Electronic Supplementary Material (ESI) for Journal of Materials Chemistry A.

Supporting information

1. Experimental part

1.1 Materials.

1, 3, 5-tribromobenzene was from TCI. The 9, 10-dibromoanthracene was obtained from Sinopharm Chemical Reagent Co. Ltd of China. 1, 3, 5-triethynylbenzene and 1, 4-diethynylbenzene were all purchased from J&K Chemical. Tetrakis(triphenylphosphine) palladium(0) and copper(I) iodide were all purchased from TCI. All starting chemicals and solvents were used had a purity of 97% or greater used as received.

1.2 Synthesis of CMPNs.

1, 3, 5-tris(4-bromophenyl) benzene (543 mg, 1.0 mmol) and 1, 4-diethynylbenzene (283.5 mg, 2.25 mmol), tetrakis(triphenylphosphine) palladium(0) (100 mg), and copper(I) iodide (30 mg) were dissolved in a mixture of toluene (5 mL) and Et_3N (5 mL). The mixture solution was heated to 80 °C and stirred for 24 h under a nitrogen atmosphere. After cooling to room temperature, the resulting polymer was filtered and washed with chloroform, water, methanol, and acetone, respectively, followed by purification using Soxhlet extraction with methanol for 72 h. The resulting product was dried at 70 °C for 24 h to a constant weight and named as CMPN-1. CMPN-2 and CMPN-3 were synthesized using the same method as mentioned above. CMPN-2 was synthesized from 9, 10-dibromoanthracene (336 mg, 2.0 mmol) and 1, 3, 5-triethynylbenzene (150 mg, 2.0 mmol), tetrakis(triphenylphosphine) palladium(0) (100 mg), copper(I) iodide (30 mg), toluene (5 mL) and Et_3N (5 mL). CMPN-3 was synthesized from 9, 10-dibromoanthracene (336 mg, 1.0 mmol) and 1, 4-

diethynylbenzene (189 mg, 1.5 mmol), tetrakis(triphenylphosphine) palladium(0) (53.3 mg), copper(I) iodide (13.3 mg), toluene (5 mL) and Et_3N (5 mL).

1.3 Preparation of CMPN-3 film.

The CMPN-3 film material was created by pressing the CMPN-3 powder (~30 mg) in a mold under a pressure of 10 kPa for 10 min at room temperature.

1.4 The uptake of iodine vapor.

The iodine adsorption experiment was performed in the following procedure. 30 mg CMPN in open glassware and a mount of solid iodine were place in a sealed glass container and heated at 70 ^{o}C and ambient pressure. Some contact time later, the CPMN sample adsorbing iodine was cooled down to room temperature and weighed. The uptake of iodine for CMPN sample was calculated by weight gain: $\alpha=(m_2-m_1)/m_1\times100$ wt%, where α is the iodine uptake, m_1 and m_2 are the mass of CMPN sample before and after adsorbing of iodine vapor.

1.5 Characterization.

Fourier transform infrared spectroscopy (FTIR) spectra recorded from in the range of 4000-400 cm^{-1} using the KBR pellet technique on a FT-Raman Module (Nicolet, America) instrument. The ^{1}H-^{13}C CP/MAS NMR spectra were recorded on a Bruker AVANCE II WB 400-MHz type (^{1}H, 400 MHz; ^{13}C, 100 MHz) spectrometer at a spinning speed of 10 kHz. The chemical shifts were determined in ppm using TMS as an internal standard. The analysis of the spectra (deconvolution and integration) was carried out using Bruker TOPSPIN software. SEM images were obtained with a field emission gun scanning electron microscope (JSM-6701F, JEOL, Ltd.) after coating the sample with an Au film.

Transmission electron microscope (TEM) images (FEI Company, USA). Brunauer–Emmet–Teller (BET), the porosity of materials was evaluated at 77.3 K using a pore and surface analyzer (Micromeritics, ASAP 2020). Samples were degassed at 100 ^{o}C for 24 h under vacuum before analysis. Thermogravimetric analysis (TGA) was performed under a nitrogen flow rate of 20 mL min^{-1} using a Perkin-Elmer TG/DTA-6300 instrument evolved during sample heating. The sample was heated from room temperature to 1000 ^{o}C at 10 ^{o}C/min.

