Electronic Supplementary Material (ESI) for Chemical Communications

Electronic Supporting Information

Binol Salt as a Completely Removable Graphene Surfactant

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Experimental Section

1.1 Materials

Natural graphite (Bay Carbon, SP-1 graphite), sulpuric acid (95-97%), hydrogen peroxide (30 wt. %), potassium permanganate, sodium nitrate, hydrazine tetrahydrofuran, hydrazine hydrate (35%), *s*-binol and sodium hydroxyde were obtained from commercial sources and used as received.

1.2 Characterization

All X-ray photoemission spectroscopy (XPS) measurements were made by a SIGMA PROBE (ThermoVG, U.K.) with a monochromatic Al-Kα X-ray source at 100 W. The powder XRD pattern was acquired using a D8-Adcance instrument (Germany) and Cu-Kα radiation. The thermal properties of the rGO were characterized by TGA (Polymer Laboratories, TGA 1000 plus). Atomic force microscopy (AFM) was performed by using a SPA400 instrument with a SPI-3800 controller (Seiko Instrument Industry Co.) at room temperature. All UV-vis absorption spectra were recorded using a double-beam UV-1650PC spectrophotometer (Shimadzu).

1.3 Preparation of Graphene oxide (GO)

GO was prepared from natural graphite powder by the modified Hummers and Offenman's method using sulpuric acid, potassium permanganate, and sodium nitrate.[1]

1.4 Preparation of 1st product (rGO with binol salt) and 2nd product (rGO)

The 15 mg GO dispersed into 10 mL DI water then binol (60 mg) and NaOH (3 equiv.) was added and made the perfect dispersed solution by stirring that solution at rt. Then made the solution's temperature about 5-10 °C. Hydrazine hydrate (0.75 mL) was added to the resultant solution then heated at ~100 °C for 30 min. After that filtered and washed with water several times and dried 1st product at 80 °C for 24 h at vacuum oven. The resulting 1st product was completely dispersed in water. The dired 1st product on the filtering buchner funnel was washed sereval times with water, ethanol and acetone and then dried to give the 2nd product at 80 °C for 24 h at vacuum oven.

1.5 Preparation of control sample.

The 15 mg GO dispersed into 10 mL DI water and NaOH (3 equiv.) was added and made the perfect dispersed solution by stirring that solution at rt, keeping temperature about 5-10 °C. Hydrazine hydrate (0.75 mL) was added to the resultant solution and then the reaction mixture was heated at ~100 °C for 30 min. After that filtered and washed with water several times and dried to provide the control sample at 80 °C for 24 h at vacuum oven.

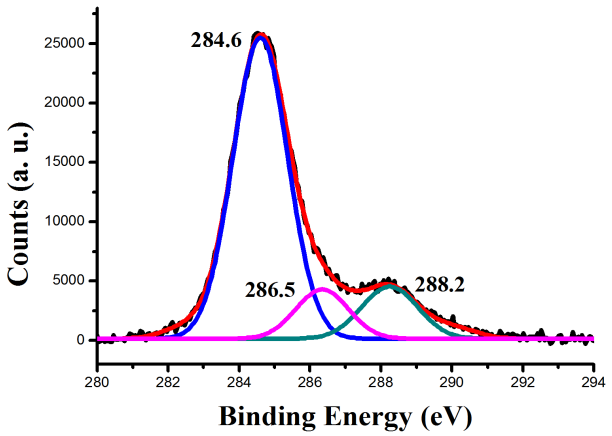

Fig. S1. High-resolution of C1s XPS spectra of binol salt.

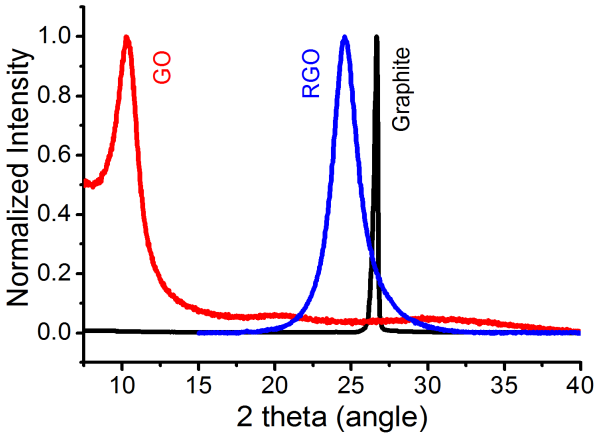

Fig. S2. XRD data of GO, control rGO and Graphite.

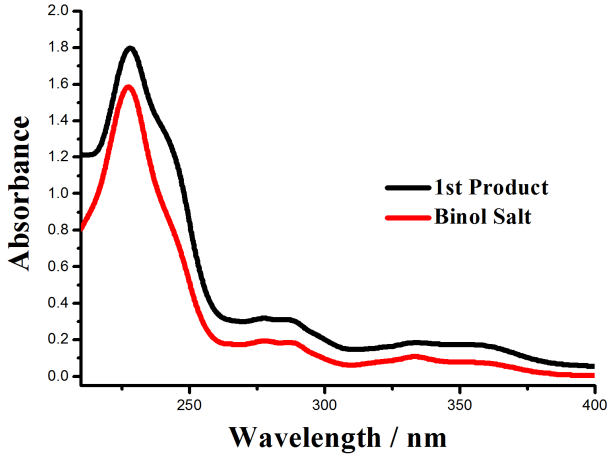

Fig. S3. UV-Vis spectra of 1st product (0.04 mg/mL) and Binol Salt (0.025 mg/mL).

