Electronic Supporting Information for

A new method to synthesize ordered microporous carbons with tunable pore size and its application in pollutant removal

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Supplementary Note 1: OMCs characterization.

High resolution transmission electron microscopy (HRTEM) images were acquired on a Thermofisher Spectra 300 TEM operated at 300 kV. OMCs powder samples were dispersed in ethanol and subsequently 20 µL of the dispersion was dropped onto a lacey-carbon film supported copper grid (LC200-CU-100 Lacey Carbon Film, Electron Microscopy Sciences), then air dried before image capturing.

The X-ray diffraction (XRD) analysis was performed by using Rigaku Ultima IV X-ray Diffractometer with Cu-Kα radiation (λ=1.5406 Å) under 40 kV, 44 mA and a scanning between 0.6° to 5° (2 θ) with a step of 0.01°.

Pore size and surface area were analyzed using the reported method in a previous study[1]. Specifically, it was performed with N_2 at 77 K on a Micromeritics ASAP2020 Plus 2.0 analyzer with the relative pressure (P/P_0) of 7.3 x10^{-7} to 1. Surface area of samples was calculated from BET equation. Pore size distribution and micropore volume was simulated by Non-local Density Functional Theory (DFT) for N_2 adsorption isotherm using built-in software. The total pore volume was calculated from the adsorbed volume of gas near the saturation point (P/P_0=0.98). All the samples were degassed at 150 °C for 18 h before the measurement.

Raman spectra of the 5 OMCs were collected using a RENISHAW® inVia Raman Microscope. A 633 nm laser, 5x objective lens with 50% laser power, 20 seconds exposure time, 1800 l/mm (vis) grating were applied. The spectral range was set to 100-3200 cm^{-1} with the center at 1600 cm^{-1}. The spectral resolution was ~0.3 cm^{-1} (FWHM). A silicon wafer was utilized to calibrate the instrument before each sample test. For each test, 10 mg of OMC sample was measured and used.

The surface Zeta potential of the 5 OMCs was appraised under a neutral pH condition by using a Malvern Zeta-Sizer. The suspensions were prepared by adding 0.02 grams of OMCs into 50 mL of 1 mM KCl solution. The suspensions were ultrasonicated for 2 minutes, then were aged for 1 hour at ambient temperature. For the smallest pore size OMC and second smallest pore size OMC, the supernatant was diluted 50 times before the Zeta potential analysis. For the rest of the OMCs, there was no dilution for the supernatant.

The water contact angle tests were measured on a ramé-hart Model 200 Standard Contact Angle Goniometer equipped with the DROPimage pro software. 20 mg of the OMC was used for each test. 15 µL of deionized water was used to form the water droplet to remain consistency during the tests.

Supplementary Note 2: Methylene Blue (MB, cationic dye) and Methyl Orange (MO, anionic dye) adsorption and analysis

For the dye removal test, 10 mg of the OMCs were measured and added into 15 mL centrifuge tubes. 10 mL of the 200 mg/L methylene blue (M9140, Sigma Aldrich) or methyl orange (M3132, Sigma Aldrich) solution (prepared by deionized water) with or without 10 mg/L humic acid (53680-10 G, technical grade, Sigma Aldrich) was added and mixed well with the OMCs. The control that only has dye solution with and without NOM was prepared to minimize the effect of the dye adsorption by centrifuge tubes and minimize the error of the test. The tubes were shaken end-over-end at room temperature for 14 hours. Then centrifuged at 5000 rpm for 5 min. The supernatant was collected and diluted 50 times before analysis. Duplicate tests were

conducted. For the MB or MO analysis, the Thermo Scientific Genesys 20 Spectrophotometer was used. Since the maximum absorption wavelength of MB is 668 nm[2], the Abs at 668 nm was used for MB concentration determination. The maximum adsorption wavelength of MO is 465 nm[3], the Abs at 465 nm was used for MO concentration determination. The R^2 for the calibration curve is 0.9993 for MB and 1.0 for MO (see shared data in excel file). Accordingly[4], the whole wavelength scanning of humic acid shows almost no absorption at 668 or 465 nm[4], and was also confirmed by our data (see the result in the shared excel file). Thus, the interference caused by humic acid in this case was negligible. Photos of the treated solution was taken in the cuvette after sample analysis to record the color changes.

