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Supporting information

Direct exfoliate anode graphite of used Li-ion batteries into few-layer graphene sheets: a green and high yield route to high-quality graphene preparation

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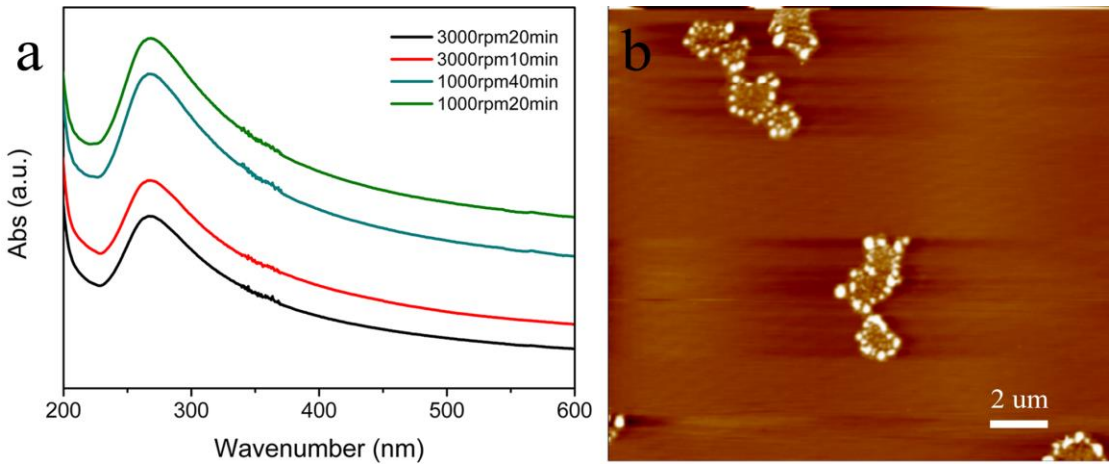

Fig. S1 (a) UV-vis spectra of UAG-made dispersions centrifuged at 3000 rpm for 10 and 20 min and 1000 rpm for 20 and 40 min. (b) AFM image of graphene sheets centrifuged at 1000 rpm for 20 min.

As shown in Fig. S1a, high speed lowered the mass yield because of some large graphene sheets removed. And AFM analysis (Fig. S1b) reveals some small but thick sheets cannot be removed at 1000 rpm 20 min, and these thick sheets can be observed when the centrifuge speed increased. Combined with other results, 1000 rpm 40 min is a suitable centrifuged condition in this research.

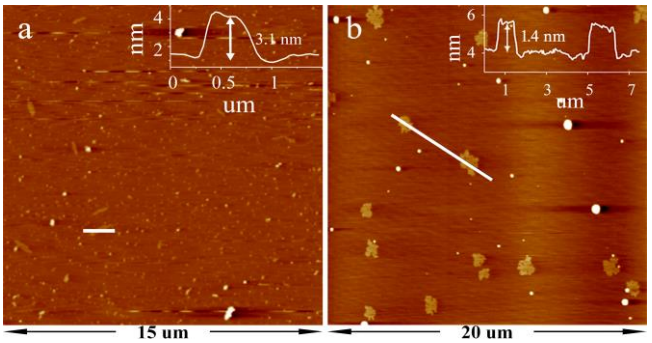

Fig. S2 AFM images of graphite-made graphene sheets (a) and UAG-made graphene sheets (b).

We notice that repeated intercalation can reduce the interlayer force of UAG which is supported by XRD analysis. As shown in Fig. S2, the UAG-made graphene sheets is larger and thinner than graphite-made sheets.

