



Fabricating MOF/polymer composites via freeze casting for water remediation

Coral Rogers ¹, Daniel Pun ¹, Qingshan Fu ², Haifei Zhang ^{1,*}

¹ Department of Chemistry, University of Liverpool, Oxford Street, Liverpool, L69 7ZD, United Kingdom;

² College of Material Science and Engineering, Sichuan University of Science and Engineering, Zigong 643000, China

* Correspondence: zhanghf@liverpool.ac.uk; Tel.: +44-151-7943545.

Table S1. Description of chitosan/UiO-66 samples prepared and tested.

Sample Name	Sample Description
CM/UiO-66-1	Chitosan (medium molecular weight) with UiO-66 nanoparticles with the weight ration of chitosan:UiO-66 = 1:1
CM/UiO-66-2	Chitosan (medium molecular weight) with UiO-66 nanoparticles with the weight ration of chitosan:UiO-66 = 1:2
CH/UiO-66-1	Chitosan (high molecular weight) with UiO-66 nanoparticles with the weight ration of chitosan:UiO-66 = 1:1
CM/UiO-66-NO ₂ -1	Chitosan (medium molecular weight) with UiO-66-NO₂ nanoparticles with the weight ration of chitosan:UiO-66-NO ₂ = 1:1
CM/UiO-66-NH ₂ -1	Chitosan (medium molecular weight) with UiO-66-NH₂ nanoparticles with the weight ration of chitosan:UiO-66-NH ₂ = 1:1
CM/UiO-66-1 (HT)	This sample is heat treated (HT) in a vacuum oven at 90 °C for 24 h.
CM/UiO-66-1 (BT)	This sample is base treated (BT) by immersing in 1M NaOH solution for 15 min.
CM/UiO-66-1 (GA)	This sample is chemically crosslinked with glutaraldehyde (GA).

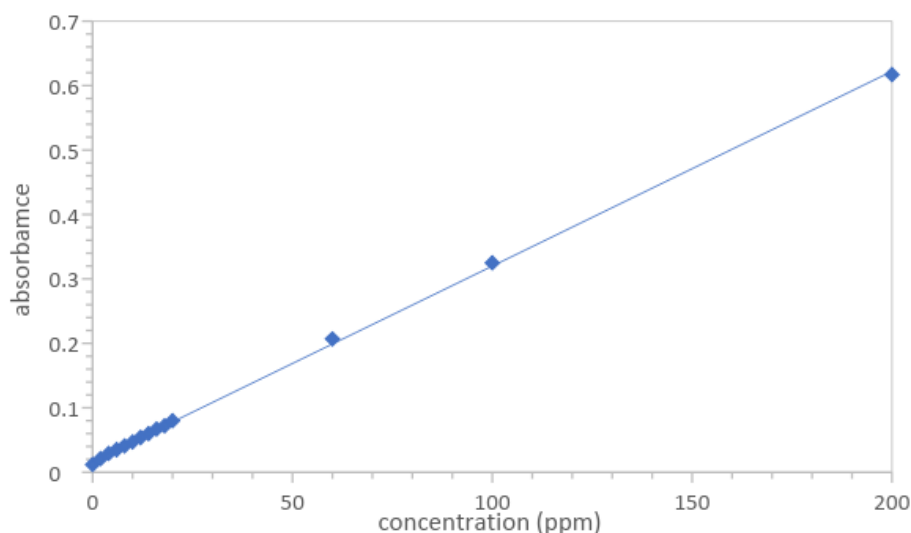


Figure S1. The calibration curve used to calculate the MCP solution concentration.

