Electronic Supplementary Material (ESI) for RSC Advances.

Low Cost and Robust Soot Dipped Polyurethane Sponge for Highly Efficient and Recyclable Oils and Organic Solvents Cleanup

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1. Materials and Characterization

The polyurethane sponges were from Shanghai Foam Materials Co. Chloroform, acetone, Ethyl acetate, Dichromethane and Hexane were all from Tianjin Chemical Reagent Co. All the chemicals were used as received.

The morphology of the all materials was characterized using a field-emission scanning electron microscope (Hitachi, S4700 FESEM system, with an ultimate image resolution of 1.2 nm at 25 KV). Transmission electron microscopy (TEM) images were recorded on Tecnai G2 F30 Field Emission Transmission Electron Microscope. Powder X-ray diffraction (XRD) patterns were collected on a Rigaku D/Max-2400 diffractometer with Cu-*K*α radiation (λ = 1.54178 Å). X-ray photoelectron spectroscopy (XPS) measurements were carried out on a PHI-5702 multi-functional spectrometer using Al *K*α radiation. Static water contact angle measurement was carried out using a contact angle goniometer (Powereach, JC2000D, China). A degassing process was used to remove the absorbents on the sample. The degassing was in a vacuum with 0.3 mmHg for 30 min at 80 ^{o}C.

2. Experimental

2.1 Preparation of Soot-dipped Polyurethane Sponge (SPUS)

The SPUS was prepared by dip-coating. Firstly, 100 mg of soot which was cleaned by aceton was dispersed in 30 ml of aceton solution, followed by a 60 min. sonication. Then polyurethane sponge was immersed in the soot dispersion for 10 mins before move it out and put it in the oven dried again at 60 ^{o}C for 2h. The soot loading on the sponge was defined as the weight ratio $(SPUS_{Weight}\text{-}PUS_{Weight})/ PUS_{Weight} \times 100\%$, where $SPUS_{Weight}$ and PUS_{Weight} are the weight of the soot coated polyurethane and original melamine sponge, respectively.

2.2 Absorption measurement

In a typical absorption measurement, the SPUS was immersed into different oils and organic solvents till saturation. The absorption capacity (Q) was defined as the weight-gain ratio of the SPUS, which can be calculated using the following equation: $Q = (M_2 - M_1)/M_1$ where M_1 and M_2 represent the weights of the sponge before and after oil absorption, respectively.