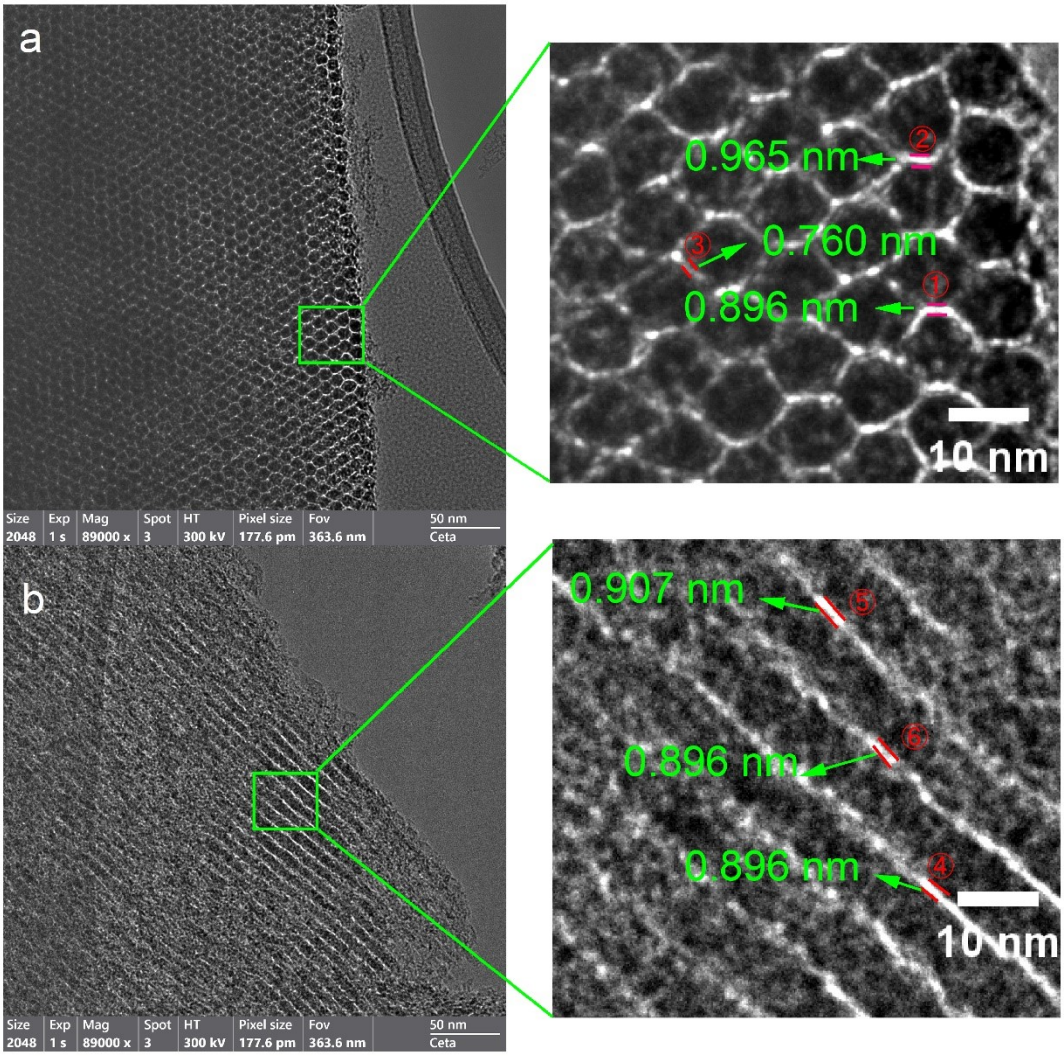


Fig. S1 the pore size measurement via HRTEM photos (Take the OMC-0.83 as an example). The pore size was analyzed by Image J based on the scale bar in the original HRTEM photos shown in Fig. S1 a and b. To ensure accuracy of the pore size measurement, 15 spots in each HRTEM photos were randomly chosen and an averaged pore size 0.83 nm was adopted as the pore size of the OMC-0.83. To simplify the figure, only 3 out of the 15 selected spots were labeled, demonstrated above. The same method was applied to other OMCs.

