Supporting information

Toward High Performance Graphene Fibers

Li Chen¹, Yuling He¹, Songgang Chai², Hong Qiang¹, Feng Chen^{1*}, Qiang Fu^{1*}

¹ College of Polymer Science and Engineering, State Key Laboratory of Polymer Materials Engineering, Sichuan University, Chengdu 610065, China.

² National Engineering Research Center of Electronic Circuits Base Materials, Guangdong Shengyi Technology Limited Corporation, Dongguan, 523039, China

Experimental Details

Materials. Two kinds of graphite powder (40 μ m and ~200 μ m) were obtained from Qingdao Henglide Graphite Co., Ltd. Concentrated H₂SO₄ (98 %), KMnO₄, H₂O₂ (30 %) solution, HI acid (40 %), were purchased from Sinopharm Chemical Reagent Co., Ltd. and used as received.

Preparation of large area GO sheets (LGO)

Graphene oxide was synthesized from the small graphite flakes (40 μ m), by Hummers' method. To prepare LGO, three modifications were made in our experiments: (1) using graphite with a large lateral size as starting material; (2) applying mild oxidation and sonication to avoid the overcracking of graphite during oxidation and exfoliation; (3) remove thick multilayer flakes and small flakes by a two-step centrifugation.

The detailed experimental procedure for the preparation of large-area GO sheets is described as follows. 3 g natural flake graphite with an average size of 500 μ m, 3 g NaNO₃ and 144 mL of concentrated H₂SO₄ were mixed at 0 °C. The mixture was continuously stirred using a magnet stirrer. 18 g of KMnO₄ was gradually added to the above mixture while keeping the temperature at 0 °C. The mixture obtained was fiftrest stirred at 0 °C for 90 min and then at 35 °C for 2 h. Distilled water (120 mL) was slowly dropped into the resulting solution, over a period of around 30 min, to dilute the mixture. Then 300 mL of distilled water was added, followed by 15 mL of H₂O₂

(30%), and the stirring continued for 10 min to obtain a graphite oxide suspension. The GO particles were washed and centrifuged with a HCl solution three times, then centrifuged again and washed with deionized water until the pH of the solution became about 7. To obtain uniform large-area GOs, a low-speed centrifugation at 3000 rpm was first used to remove thick multilayer flakes until all the visible particles were removed (10 min). Then the supernatant was further centrifuged at 15 000 rpm for 10 min to separate large flakes (precipitate) and small flakes (supernatant).Finally, the obtained precipitates containing large flakes were redispersed in water to get a LGO suspension.

The average size and size distribution of both GO and LGO, were shown in Fig.S2.



Figure S1 Schematic apparatus for spinning GO fibers.



Figure S2 Typical SEM images GO size and the corresponding area distributions of GO (a, b) and LGO(c, d).



Figure S3. XRD patterns of (a) GO,LGO fibers and (b)RGO and RLGO graphene fibers.



Figure S4. Typical XPS C 1S spectra of (a) GO fibers, (b) LGO fibers, (c) RGO fibers and (d) RLGO fibers fiber.



