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Electronic Supplementary Information

A facile synthesis of Ce-based MOF at room temperature for effective adsorption of methylene blue

Yang Zhou,[a] Dan wang,[a] Qiuxiang Feng,[a] Qi Wu,[a] Feng Cao,[a] Li Jiang,[a] Qianli Zhang,[a] and Jie Liu*[a]

a. *School of Chemistry and Life Sciences, Suzhou University of Science and Technology, Suzhou, Jiangsu 215009, P.R. China.*

General procedures

The crystal structure of the target materials was characterized using the Bruker D8-Advance X-ray diffractometer, under the test conditions of an operating voltage of 40 kV, an operating current of 40 mA, a scanning angle range of 5-40°, and a step size of 0.15°/s. The micro-morphological structure was analyzed with a scanning electron microscope (SEM, S4800) from Japan. The specific surface area and pore size distribution were determined using an ASAP 2020M instrument from Mack Instruments, USA. The thermal stability was assessed using a Pyris 1 TGA thermogravimetric analyzer from Perkin-Elmer, USA. The characteristic functional groups and molecular structures were identified using a Spectrum Two Fourier Infrared Spectrometer from PE, USA, with a test range of 400-4000 cm^{-1}. Thermo Scientific K-Alpha X-ray photoelectron spectrometer from Thermo Fisher Scientific, UK, was utilized to characterize the target materials, and the zeta potential of the samples was measured using a Zeta-sizer Nano-ZS (Malvern, UK). The solution's concentration was determined using a HB-7 UV spectrophotometer from Beijing Haotianhui Instrument Co. Ltd.

Additional figures

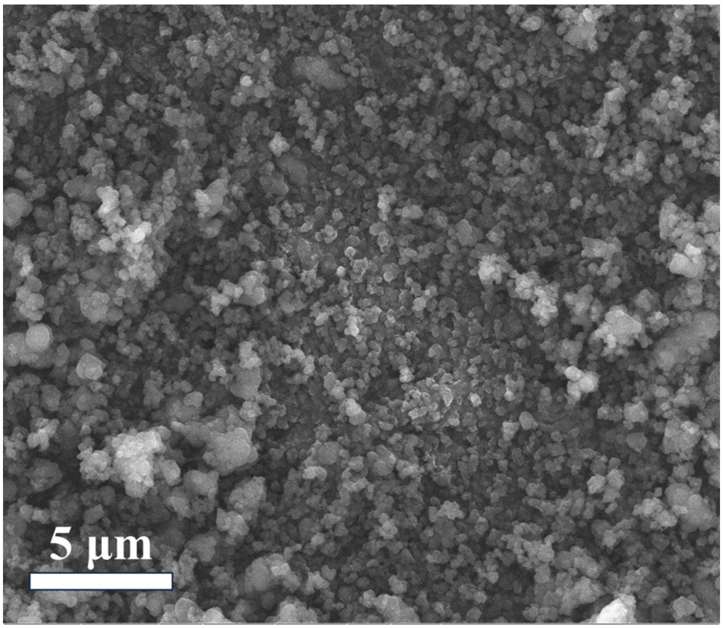


Fig. S1 SEM image of Ce-UiO-66-NH_2.

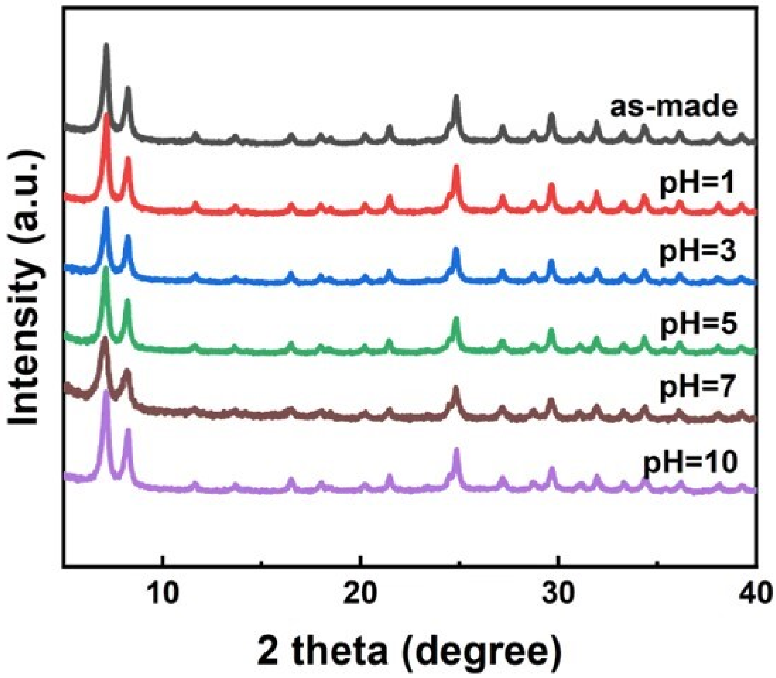


Fig. S2 PXRD patterns of Ce-UiO-66-NH_2 samples recovered from solutions at different pH values.

