of single- and few-layer graphene sheets for several days. Layers of graphene were characterized by several techniques such as UV-vis spectrometry, Raman spectrometry, thermogravimetric analysis and transmission electron microscopy. This new approach opens the way to carry out different organic reaction on stable graphene sheets, in order to produce specific structures for several applications.

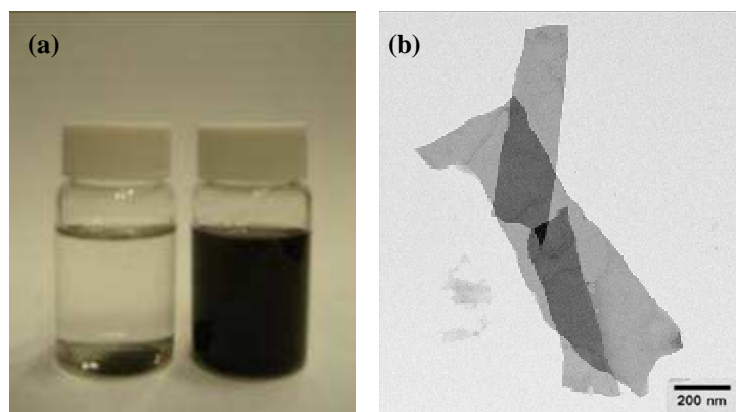


Figure: (a) Graphite in dimethylformamide (left) and graphene in dimethylformamide (right). (b) TEM image of graphene flakes.