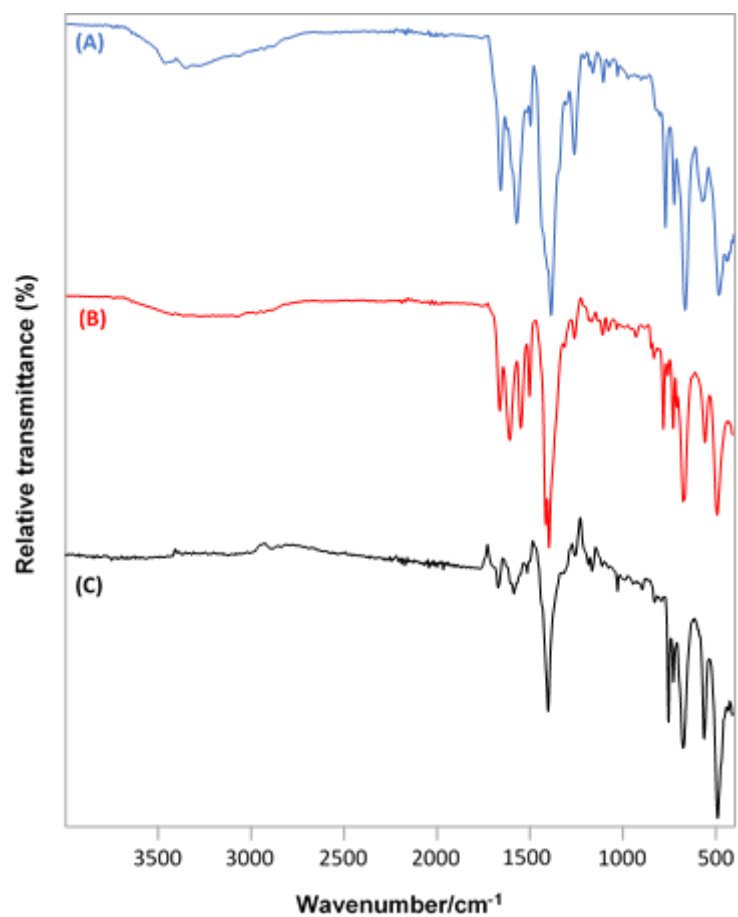


Figure S2. FTIR spectra of the MOF nanoparticles (A) UiO-66-NH₂, (B) UiO-66-NO₂, and (C) UiO-66.

