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Electronic Supplementary Information

Synthesis of reduced graphene oxide/phenolic resin-based carbon composite ultrafine fibers and their adsorption performance for volatile organic compounds and water

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1. Synthesis of GO

Expanded graphite powder (4 g) was added to H_2SO_4 (98%, 120 mL) and stirred vigorously in an ice bath. Next, $NaNO_3$ (2 g) and $KMnO_4$ (16 g) was slowly added into the reaction flask and stirred for 30 min. Then, the reaction mixture was transferred to a water bath of 35 ℃ and stirred for about 50 min. Water (200 mL) was then added and the reaction temperature was increased to about 90 ℃, at this point the reaction mixture was further stirred for about 30 min. 200 mL water and 12 mL H_2O_2 (30% aq.) were added into the mixture. After standing overnight, the deposits were removed and then 22 mL hydrochloric acid (10% aq.) was added. At last, the dispersion was washed repeatedly with deionized water until the pH value reached about 7 and dried under vacuum (60 ℃) for 3 days.

2. Vapor adsorption measurement

Before the test water and organic liquids used to generate the vapors were fully degassed by

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repeated evacuation. Pristine carbon and composite fibers (about 30 mg) were degassed at 195 °C for 18 h under nitrogen flow. After pretreatment, the accurate weight of sample was used to obtain isotherms. System temperature was maintained by the constant temperature instrument. Saturation pressures of water, benzene, butanone, and ethanol were calculated with the Antoine equation. The apparatus would measure adsorption capacities at different pressures to obtain the isotherms after the above parameters were inputted into testing system software.

3. Water contact angle measurement

Volume of the water droplet used for measurement was 3 μL. Four parallel tests were carried on for the same sample, and the average value was used as the water contact angle listed in Table 2. Water contact angle was acquired after the droplet was stabilized on the carbon surface. Error bar for the water contact angles is shown in Fig. S1.

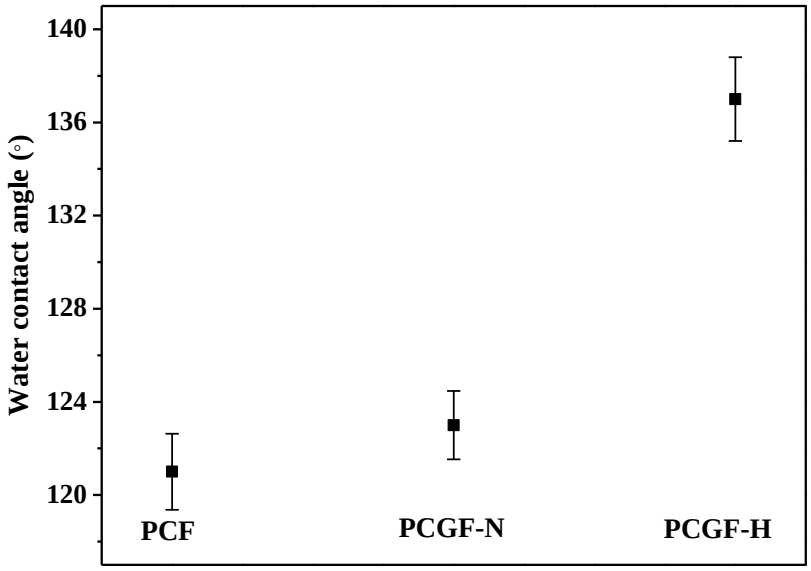

Fig. S1 Error bar for the water contact angles of three fibers.

4. XRD patterns of PCF, PCGF-N and PCGF-H

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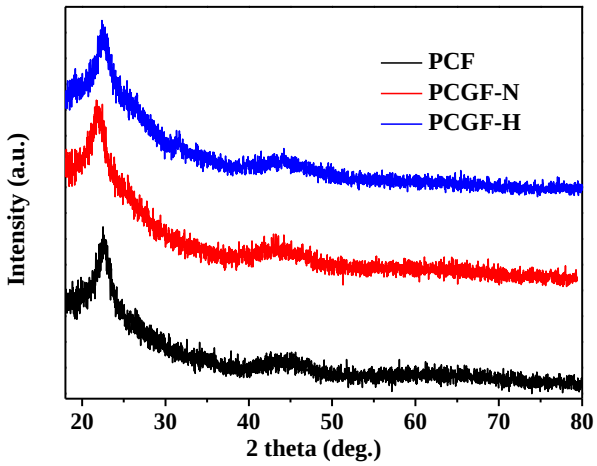

Fig. S2 XRD patterns of PCF, PCGF-N and PCGF-H.

5. Calculation of effective content of RGO in RGO/C composite fibers

In electrospinning solution, weight ratio of GO to phenolic resin was 5:100. The respective yield of pristine phenolic resin-based carbon fiber (PCF) and RGO/C composite fiber (PCGF-H) after carbonization was 51.8 and 53.9 wt.%. Taking into account the yield (51.8 wt.%) of PCF, the yield of phenolic resin-derived carbon phase in RGO/C composite can be obtained. Finally, according to the yield (53.9 wt.%) of RGO/C composite, the weight percent of RGO relative to the whole RGO/C composite fiber can be calculated. Through calculation, effective content of RGO in RGO/C composite fibers is around 8 wt.%.