

Mild oxidative exfoliation of single-layer graphene

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Graphene research has exploded since its initial discovery in 2004.¹ With its unique properties and capabilities, graphene shows promise for many applications, especially electronic and biomedical materials.² One of the major challenges facing the further development and realization of these cumulative works is the facile, reproducible, and scalable production of high-quality graphene. Bottom-up methods like chemical vapor deposition face limitations in throughput,³ while top-down methods, often based on Hummers' method, either produce highly defective graphene oxide, or give low yields.^{4,5,6}

In this work, we report on a new scalable method for mild oxidative exfoliation of graphite to produce high-quality single- and few-layer (<5 layers) graphene. Graphite was reacted with sodium hypochlorite for a period of days, to produce a graphene product with very low oxygen content, more comparable to that of thermally reduced graphene oxide than graphene oxide.^{5,6} Investigation by XPS and chemical analysis shows a carbon content over 90 wt.%, with 4-6 wt.% of oxygen.

This method produces a good yield of high-quality graphene with consistent thickness under five layers. The synthesis is easily scalable, and requires only very low volumes and concentrations of sodium hypochlorite, leading to an easy and comparatively mild, environmentally friendly process.

References

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Figures

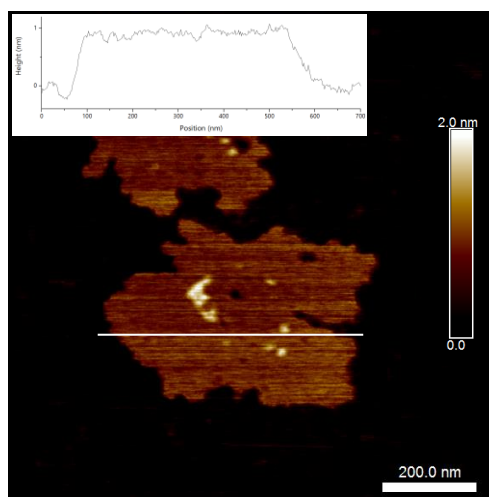


Figure 1: AFM image of graphene sheet (inset: height profile along white line)

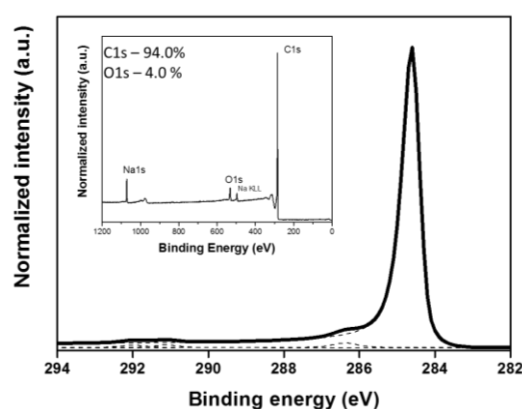


Figure 2: C1s XPS spectrum of graphene sheets with survey spectrum in inset