

## Supporting Information

### IL-functionalized Mn(II) -doped core-shell Fe<sub>3</sub>O<sub>4</sub>@ Zr-MOF nanomaterials for removal MB from wastewater based on dual adsorption/Fenton catalysis

Ruowei Lu,<sup>a</sup> Cuijuan Wang,<sup>a</sup> \*Yanxia Chen,<sup>a</sup> Lichuan Tan,<sup>a</sup> Peng Wang,<sup>a</sup> and  
Siwen Feng<sup>a</sup>

<sup>a</sup> Department of Chemistry and Chemical Engineering, School of Life Science and  
Engineering, Southwest Jiaotong University, Chengdu, Sichuan, 610031, PR China

\*Corresponding Author

#### Figures and tables

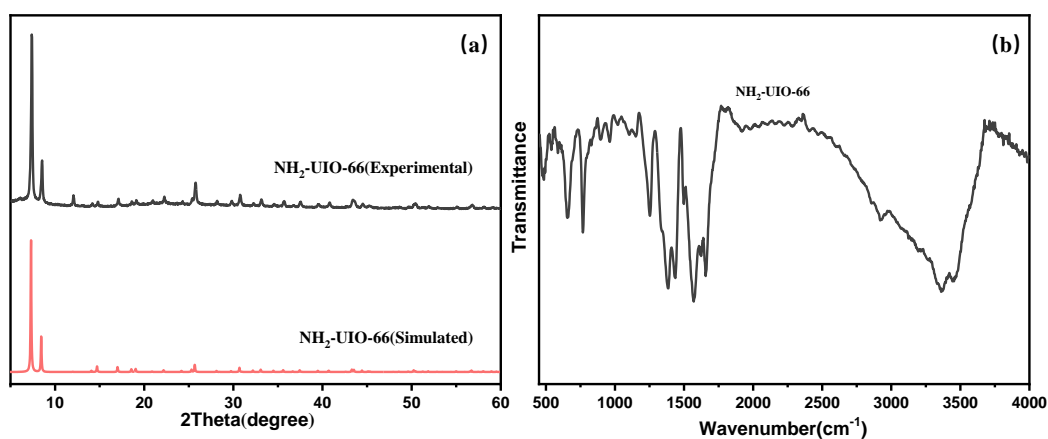


Figure. S1. (a) PXRD patterns and (b) FT-IR spectra of NH<sub>2</sub>-Uio-66.

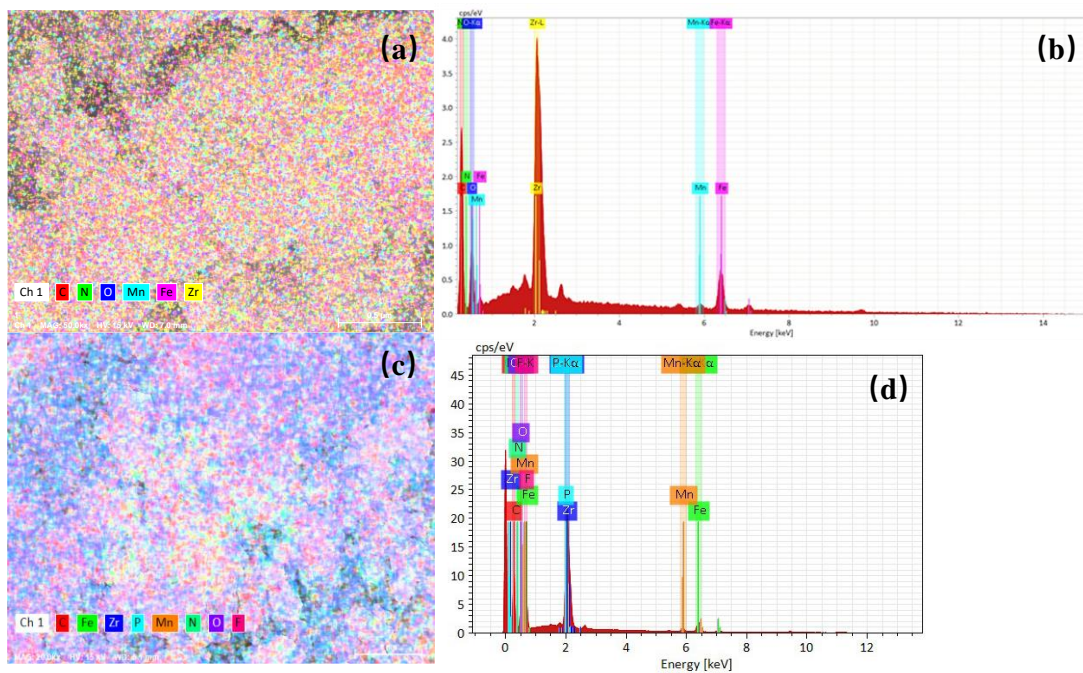


Figure. S2. EDS spectrum of the obtained MFC@Mn-NH<sub>2</sub>-UiO-66 and MFC@Mn-NH<sub>2</sub>-UiO-66@IL magnetic composites.