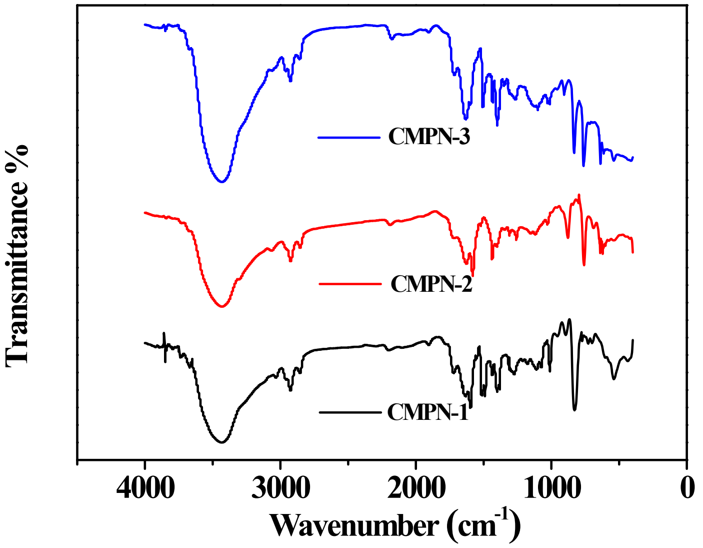


Figure S1. FTIR spectra of the CMPN samples

The chemical bonds and functional groups of organic molecular were assessed by FTIR. The three CMPN samples are basically similar and confirm three main adsorption regions: a first absorption bands appeared at 700–1100 cm^{-1}, which can be assigned to skeleton vibration of benzene ring , while a second absorption band at 1300–1750 cm^{-1} and a peak close to 3050 cm^{-1}, which are due to benzene stretching. While the third peak close to 2900 cm^{-1}, corresponding to –C–H stretching of benzene ring. Moreover, it is worth mentioning that the characteristic weak peak at 2250 cm^{-1}, which refers to –C≡C– stretching was observed.

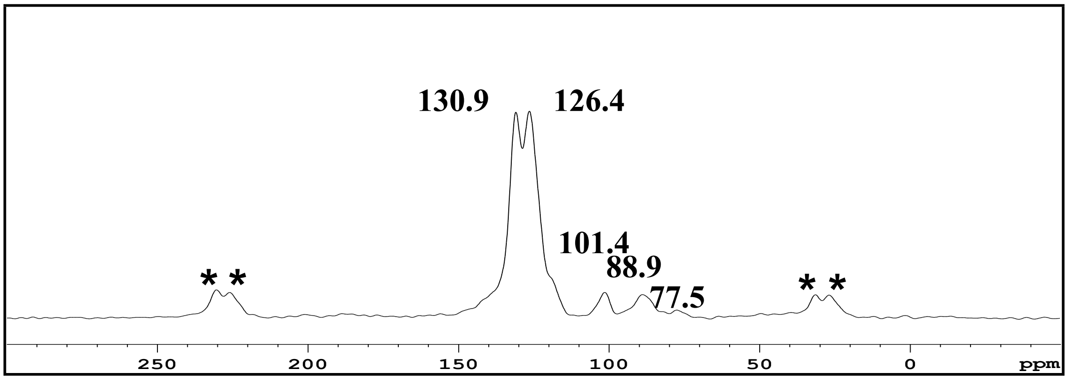


Figure S2. Solid-state ^{1}H-^{13}C CP/MAS NMR spectrum of CMPN-3. Spinning side-bands are denoted with asterisks.

The polymers were characterized at the molecular level by ^{1}H-^{13}C CP/MAS NMR in order to demonstrate the inclusion of the different functional groups in the polymer networks. The Figure 1 show peak at ca. 130.9 ppm, which correspond to non-protonated C_{Ar}–C_{Ar} sites, and peak at ca. 126.4 ppm are observed for protonated C_{Ar}–C_{Ar} sites. The peak at ca. 101.4 ppm and ca. 88.9 ppm are C_{Ar}–C≡C–C_{Ar} units, peak at ca. 77.5 ppm are the –C≡C–H end groups.