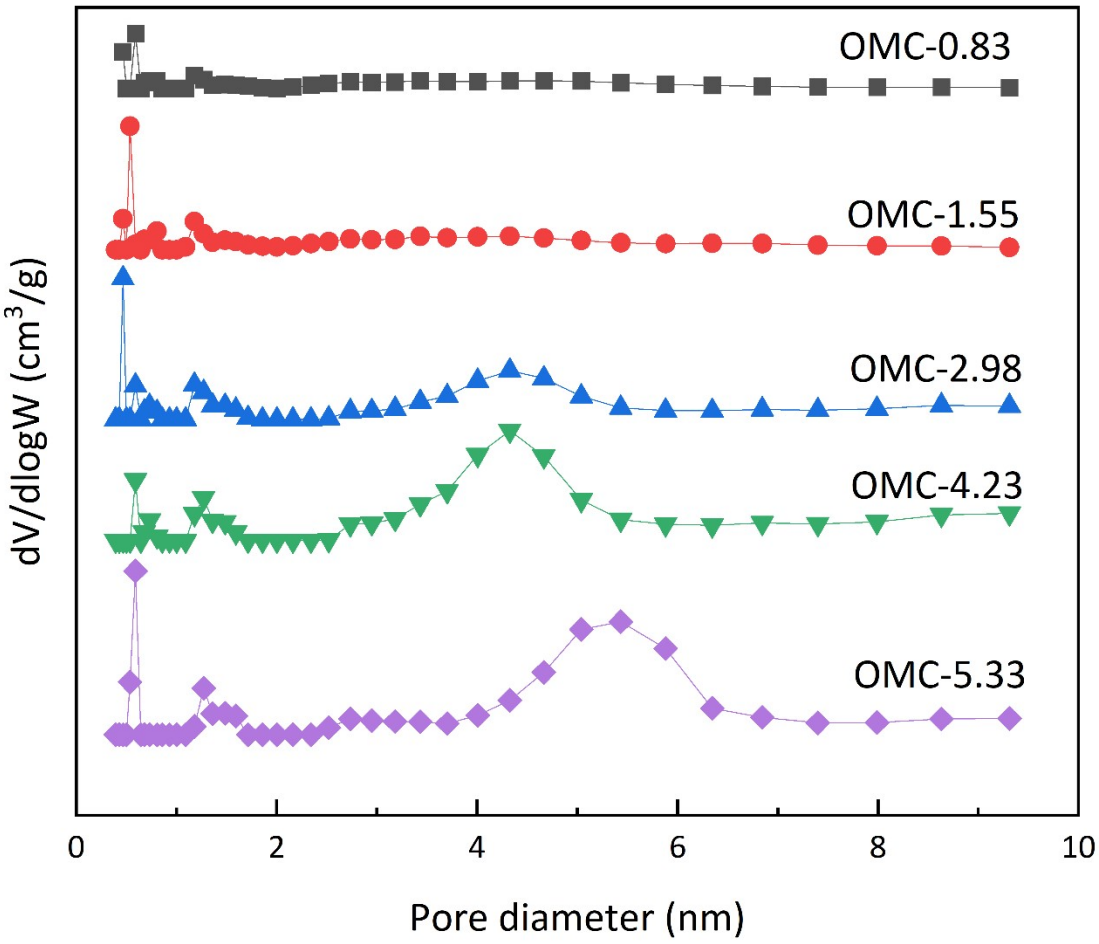


Fig. S2 Pore size distributions of the five OMCs. dV: derivative of pore volume V with respect to log pore width W.

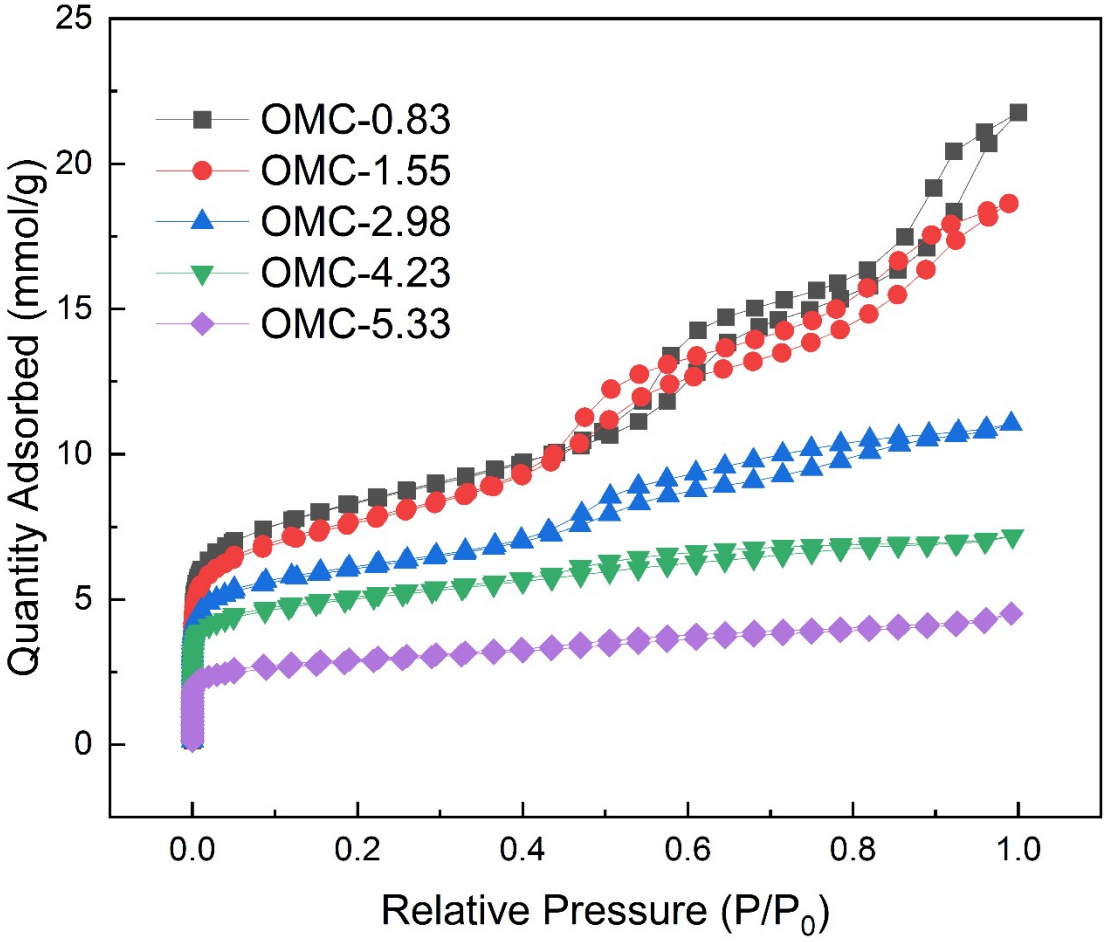


Fig. S3 Nitrogen adsorption/desorption isotherm at 77 K on five OMCs.