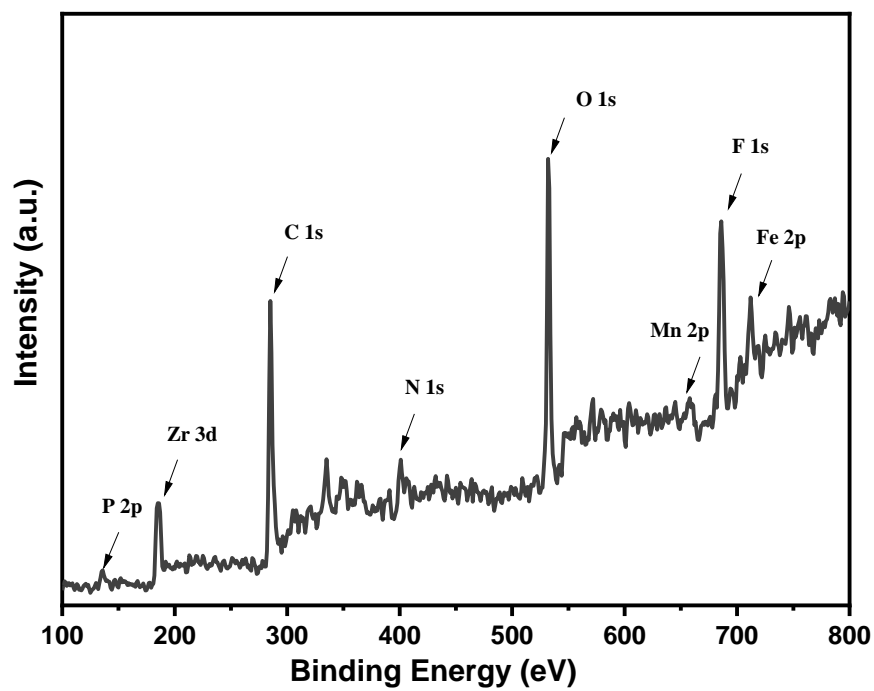


Figure. S3. XPS spectra of MFC@Mn-NH<sub>2</sub>-UiO-66@IL.

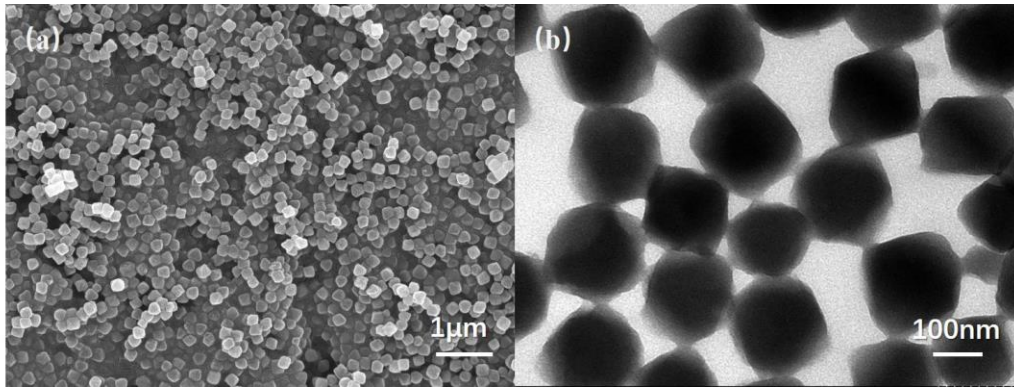


Figure. S4. (a) SEM and (b) TEM images of NH<sub>2</sub>-UiO-66.

