

Supporting information for RSC Advances

Flexible Sandwiched Graphite Nanoplatelets/Copper Nanowires/Graphite Nanoplatelets Paper with Superior Electrical Conductivity

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EXPERIMENTAL DETAILS

Preparation of graphene sheets aqueous suspension

Graphite was treated by the shear-assisted supercritical CO₂ exfoliation. Graphite powder feeding into the reactor was heated by the electric heating sleeve. Then CO₂ was cooled into liquid by chiller followed by being pumped into the reactor. Under certain temperature and pressure, the graphite was exfoliated into graphene nanosheets by supercritical CO₂ with the help of magnetic stirring motor. Graphene collected was dispersed in water through shear mixing and acid treatments. In a typical process, graphene (250 mg) was added to the mixture of alcohol and water with volume ratio of 13:7 (400 mL) by shear mixing for 30 mins. The products were obtained by filtration and dried in the vacuum oven. Then the sample was sonicated in the acid mixture with 20mL nitric acid and 60mL sulfuric acid for 3 days. The solution was diluted and stirred in 1L water to achieve homogeneous dispersion.

Preparation of Cu NWs

Cu NWs were synthesized by a hydrothermal method. In a typical experiment, copper chloride (0.17g) and glucose (0.39g) were stirred in distilled water (80mL). Then hexadecylamine (1.10g) was added into the solution slowly. After stirring for 5 hours, the produced light blue solution was heated at 135 °C for overnight. Cu NWs were collected by centrifuge (3000 rpm) and then washed with DI water, ethanol and *n*-hexane repeatedly. Finally, the Cu NWs were dispersed in ethanol.

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Preparation of G/NWs/G sandwiched paper

The sandwiched paper was produced by a simple sequential filtration method. The graphene aqueous suspension prepared before was filtered through a PVDF membrane (0.45 μ m pore) as the first layer. Then the Cu NWs dispersion in ethanol was filtered as the second layer followed by a third layer of graphene sheets as the top. The produced sample were peeled off followed by heating at 400 ° C under gas mixture of 20% H₂ and 80% Ar for 1 hours.

Characterization

The morphologies of graphene sheets and Cu NWs were investigated by SEM (FEI quanta 200F) and TEM (FEI F20). XRD measurements of Cu NWs were carried out on Bruker D8 Advance X-ray diffractometer. SEM of the cross section of the sandwiched paper was conducted under FEI quanta 200F. Electrical conductivities of the products were measured by four point method with Kunde KDY-1 system (Guangzhou, P. R. China).

Table S1. Thicknesses of the obtained papers before and after compression

Samples	Before compression			After compression		
	Thickness (GNPs)	Thickness (Cu NWs)	Cu NWs loadings Vol. %	Thickness (GNPs)	Thickness (Cu NWs)	Cu NWs loadings Vol. %
	μ m	μ m		μ m	μ m	
1	60	0	0	13	0	0
2	60	2	3.2	13	2	13.3
3	60	5	7.7	13	4	23.5
4	60	11	15.5	13	6	31.6
5	60	15	20.0	13	8	38.1
6	60	20	25.0	13	13	50.0