Electronic supplementary information

Synthesis of superior dispersions of reduced graphene oxide

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1. Preparation of graphite oxide

Graphite oxide was prepared by oxidation of natural flake graphite according to the modified Hummers method.[1,2] Firstly, flake graphite (10 g) was put into the mixture of concentrated H_2SO_4 (25 mL), $K_2S_2O_8$ (5 g) and P_2O_5 (5 g). The mixture was held at 80°C for 6 h with continuous stirring and then cooled down to room temperature. Subsequently, the mixture was carefully diluted with deionized water, filtered and washed with copious amount of deionized water until the pH of washing water is neutral. This pre-oxidized graphite powder was air-dried at room temperature overnight. Secondly, the pre-oxidized graphite powder was transferred to concentrated H_2SO_4 (230 mL) with vigorous agitation in an ice bath. $KMnO_4$ (30 g) was gradually added over a period of 45 min to maintain the mixture temperature below 10°C. The mixture was then stirred at 35°C for 2 h. After that, deionized water (460 mL) was added, and the mixture was stirred for another 15 min. Finally, 1.4 L of deionized water was poured into, followed by slowly adding 30% H_2O_2 solution (25 mL) to terminate the reaction. The color of the mixture changed from brown into bright yellow. The as-made product was filtered and washed with 1:10 HCl solution (2.5 L). The resulting solid was suspended in deionized water to make a viscous and brown dispersion, and further purified by dialysis for two weeks to remove remaining metal ions and acid. The dark brown graphite oxide powder was obtained by filtering and drying under vacuum at 40°C for 48 h.

The graphene oxide dispersion could be obtained by sonication of the as-made graphite oxide powder in deionized water, which was stable over 6 months.

2. Measurement of the dispersibility of rGO

Because small water content within rGO samples is significant for their dispersion in solvents,[3,4] the rGO filter cakes were used the samples for determining the

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dispersibility. The experimental procedure is as follows. A certain amount of the as-made rGO was added to 4 mL solvent and sonicated for a given time. If it was well dispersed, a more amount of rGO was added to another 4 mL solvent and sonicated for the same time. Similar operation was repeated until the maximal re-dispersible amount of rGO was obtained. In addition, the percent of the dry rGO in the as-made rGO (filter cake) was obtained by measuring the rGO weight before and after drying at 50°C for 24 h. Thus the dispersibility of the dry rGO could be deduced.

References

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