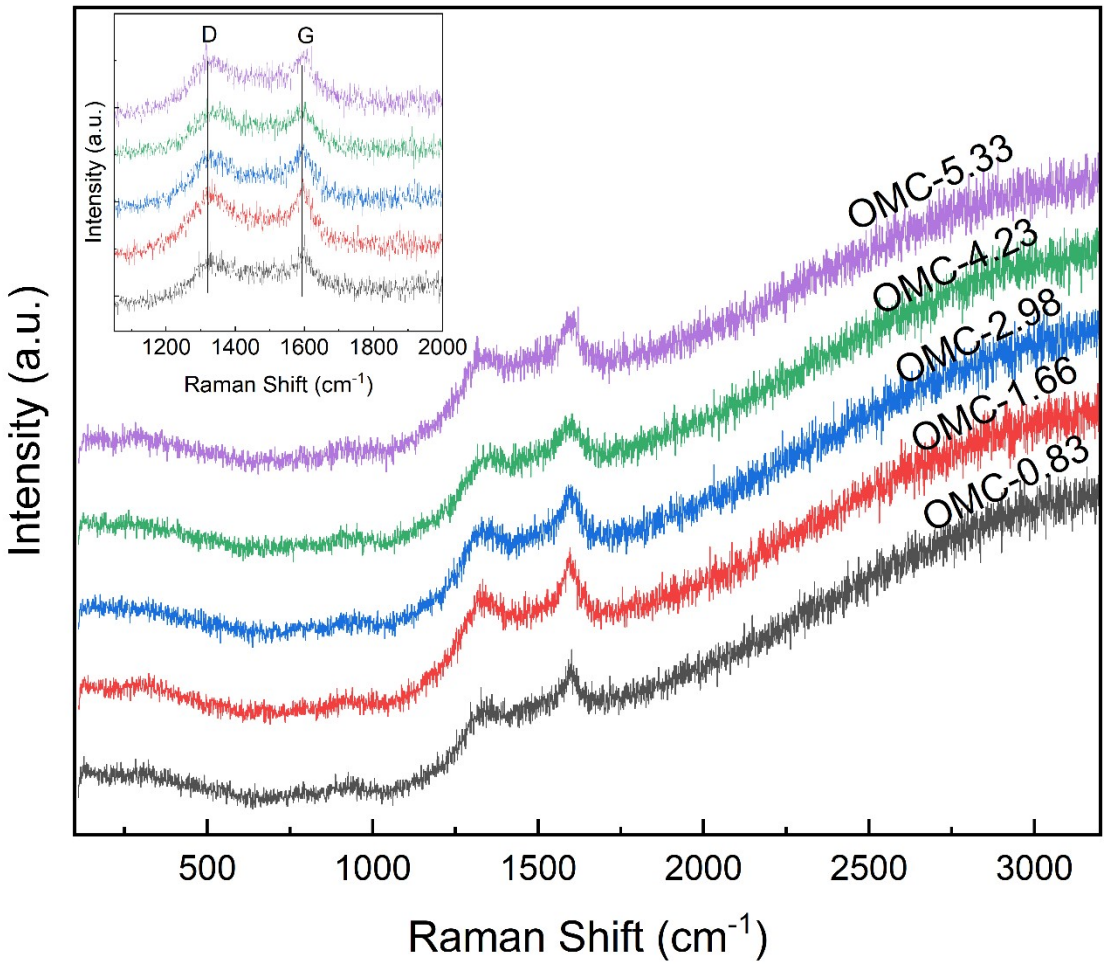


Fig. S4 The Raman spectra of the five OMCs**.** Inserted graph is the magnified area between 1050 and 2000 cm^{-1}. The baseline in the inserted graph is corrected via Origin 2023 using the Peak Analyzer function.

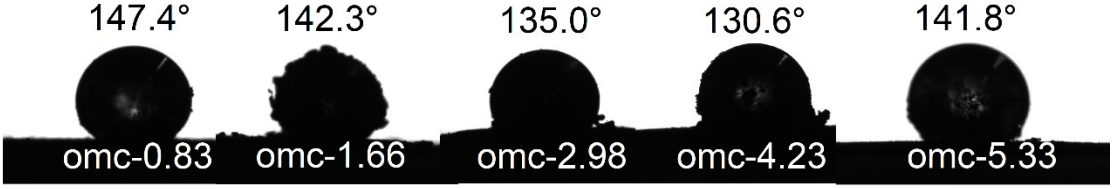


Fig. S5 The contact angle test results of the five OMCs.