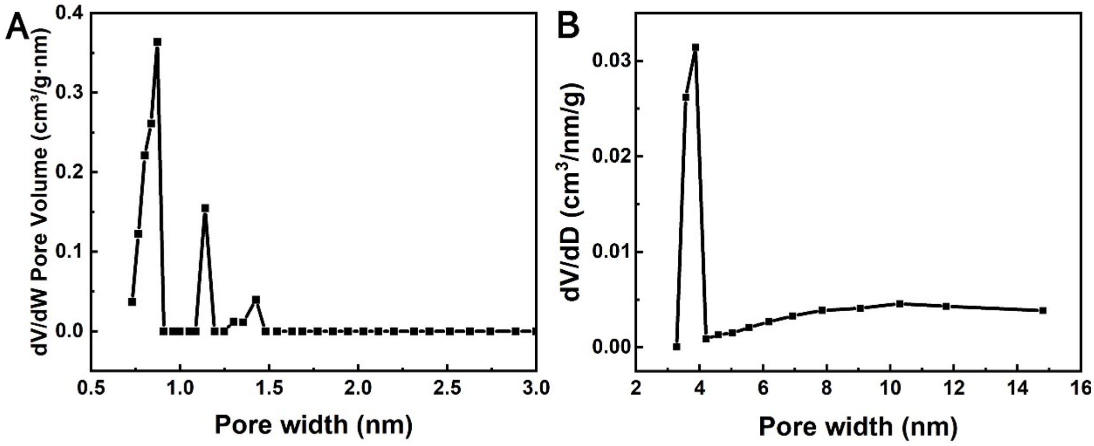


Fig. S3 (A) Density Functional Theory (DFT) pore diameter distributions and (B) Barrett-Joyner-Halenda (BJH) pore size distributions of Ce-UiO-66-NH_2

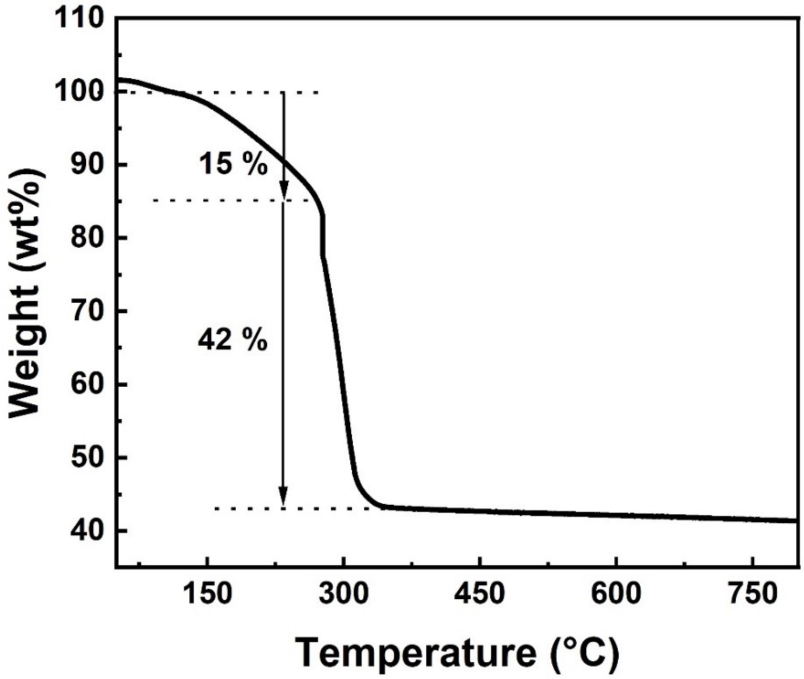


Fig. S4 TGA curve of as-made Ce-UiO-66-NH_2.