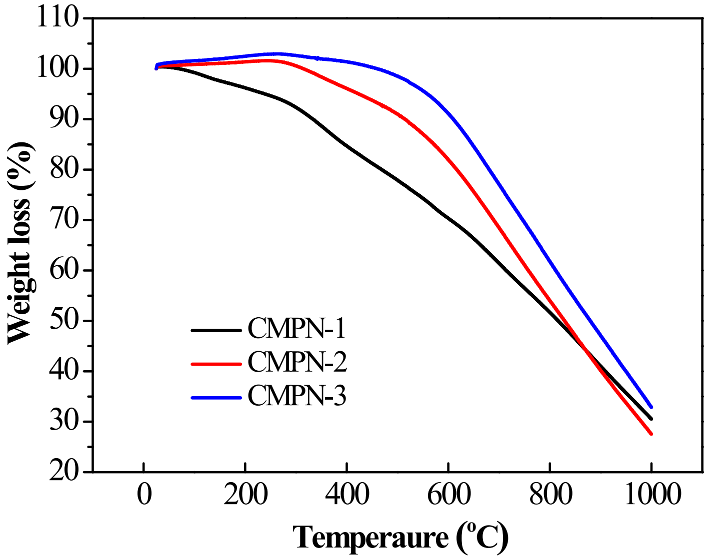


Figure S3. The TGA curves of CMPN samples.