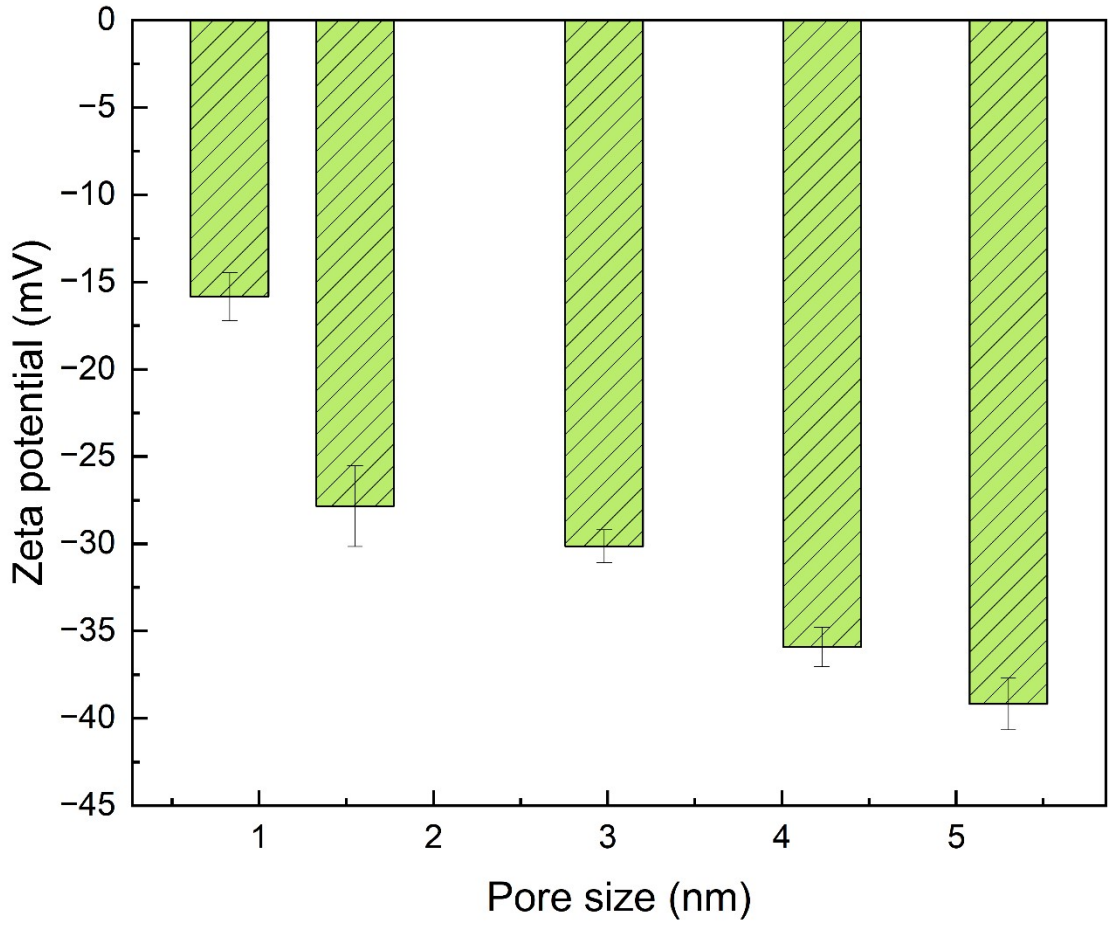


Fig.S6 The Zeta potential of the five types of OMCs at neutral pH in deionized water.