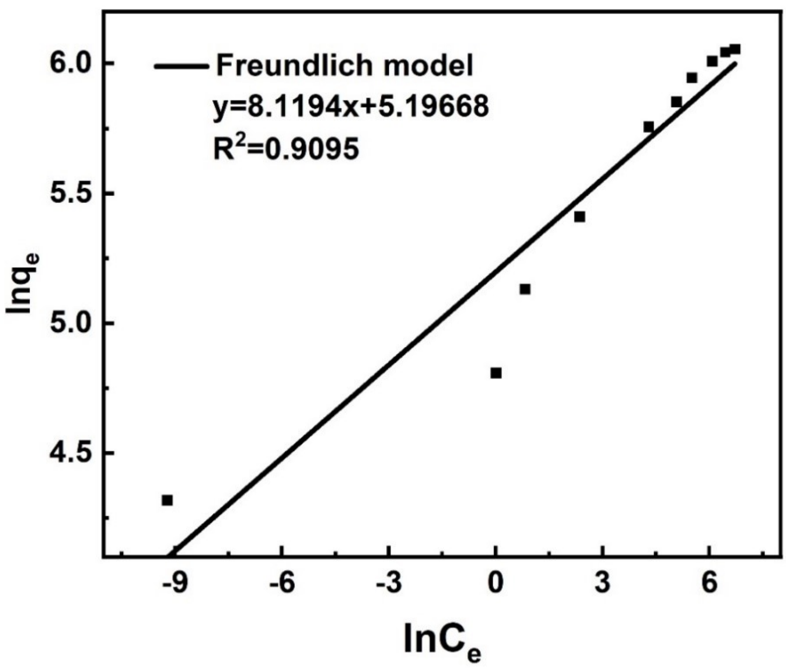


Fig. S5 the corresponding fitting curve of Freundlich model.

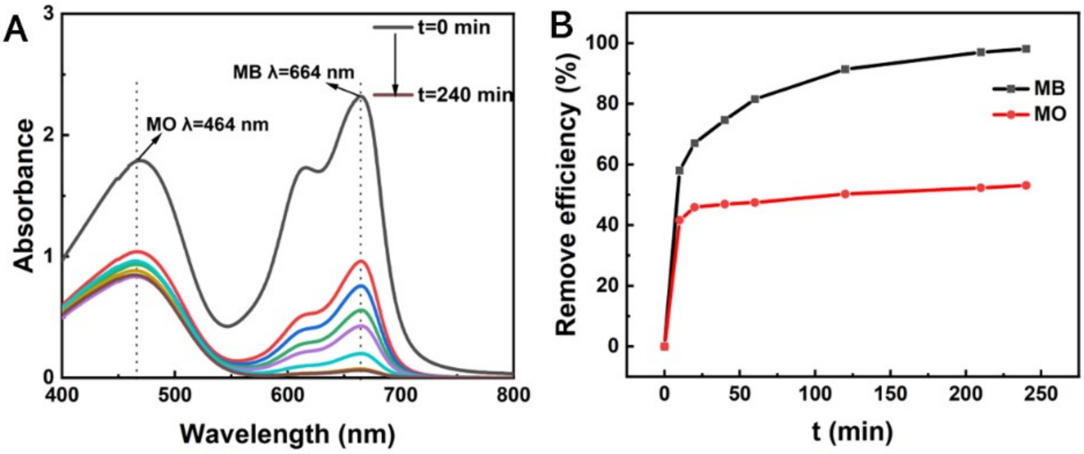


Fig. S6 (A) UV-Vis Spectra of adsorption for MB and MO dyes and (B) the corresponding adsorption plots.

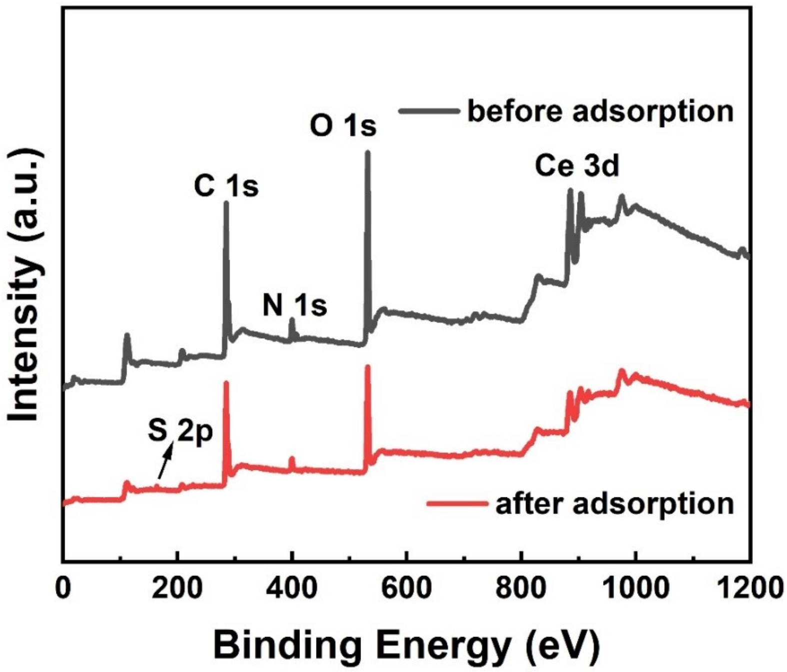


Fig. S7 Full XPS spectra of Ce-UiO-66-NH_2 before and after adsorption for MB.