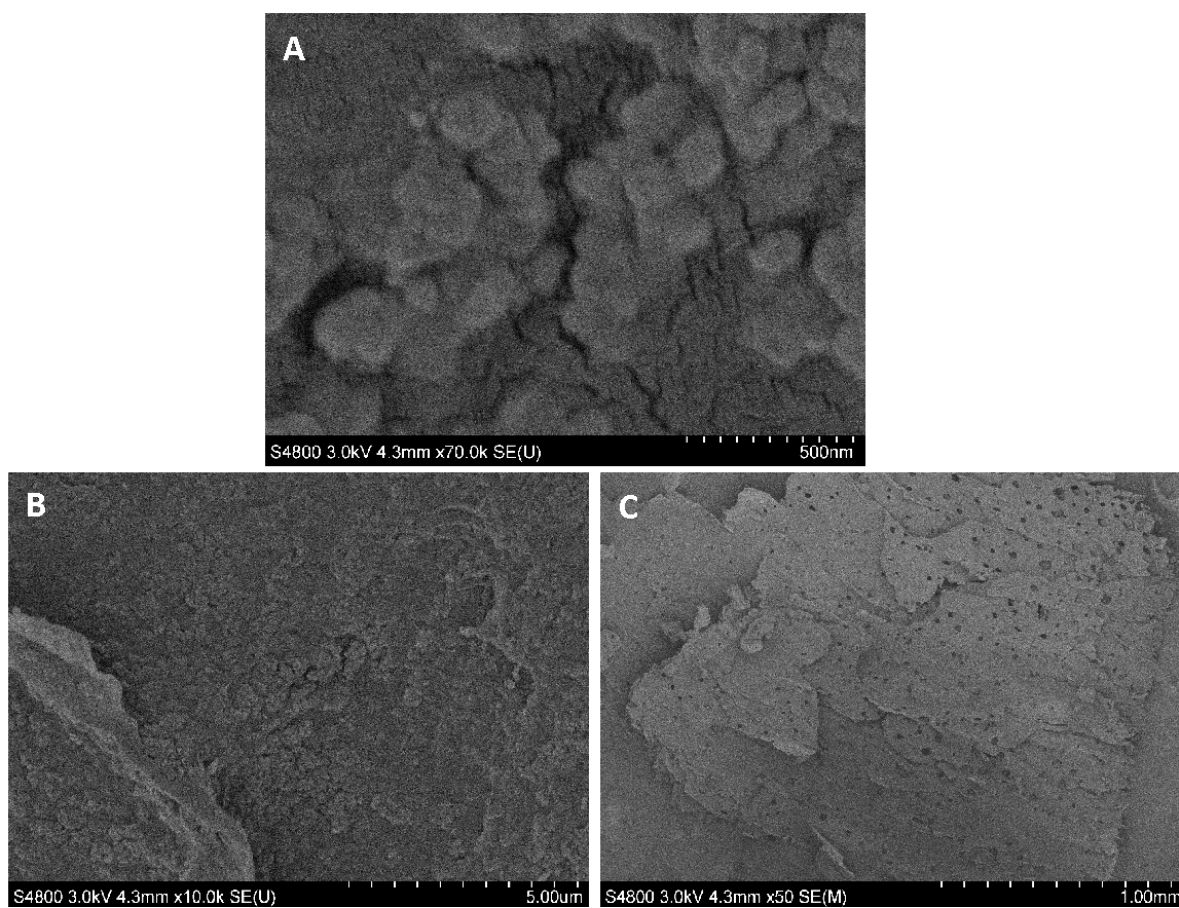


Figure S3. SEM images of chitosan (medium molecular weight)/UiO-66 composites at different magnifications. The UiO-66 nanoparticles (A,B) can be clearly seen. An ice-templated layered structure is also observed (C).