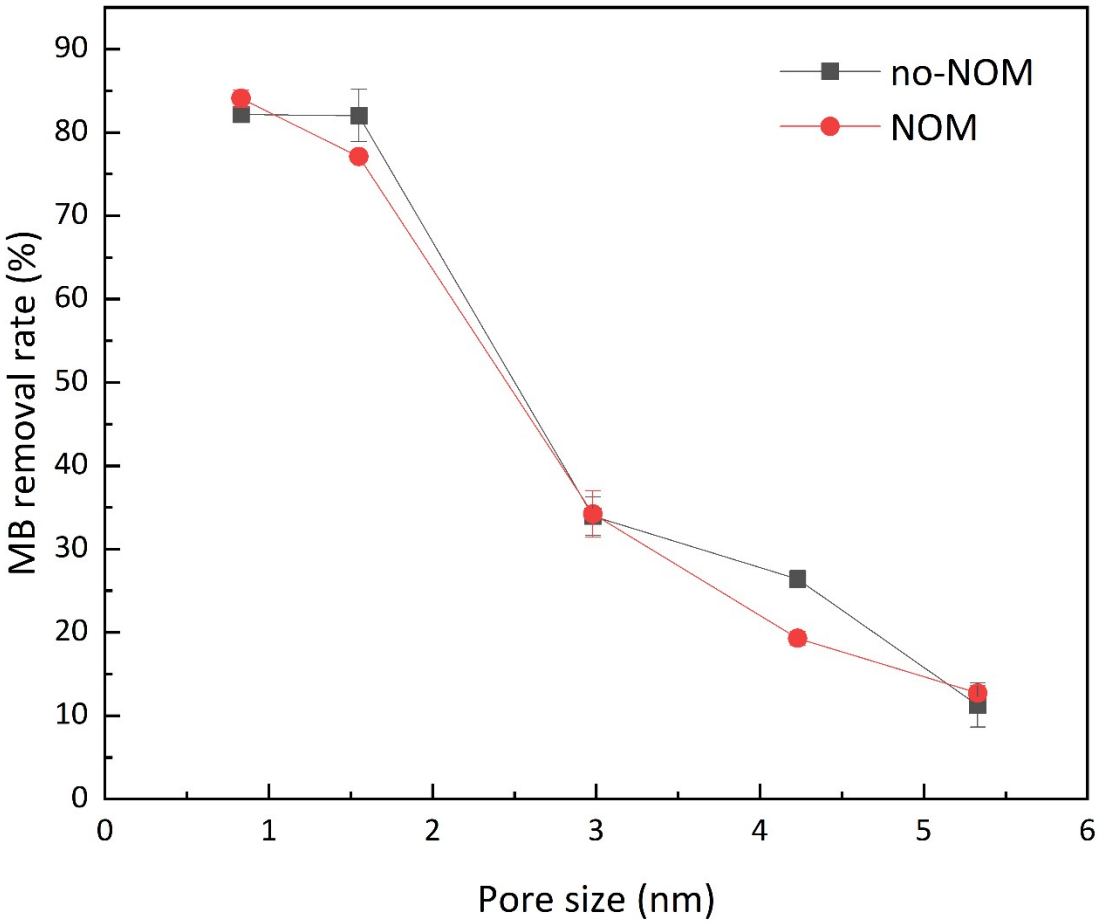


Fig. S7 The pore size effect of OMCs on MB removal. MB: methlene blue. The test condition is the same as that of Fig. 4. The initial concentration of the dye is 200 mg/L. The dose of OMCs is 1g/L.

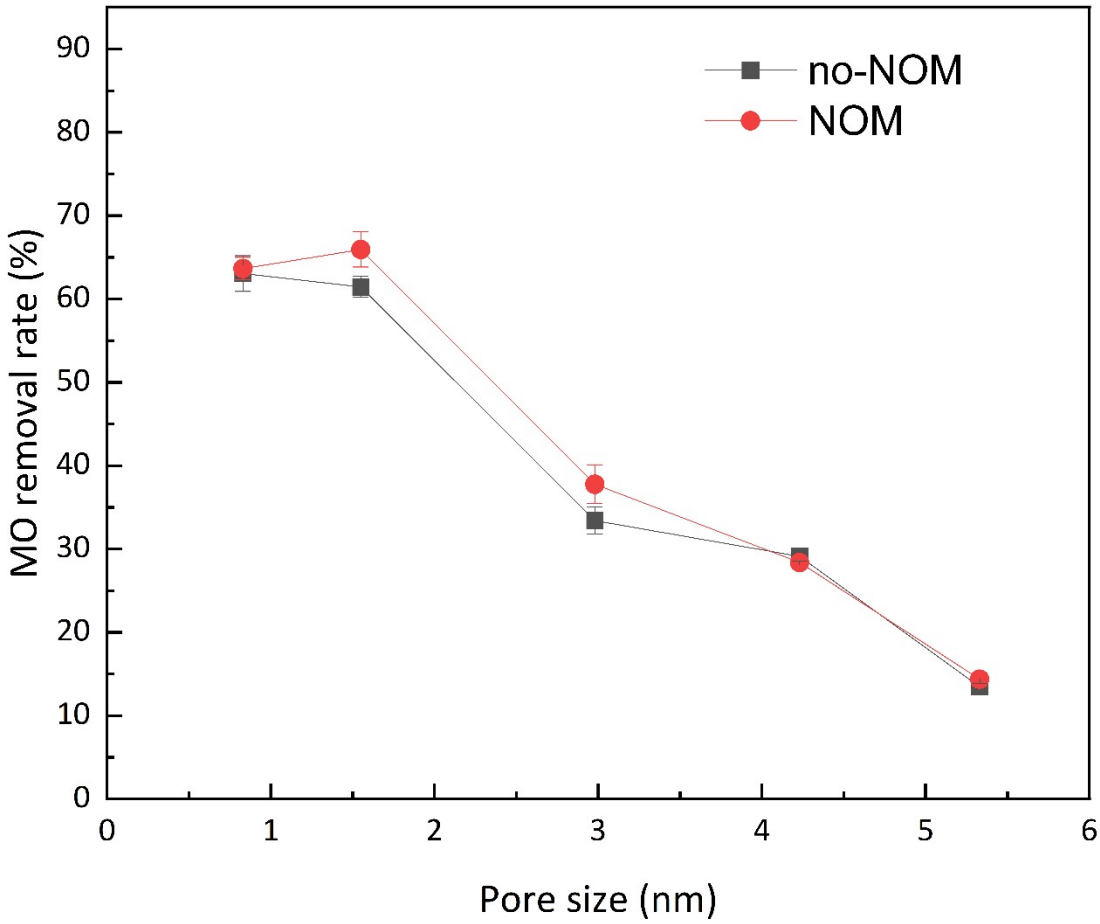


Fig. S8 The pore size effect of OMCs on MO removal. MO: methyl orange. The test condition is the same as Fig.4. The initial concentration of the dye is 200 mg/L. The dose of OMCs is 1g/L.