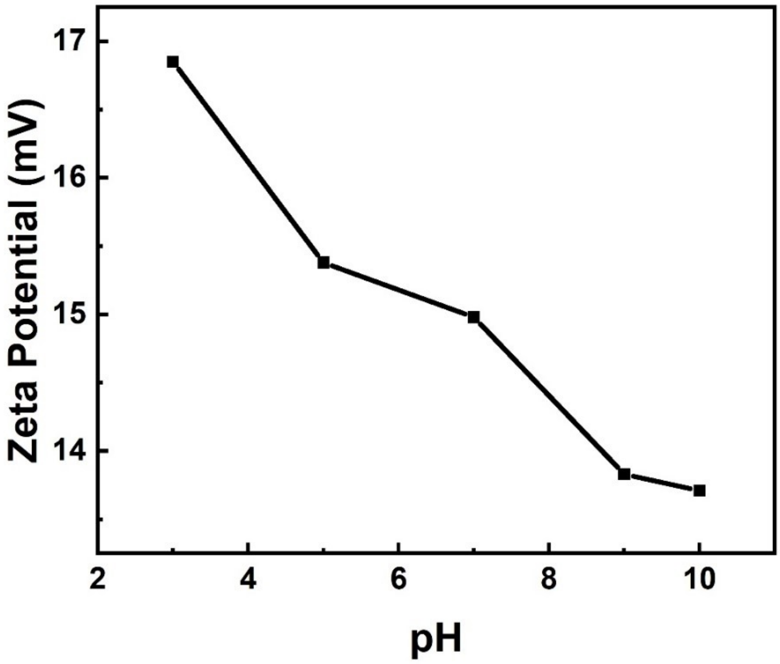
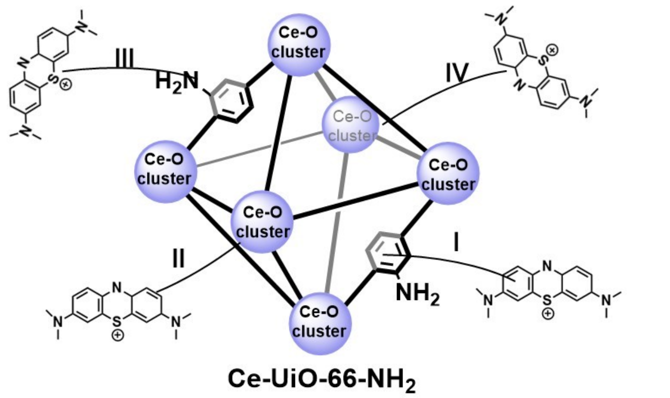


Fig. S8 Zeta potentials of Ce-UiO-66-NH_2 at varied pH values.



I: π-π stacking
II: interactions between the central metal and the organic dyes
III: intermolecular hydrogen bonding
IV: pore filling

Fig. S9 Mechanism of MB adsorption on Ce-UiO-66-NH_2.

Table S1 Comparison on the adsorption capacity of MB by UiO-66(Zr/Ce) based materials.

Adsorbents	Maximum adsorption capacity of MB ($mg \cdot g^{-1}$)	Ref.
Fe_3O_4@UiO-66	205	1
Fe_3O_4@UiO-66-SO_3H	297.3	2
UiO-66-NH_2	96.45	3
Zr-UiO-66@Cu-HKUST-1	208	4
ZIF-8-loaded UiO-66-NH_2	173.01	5
Ce-MOF@Fe_3O_4@AC	84.9	6
Ce(III) doped UiO-66	145.3	7
UiO-66(Ce)	243	8
UiO-66(Ce)	110	9
Ce-UiO-66 electrospun cross-linked polyvinyl alcohol /chitosan nanofibe	34.23	10
Ce-UiO-66-NH_2	427	this work

Table S2 Parameters of thermodynamic study for MB adsorption on Ce-UiO-66-NH_2

T(K)	lnK_c	ΔG ($kJ \cdot mol^{-1}$)	ΔH ($kJ \cdot mol^{-1}$)	ΔS ($J \cdot mol^{-1} \cdot K^{-1}$)
303	3.32746	-8.38242	202.12	764
313	5.30757	-13.8118		
323	8.00199	-21.4487		
333	11.44836	-31.6955		

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