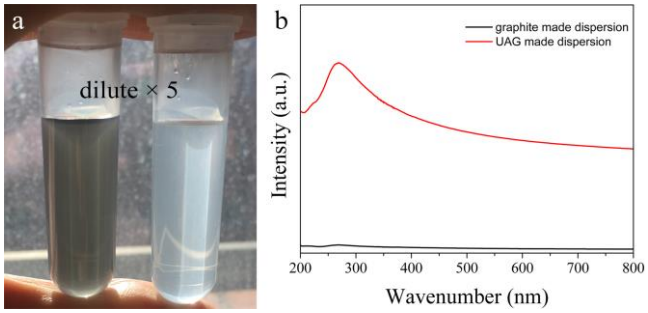

Fig. S3 (a) Digital images of UAG-made dispersion (left) and graphite-made dispersion (right). The dispersions were diluted identically for comparison. (b) UV-vis-NIR spectra of graphite (black line) and UAG (red line). The initial graphite or UAG concentration was 2 mg mL^{-1} (45 vol% ethanol-water solution), and sonication (15% × 700 W) was carried out for 2 h followed by standard centrifugation at 1000 rpm.

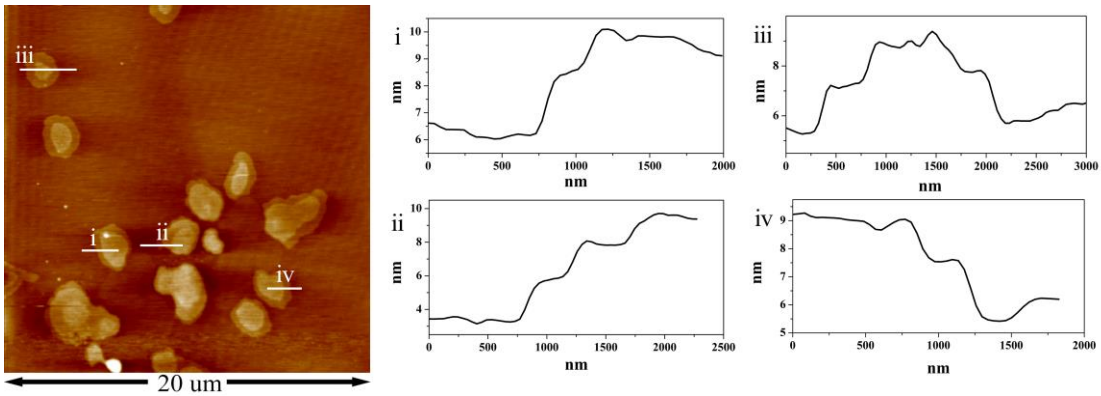

Fig. S4 AFM image and line scans of the dispersed graphene nanosheets. The initial graphite or UAG concentration was 2 mg mL^{-1} (6mM SC), and sonication (15% × 700 W) was carried out for 1 h followed by standard centrifugation at 1000 rpm.

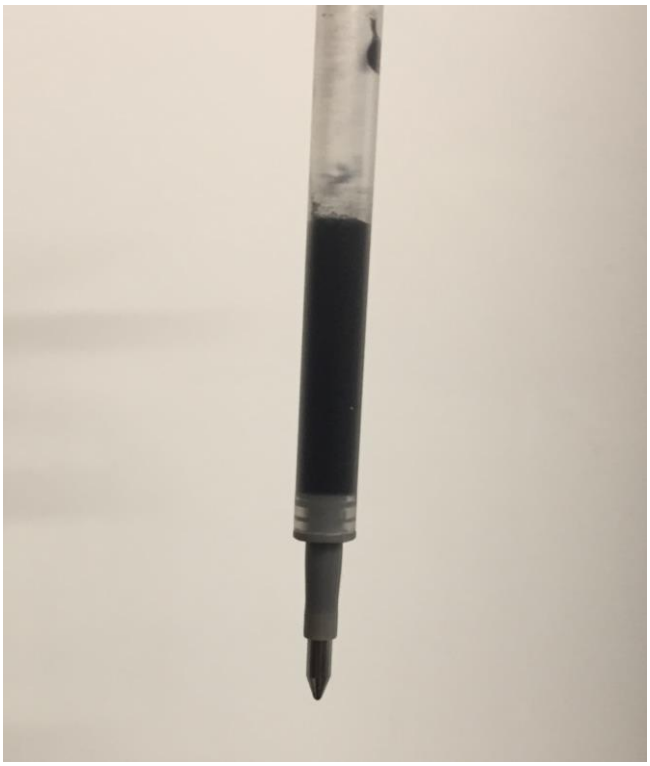

Fig. S5 Digital image of the conductive ink in rollerball pen.