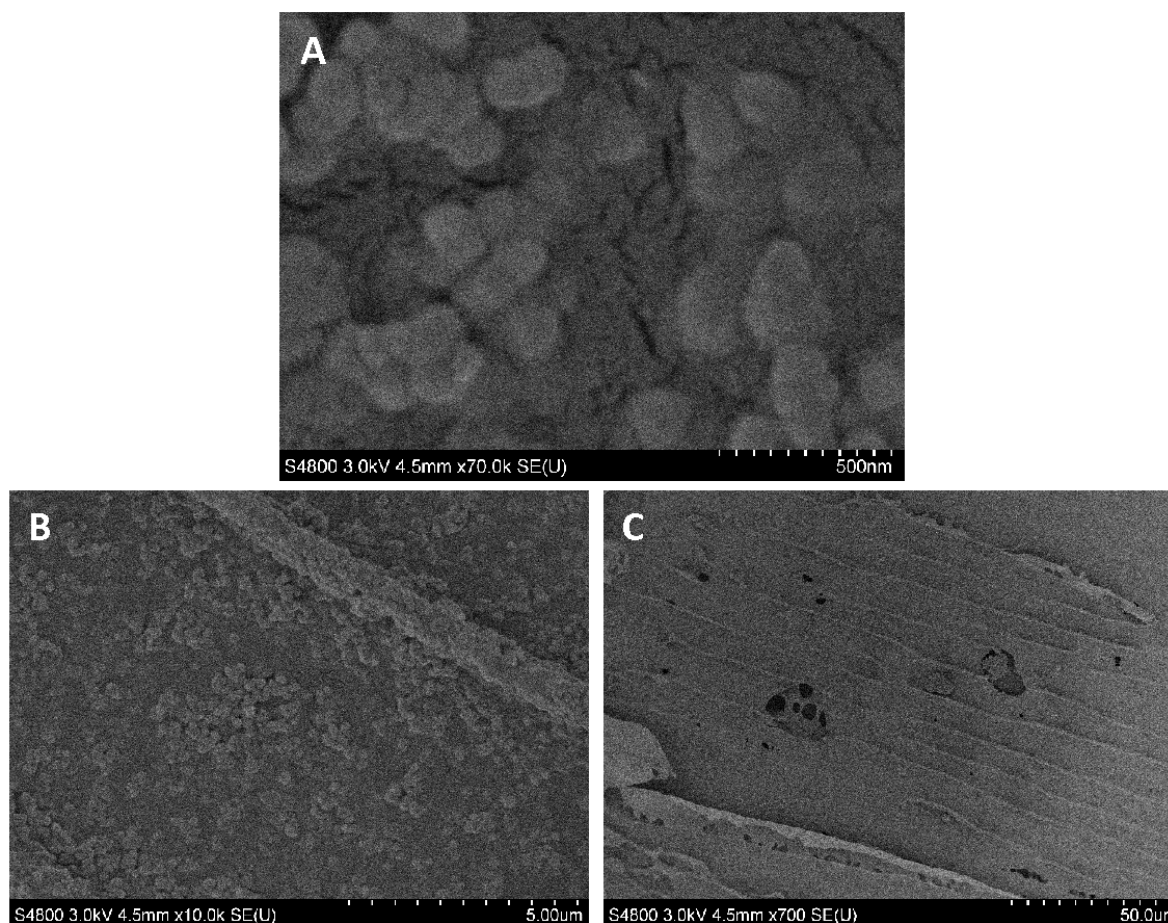


Figure S4. SEM images of chitosan (medium molecular weight)/UiO-66-NH₂ composites at different magnifications. The UiO-66-NH₂ nanoparticles (A,B) and the ice-templated structure (B,C) can be clearly seen.

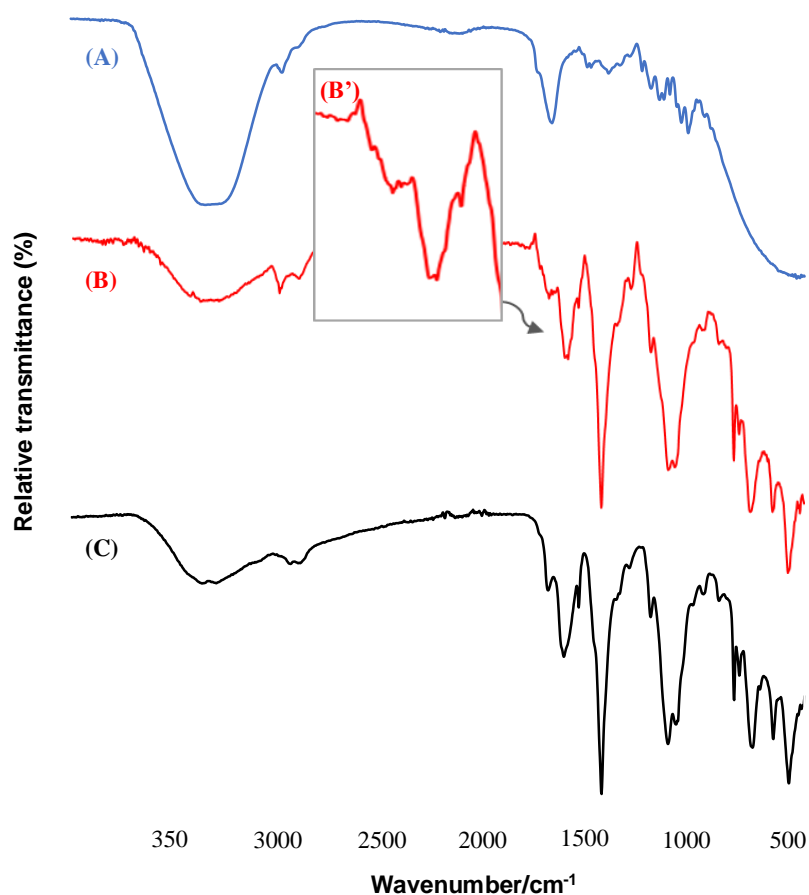


Figure S5. FTIR spectra confirm the crosslinking of chitosan by glutaraldehyde. (A) glutaraldehyde solution, (B) glutaraldehyde-crosslinked CM/UiO-66-1 monolith and (B') zoomed in section of B, (C) un-crosslinked CM/UiO-66-1 monolith.