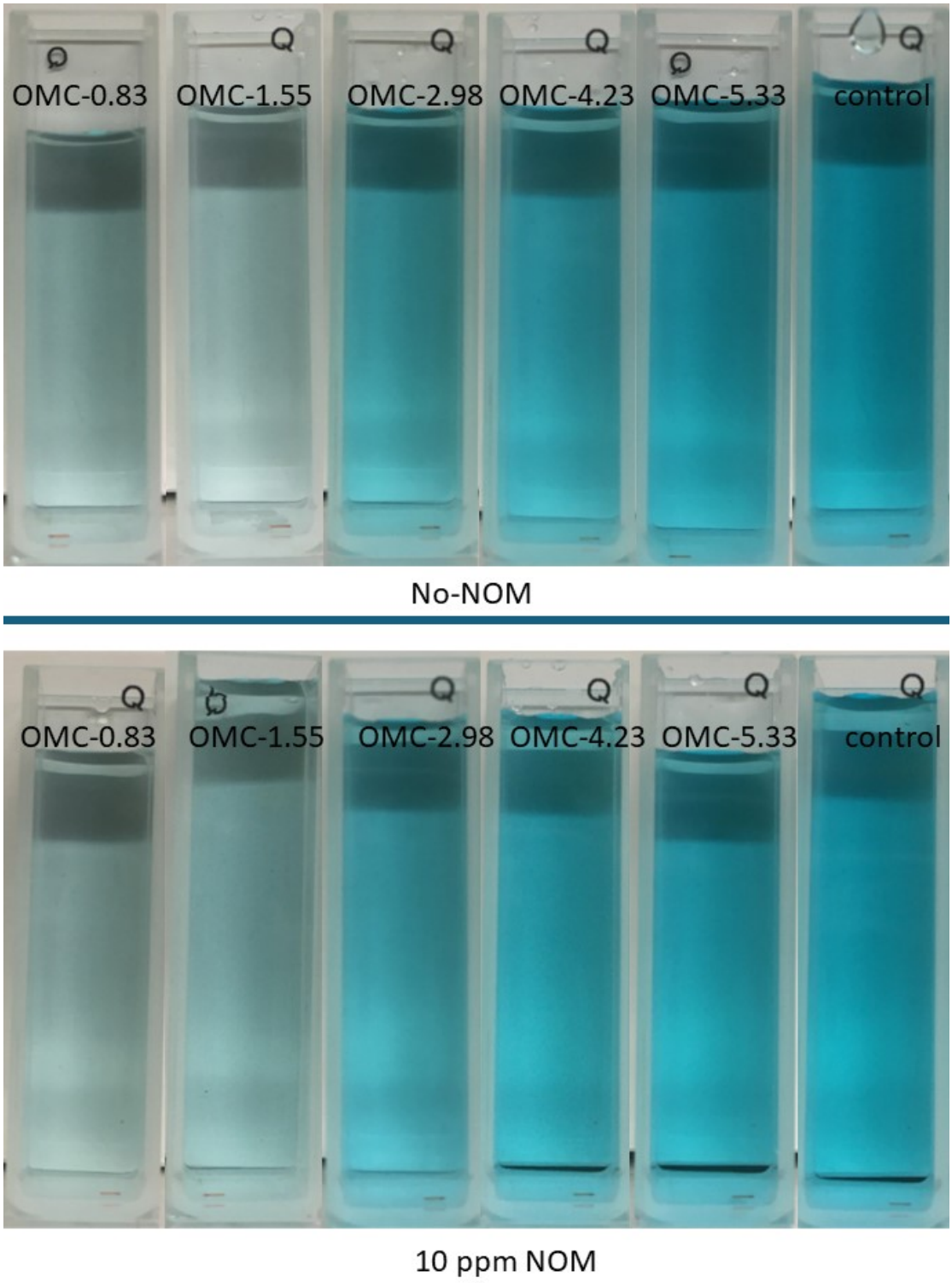
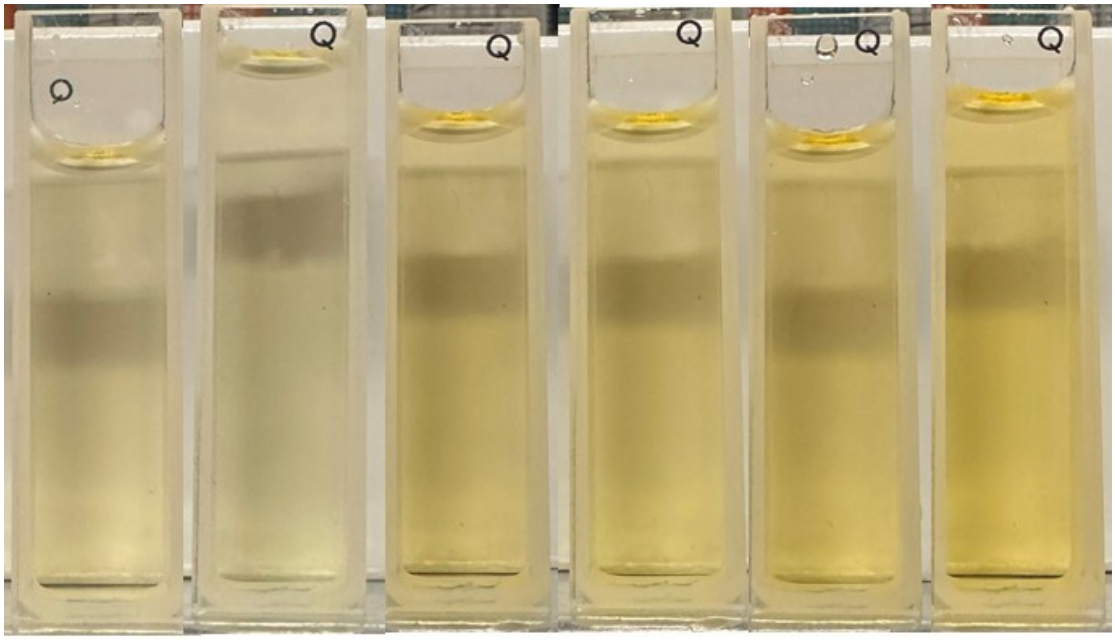
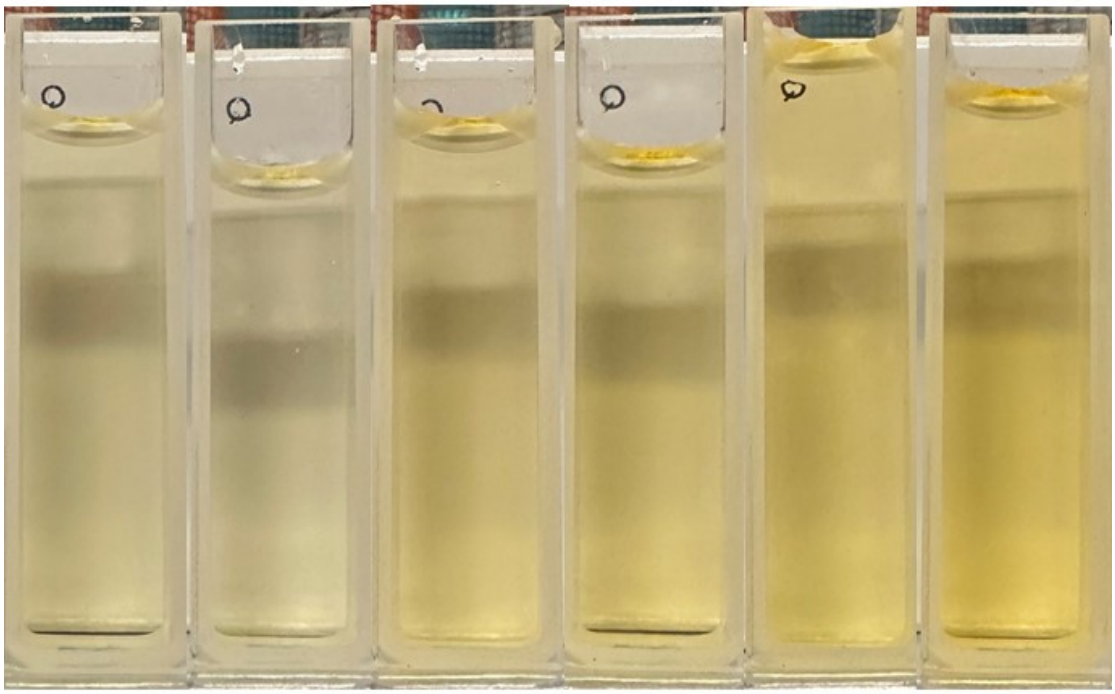


