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A simple effective path to produce bulk quantity pure neat graphene with average layers of 3.8 ± 1.9 without contamination

Graphene is one of the most fantastic nanomaterials and has attracted much attention in various fields.^[1] The industrial applications are hindered since there is no effective path to produce scalable few layered graphene without functional groups. Here we report a simple effective green path to produce bulk quantity of few layered graphene without functionalization. No functional groups or contamination have been introduced in the processes. No extra time-consuming purification processes are needed. The as-produced graphene nanosheets have been demonstrated by height statistics to have 1-10 layers with average layers of 3.8 ± 1.9 and further confirmed by spectroscopic metrics.^[2] About 140 mg graphene sheets were obtained from one 500 ml agate tank after process carried out at a speed of 100 rpm for 5 h. The exfoliation can be easily extended to industrial scale by using larger and more agate tanks without the sacrifice of yields.

References

- [1] Warner JH, Rummeli MH, Ge L, Gemming T, Montanari B, Harrison NM, et al. *Nat Nanotechnol*, 4 (2009) 500-504.
- [2] Backes C, Paton KR, Hanlon D, Yuan S, Katsnelson MI, Houston J, et al. *Nanoscale*, 8 (2016) 4311-4323.

Figures

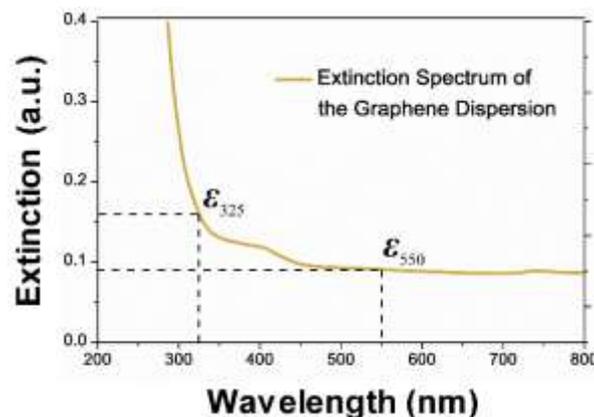


Figure 1: Extinction spectrum of the graphene dispersion. The graphene sheets were exfoliated by alumina microspheres at a speed of 100 rpm for 2 h.