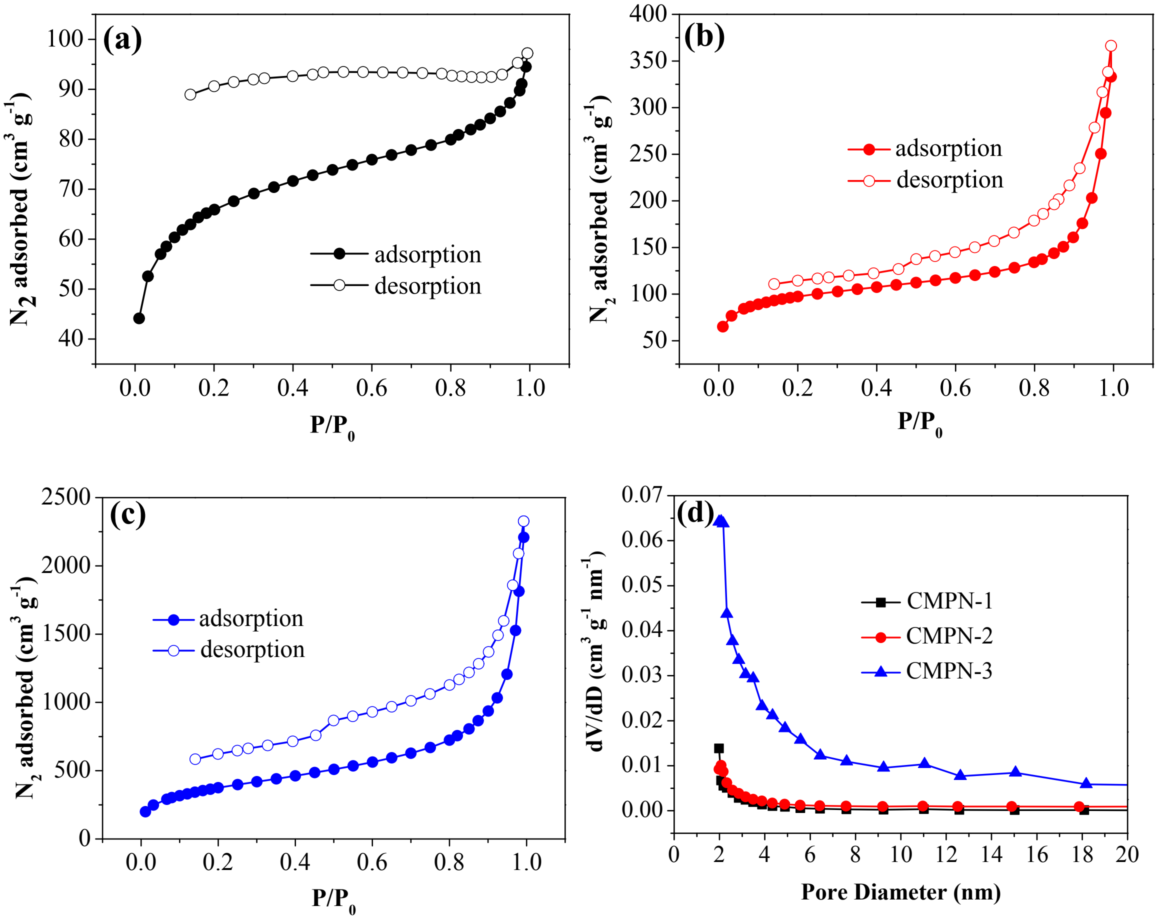


Figure S4. Nitrogen sorption curves for CMPN-1 (a), CMPN-2 (b) and CMPN-3 (c). (d) BJH adsorption pore size distribution for CMPN samples.

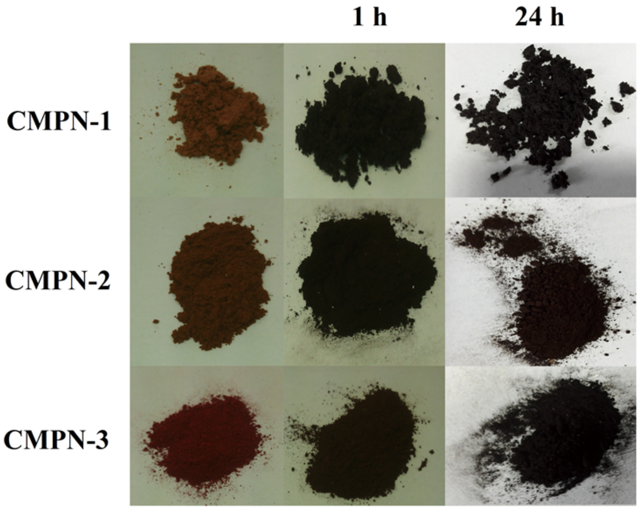
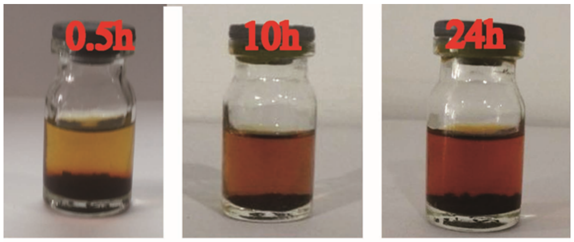
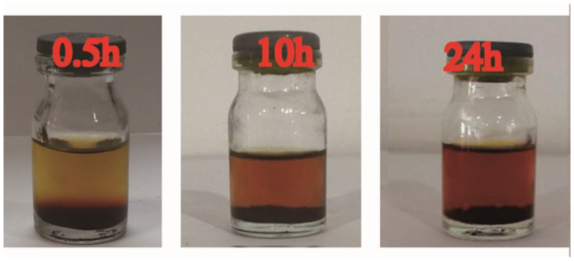


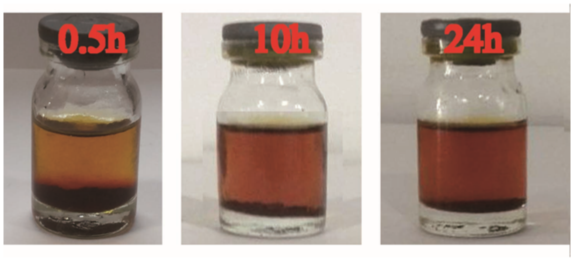
Figure S5. Photographs showing the color change when the CMPN-1, CMPN-2 and CMPN-3 were exposed to iodine vapor over 24h.