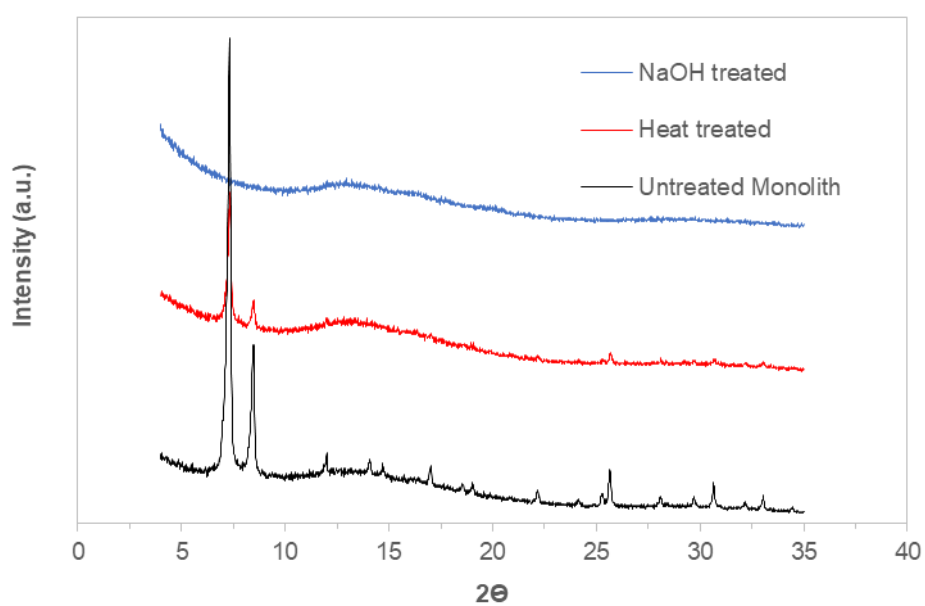


Figure S6. PXRD patterns of the chitosan (medium molecular weight)/UiO-66-NO₂ composite and after heat treatment and NaOH treatment, respectively.

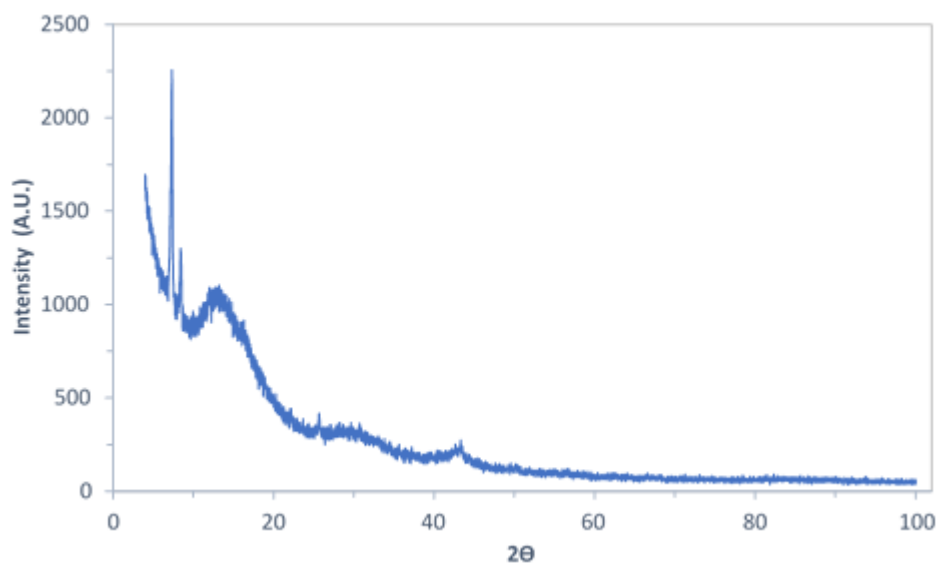


Figure S7. The PXRD patterns of the chitosan (medium molecular weight)/UiO-66-NH₂ composite.

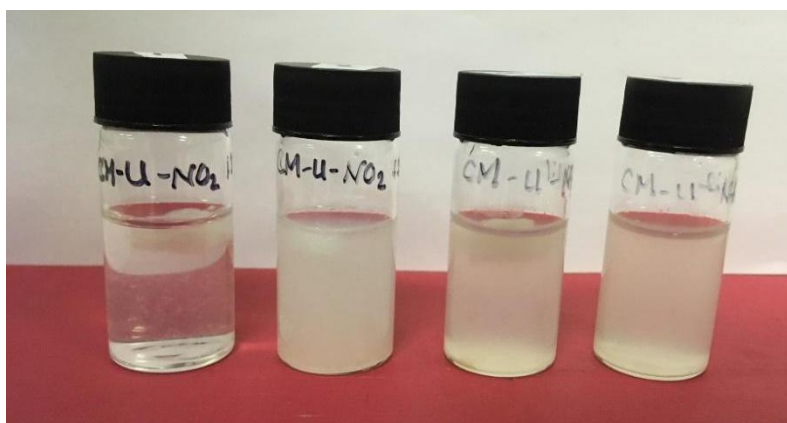


Figure S8. The photo shows the stability of the samples after adsorption testing; immersed in 10 mL of 60 ppm MCP solution for 3 h. From left to right: CM/UiO-66-NO₂-1 (heat treated), untreated CM/UiO-66-NO₂-1, CM/UiO-66-NH₂-1 (heat treated), and untreated CM/UiO-66-NH₂-1. After heat-treatment, the monoliths are still there, floating in the solution, whilst the untreated monoliths are completely disintegrated.