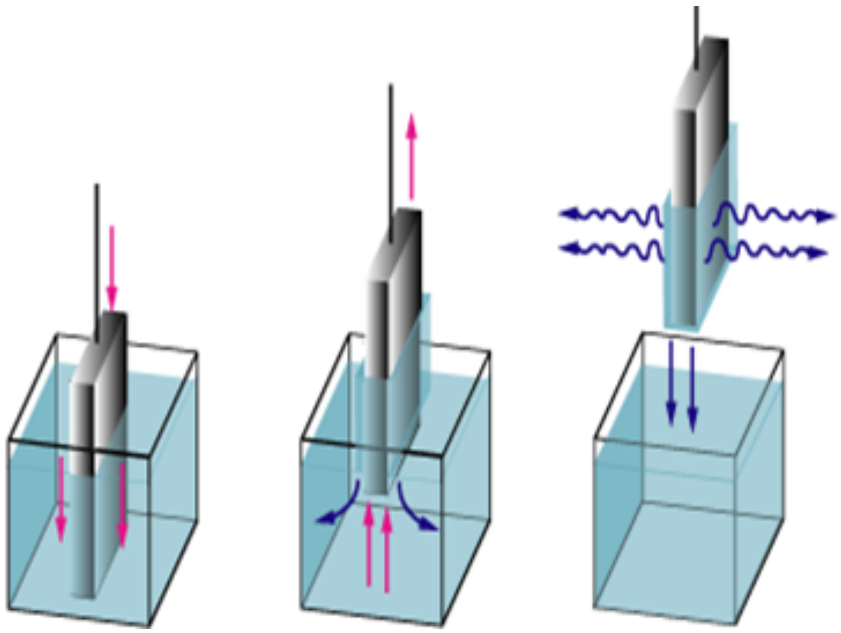

Fig. S1 Dip-coating method for synthesis SPUS

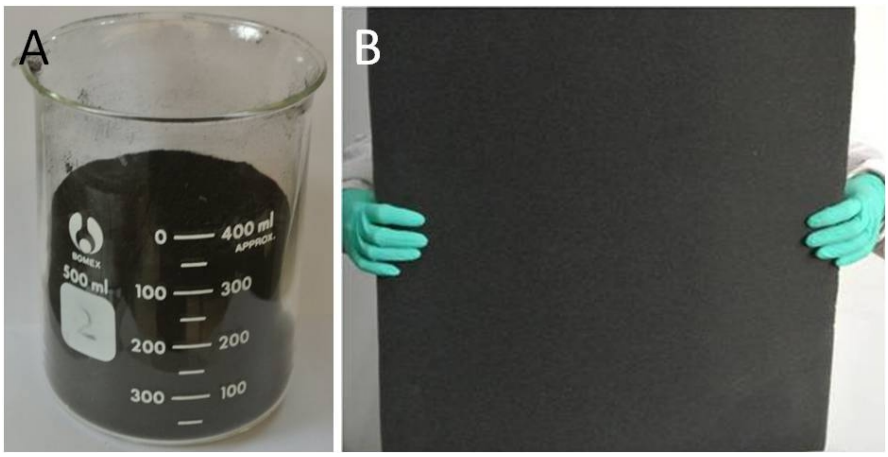

Fig. S2 (A) Photo of soot and (B) Large scale prepared SPUS

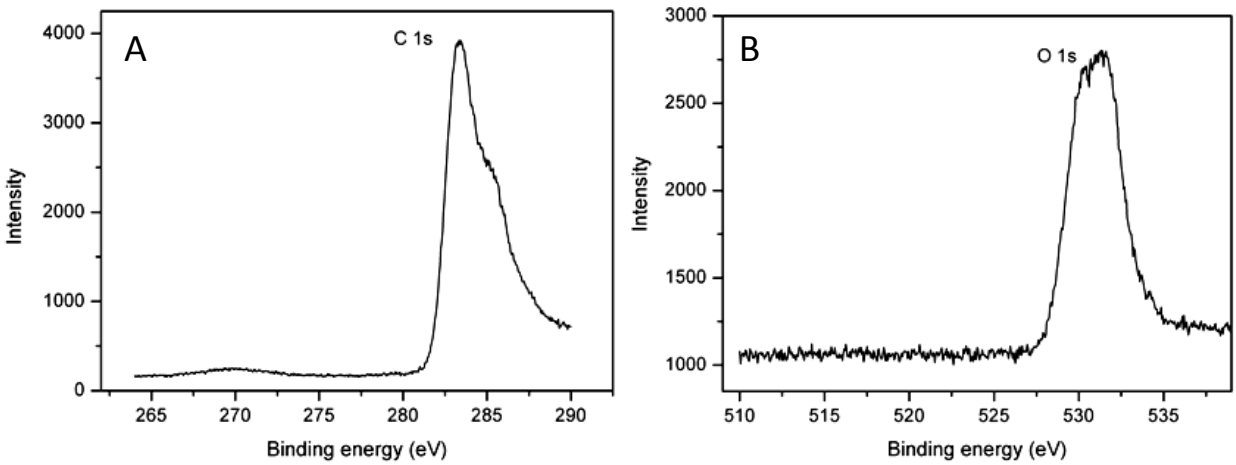

Fig S3 XPS of C1S and O1S of soot

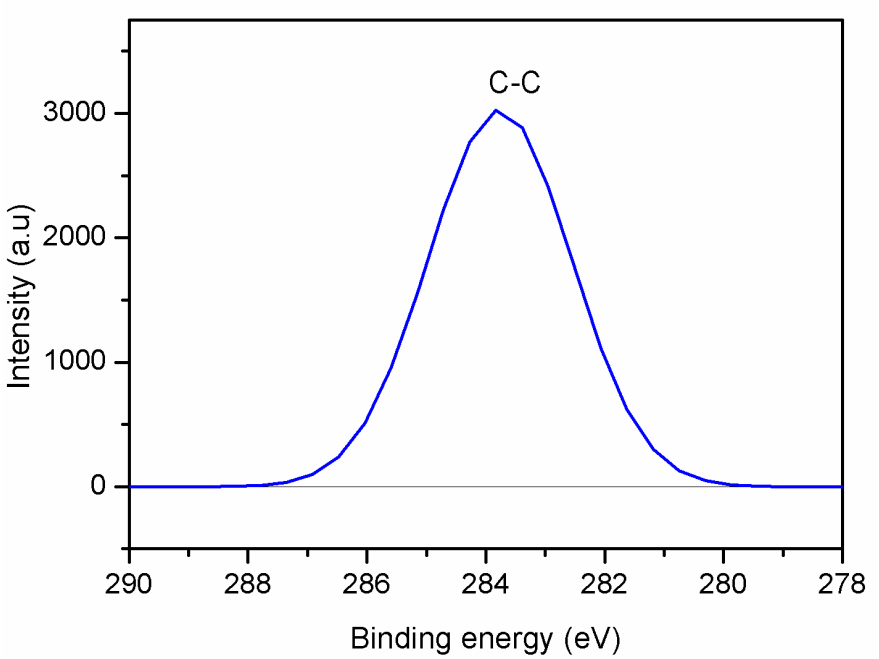

Fig S4 XPS of C-C spectrum of soot

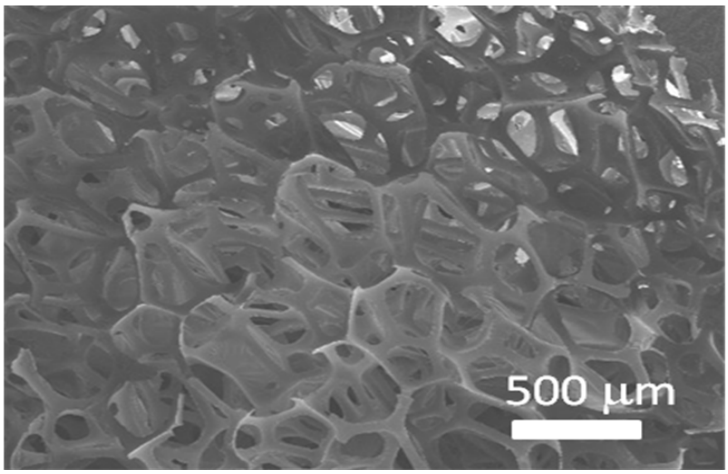

Fig S5 SEM of the scaffold of PUS

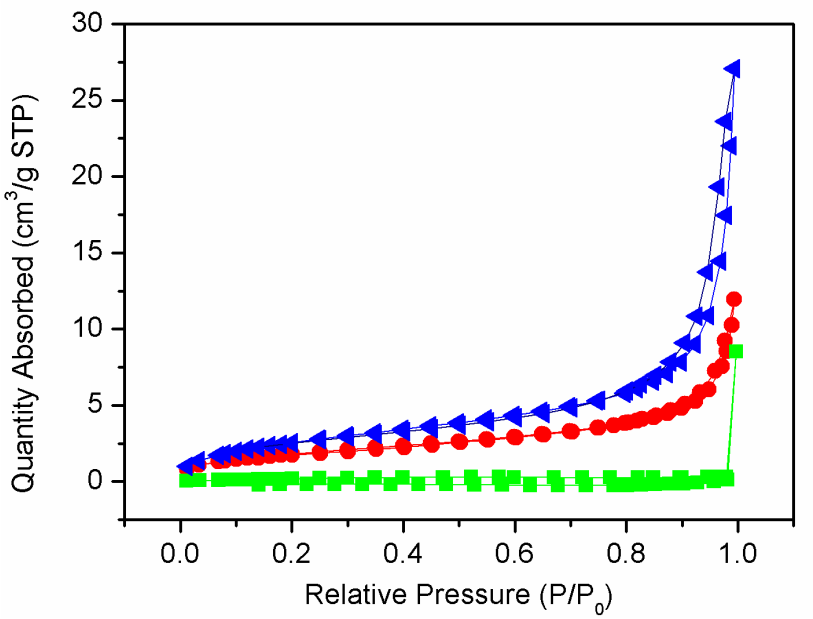

Fig S6 Nitrogen sorption isotherms of the soot(green line), PUS(red line) and SPUS(blue line).

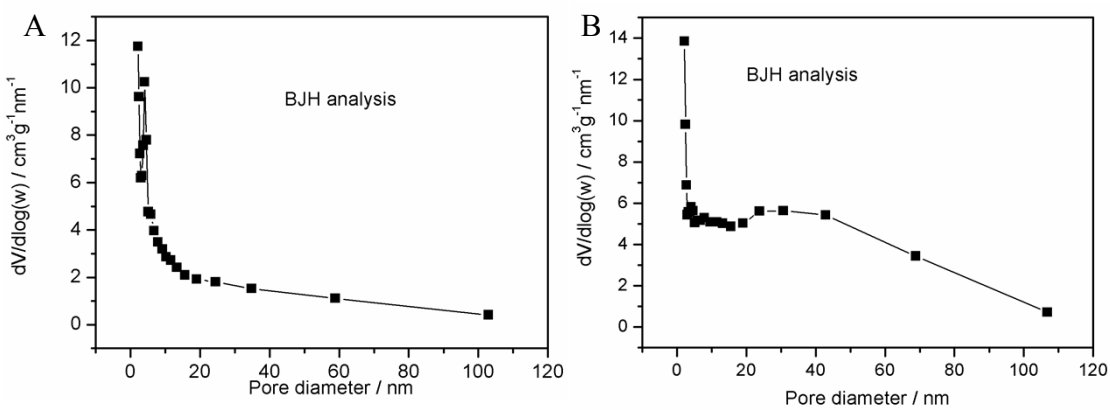

Fig S7 Pore size distribution of (A) soot and (B) SPUS.

Table S1 The relation between the soot loading and water contact angle

CPUS(Colly Loading)	Water contact angle
1%	108.6°
4%	120.1°
9%	133.3°
12%	135.6°
17%	142.3°
20%	142.4°

Table S2 Comparison of the absorption capacities of various materials

Sorbent	Oil	Q(g g^{-1})	Solvent	Q(g g^{-1})
Sepiolite	Motor oil	0.18		
Polydienthylsiloxane	Motor oil	5	Chloroform	11
Corn stalk	Gas oil	8		
Polypropylene	Fuel oil	15.7	Toluene	11.4
Butyl rubber	Crude oil	23	Toluene	17.8
Modified PU sponge	Lubricate oil	25	Dodecane	18
CNF carbon foam	Wash oil	28.4		
Graphene sponge	Castor oil	75	chloroform	87
Graphene-CNT hybrid foam	Sesame oil	105	Toluene	130