CMPN-1



CMPN-2



CMPN-3

Figure S6. Photographs showing the visual color change of the CMPN1, CMPN-2 and CMPN-3 before and after I_2 release process in 3.5 mL of EtOH.

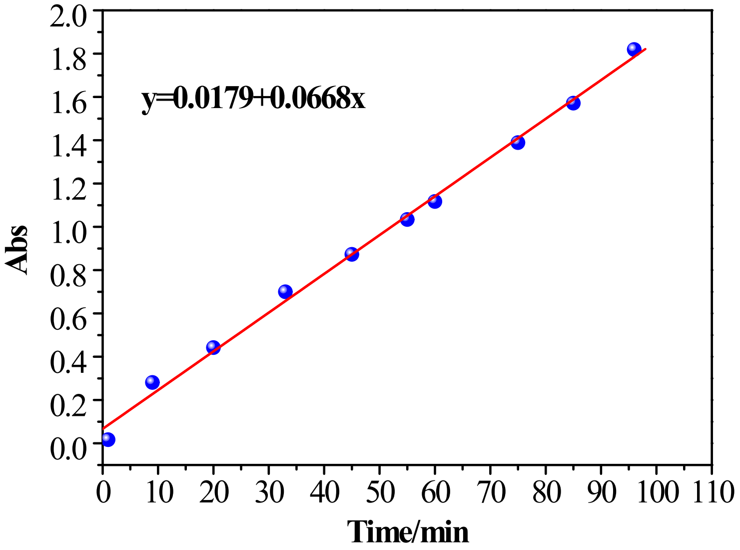


Figure S7. The controlled delivery of I_2 in the first 96 min of CMPN-3. Adj. R-Square equal to 0.99543.

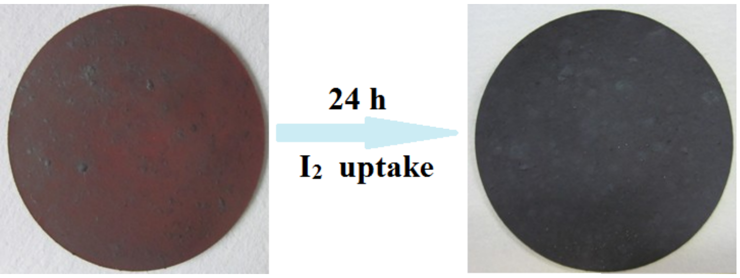


Figure S8. The photographs showing the color change before and after I_2 uptake by CMPN-3 film.

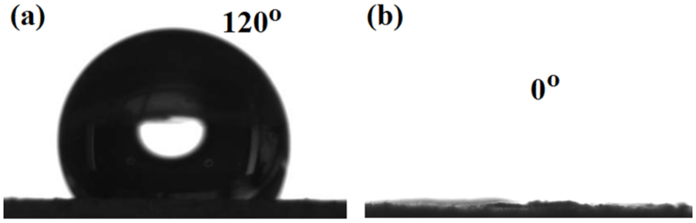


Figure S9. The water (a) and diesel oil (b) contact angle (CA) measurement for CMPN-3, which shows surface hydrophobicity and oleophilicity.

Table S1. The textural parameters of CMPN samples, CO_2 uptakes and adsorption heat for CO_2.

samples	S_{BET}[a] (m^2/g)	S_{micro}[b] (m^2/g)	V_t[c] (cm^3/g)	V_{micro}[d] (cm^3/g)	D[e] (nm)	CO_2 uptake		
						273K (mg/g)	298K (mg/g)	Qst (kJ/mol)
CMPN-1	230	110	0.14	0.05	2.4	42.9	28.2	28.2
CMPN-2	339	160	0.39	0.07	4.6	73.4	47.0	30.2
CMPN-3	1368	107	2.36	0.03	6.9	38.2	28.8	26.5

[a] The specific surface area (S_{BET}) was calculated by the Brunauer-Emmet-Teller (BET) method. [b] S_{micro} was the micropore surface area estimated by t-plot method. [c] V_t represented the total pore volume. [d] The micropore volume (V_{micro}) was calculated using t-plot method. [e] The average pore width (D) was calculated from single point BET surface area.