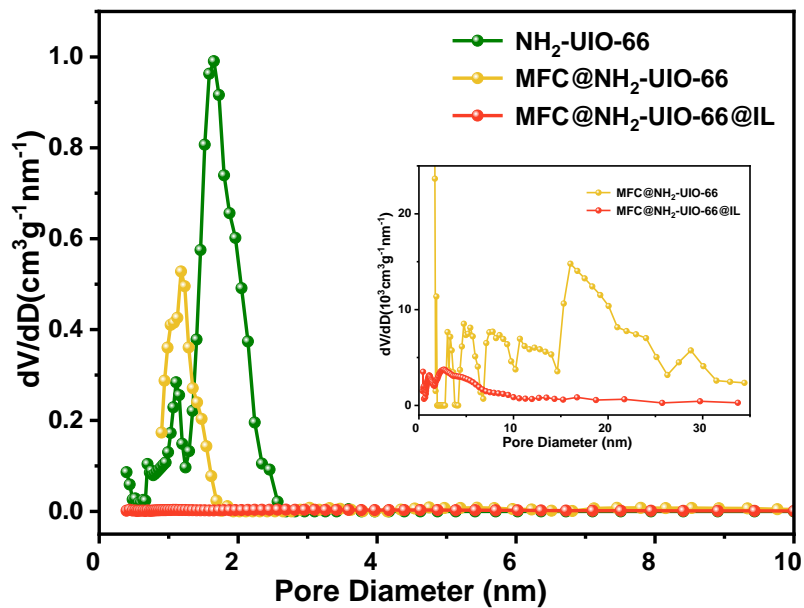


Figure. S5. The pore size distribution of NH<sub>2</sub>-UiO-66, MFC@Mn-NH<sub>2</sub>-UiO-66 and MFC@Mn-NH<sub>2</sub>-UiO-66@IL nanocomposites.

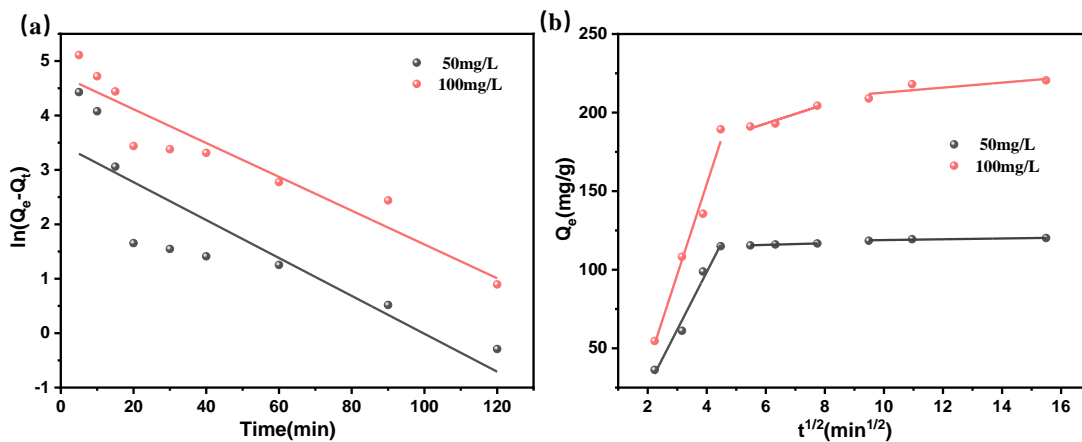


Figure. S6. (a) Kinetics plot of the pseudo first-order, and (b) intra-particle diffusion kinetic model for MB adsorption.

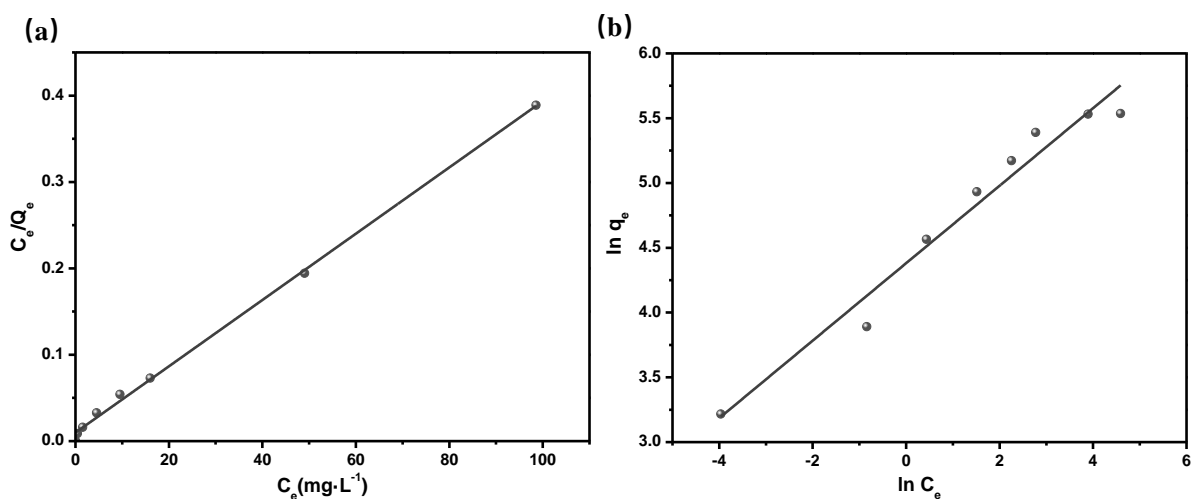


Figure. S7. Adsorption isotherm of (a) Langmuir, and (b) Freundlich model for MB removal by MFC@Mn-NH<sub>2</sub>-UiO-66@IL.