Figure S9. The photo shows the stability of the base-treated composite monoliths with UiO-66-NO₂ or UiO-66-NH₂ after adsorption testing; immersed in 10 mL of 60 ppm MCP solution for 6 h. From left to right: CM/UiO-66-NO₂-2, CM/UiO-66-NO₂-1, CM/UiO-66-NH₂-2, CM/UiO-66-NH₂-1.

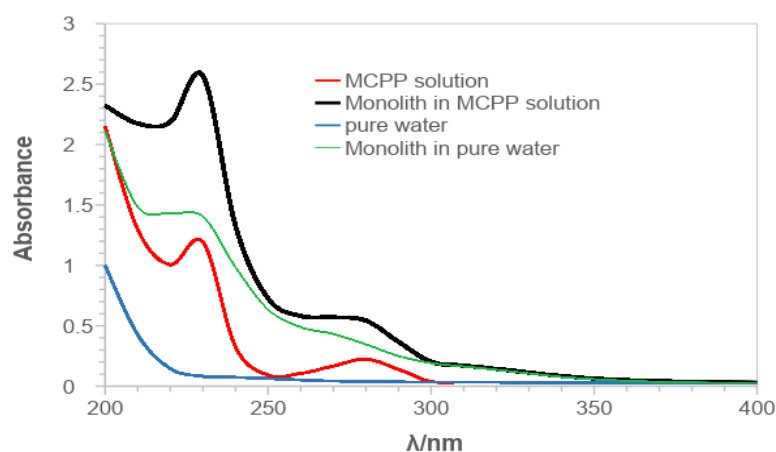


Figure S10. UV absorbance profile after the base-treated CM/UiO-66-NO₂ monolith is immersed for 2 h in MCPP solution and water.

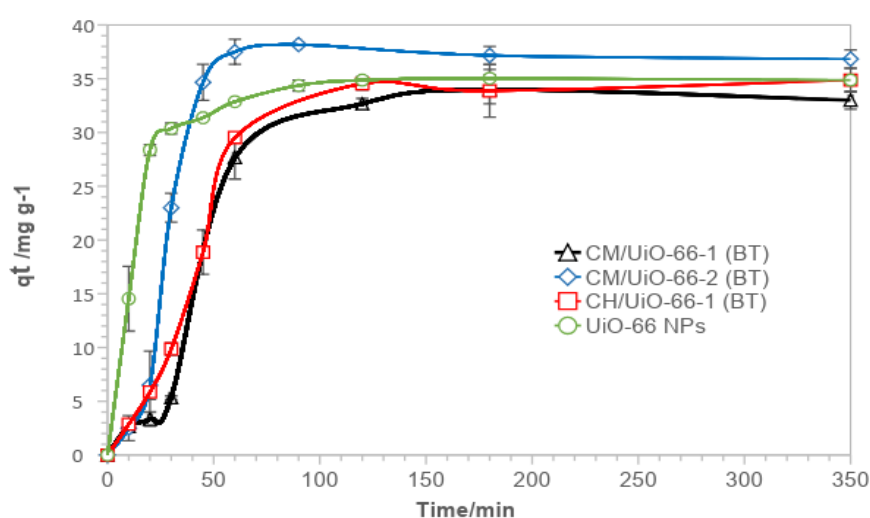


Figure S11. Profiles of the adsorbed quantity of MCPP versus soaking time by immersing the based-treated CM/UiO-66 composites (10 mg) or dispersing UiO-66 nanoparticles in 10 mL of aqueous solution of MCPP (60 ppm).



Figure S12. The photo shows the glutaraldehyde-crosslinked CM/UiO-66-1 monolith can be easily picked up after six hours immersed in MCPP solution.