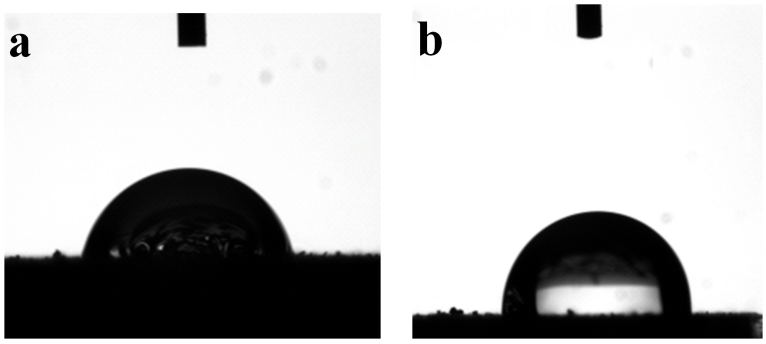

Fig. S4. (a) Contact angle images of 1st product (73°). (b) Contact angle images of 2nd product (86°).

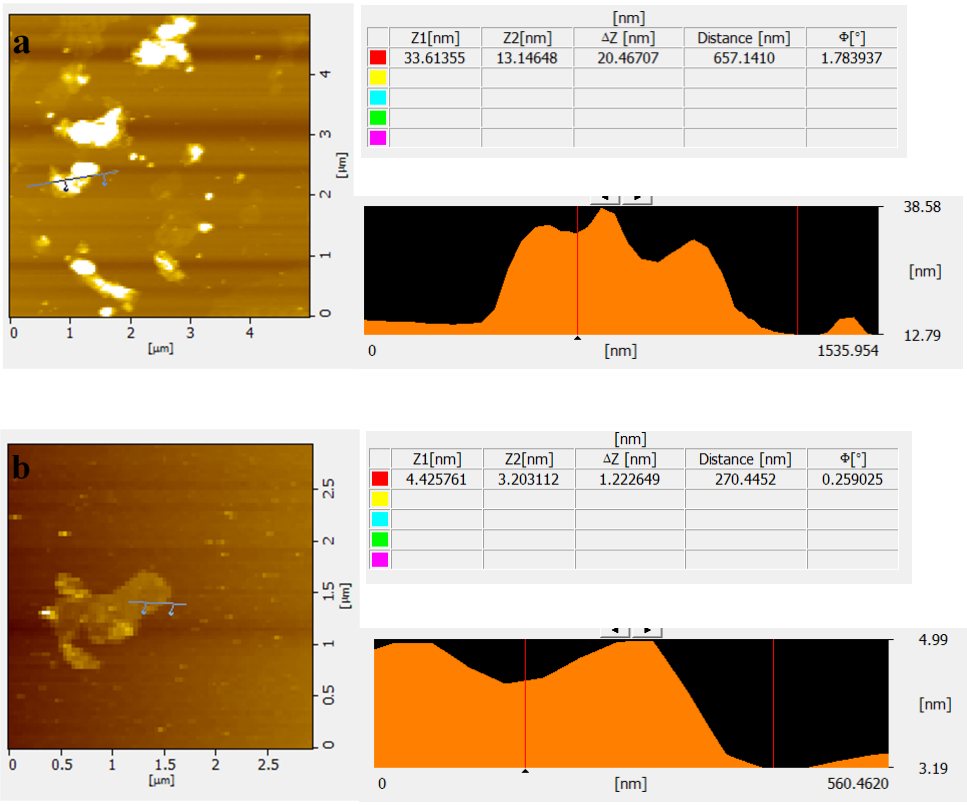

Fig. S5. (a) AFM image of 1st product (20 nm height). (b) AFM image of 2nd roduct (1.2 nm height).

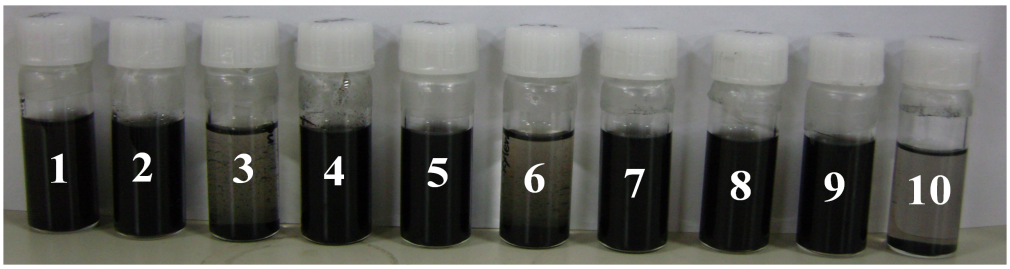

Fig. S6. Solubility Test of 1st product in a variety of solvents prepared by 2 h sonication (1mg/mL). Photographs of 1st product dispersed were taken 1 week after preparation, 1: Isopropyl alcohol; 2: Acetonitrile; 3: Toluene; 4: Dimethylsulfoxide; 5: Dimethylformamide; 6: *p*-Xylene; 7: N-Methylpyrrolidone; 8: Tetrahydrofuran; 9: Ethanol; 10: Dichloromethane.

Reference

1. Moon, I. K.; Lee, J.; Ruoff, R. S.; Lee, H. *Nat. Commun*. **2010**, *1*, 73.