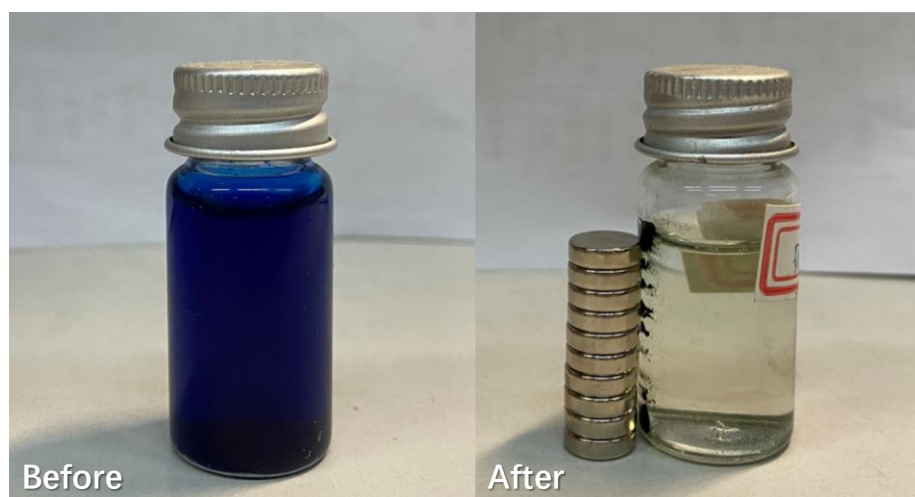


Figure. S8. Before and after comparison of adsorption/catalytic MB.

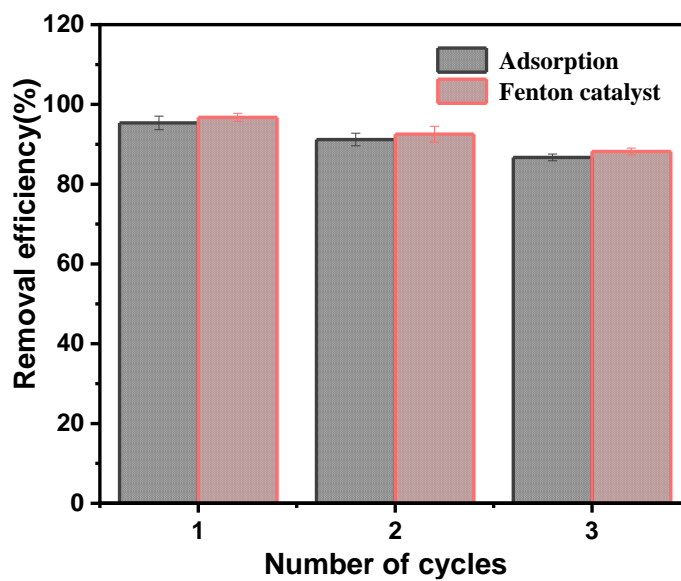


Figure. S9. Recycle efficiency of MFC@Mn-NH<sub>2</sub>-UiO-66@IL over three cycles.