Fig. S9 The color change of the MB solution after 14 hours of treatment. All the solution was diluted 50 times before taking the photo.



No-NOM



10 ppm NOM

Fig. S10 The color change of the MO solution after 14 hours of treatment. All the solution was diluted 50 times before taking the photo.

Table S1 The I_D/I_G ratio of the original five OMCs based on Raman spectra.

Adsorbents	I_D	I_G	I_D/I_G
OMC-0.83	63.44	88.43	0.717
OMC-1.66	117.57	138.14	0.851
OMC-2.98	107.54	119.08	0.903
OMC-4.23	82.64	70.45	1.173
OMC-5.33	102.52	107.54	0.953

Note the D band is at 1329 cm^{-1}, the G band is at 1595 cm^{-1}. The data collected from Fig. S4.

Table S2 The dye removal performance comparison

adsorbent	Dye	Dye loading* capacity (mg/g)	Equilibrium time (h)	Ref.
MWCNTs/	Methylene blue	166.67	1.67	5
PANI/Fe_3O_4	Congo red	142.86	3.33	5
Chitosan-RI		487.9	3.33	6
Chitosan-RII	Recative black 5	327.3	3.33	6
Chitosan-RIII		616.9	3.33	6
Chitosan-RIV		692.3	3.33	6
Chitosan- MCGMA-I	Remazol Brilliant Blue R	95.9	2.5	7
Chitosan- MCGMA-II		109.0	2.5	7
Chitosan-RI		801.2	2.5	8
Chitosan-RII	Brilliant Blue R250	652.5	2.5	8
Chitosan-RIII		2069.1	6	8
R1 (chitosan resin)	Recative black 5	624.8	2.67	9
R2 (chitosan resin)		773.6	2.67	9
CAS (aluminasilica)	Gentian Violet	554.9	0.17	10
TF resin	Titan yellow	315.2	4	11
TF resin	Rose bengal	359.3	4	11
MTF resin	Titan yellow	492.6	4	11
MTF resin	Rose bengal	553.0	4	11
ACRPs-MS (carbon)	Methylene blue	81.9	0.33	12
ACRPs-MS (carbon)	Crystal violet	86.1	0.33	12
Biochar/gellan gum hydrogel composite	Methylene blue	542.1	2	13
OMC-0.83	Methylene blue	163.9	N/A	This
OMC-0.83	Methyl orange	128.3		work

*denotes the loading capacity was collected at room temperature 20-25°C.

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