

## Exfoliation of single- and multi-layer graphenes from the surface of polyacrylonitrile-based copolymer under thermal treatment

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Single-layer graphenes (SLGs) are sheets of  $sp^2$ -hybridized carbon atoms [1], which have several advantages compared to other carbon materials. For example, the calculated conductivity of single-layer graphene (assuming thickness of 0.34 nm [2]) is six orders of magnitude higher than the conductivity of amorphous carbon [3]. SLGs are also demonstrated to be superior in thermal conductivity [4], elastic response to deformations [5] and high mechanical strength [6]. Although the pristine graphenes are hydrophobic the chemical modification [7] of pre-oxidized single-layer graphenes provides ample opportunities for incorporating such a material into a range of possible applications.

Nonetheless, single-layer graphenes are expensive and therefore efforts have been focussed on cheaper manufacturing solutions. In this study, we demonstrate that under heating to 850°C of a polyacrylonitrile-based copolymer, the sample undergoes subtle contraction due to mass loss, which also manifests itself in the exfoliation of its outer layers. Transmission Electron Microscopy, Selected Area Electron Diffraction and Atomic Force Microscopy reveal the presence of single- and multi-layered graphenes [8].

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