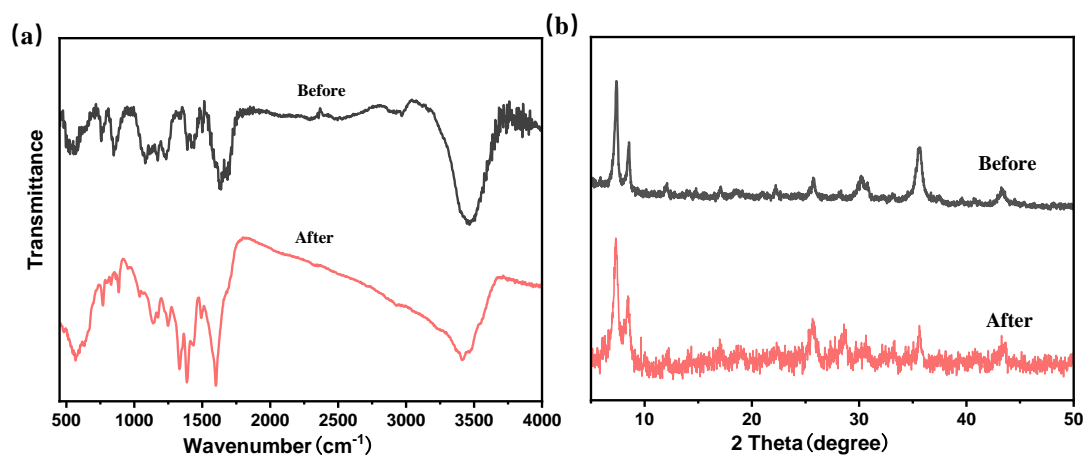


Figure. S10. (a)FT-IR spectra and (b)PXRD patterns MFC@Mn-NH<sub>2</sub>-UiO-66@IL composite before and after adsorption of MB.

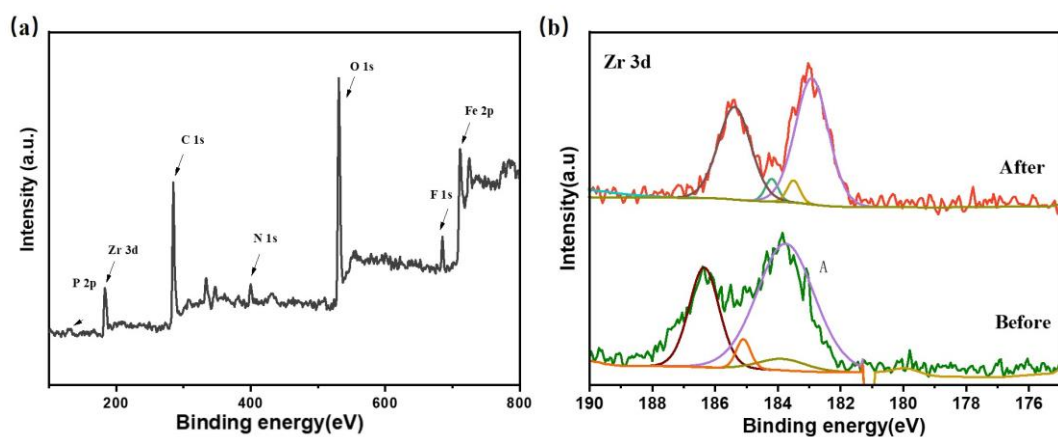


Figure. S11. XPS spectra of the recycled MFC@Mn-NH<sub>2</sub>-UiO-66@IL: (a) The survey spectrum; (b) XPS Zr 3d spectrum.

Table. S1. Element components of MFC@Mn-NH<sub>2</sub>-UiO-66, and MFC@Mn-NH<sub>2</sub>-UiO-66@IL.

Samples	C (wt%)	Zr (wt%)	O (wt%)	F (wt%)	Fe (wt%)	N (wt%)	P (wt%)	Mn (wt%)
MFC@Mn-NH <sub>2</sub> -UiO-66	41.51	24.46	15.95	-	11.4	4.07	-	1.05
IL@MFC@Mn-NH <sub>2</sub> -UiO-66	31.21	23.28	21.62	7.68	6.41	7.44	1.53	0.66

Table. S2. BET surface areas and t-plot micropore volumes of samples.

Samples	$S_{\text{BET}}(\text{m}^2 \cdot \text{g}^{-1})$	$V_{\text{pore}}(\text{cm}^3 \cdot \text{g}^{-1})$
NH <sub>2</sub> -UiO-66	1264.30	0.54
MFC@Mn-NH <sub>2</sub> -UiO-66	699.25	0.46
MFC@Mn-NH <sub>2</sub> -UiO-66@IL	30.31	0.06

Table. S3. Intra-particle diffusion model parameters for the adsorption of MB dye onto MFC@Mn-NH<sub>2</sub>-UiO-66@IL composite

$C_0(\text{mg} \cdot \text{L}^{-1})$	First step			Second step			Third step		
	$K_{\text{id},1}$ ( $\text{mg g}^{-1} \cdot \text{min}^{-0.5}$ )	$C_1$ ( $\text{mg} \cdot \text{L}^{-1}$ )	$R^2$	$K_{\text{id},2}$ ( $\text{mg g}^{-1} \cdot \text{min}^{-0.5}$ )	$C_2$ ( $\text{mg} \cdot \text{L}^{-1}$ )	$R^2$	$K_{\text{id},2}$ ( $\text{mg g}^{-1} \cdot \text{min}^{-0.5}$ )	$C_3$ ( $\text{mg} \cdot \text{L}^{-1}$ )	$R^2$
50 $\text{mg} \cdot \text{L}^{-1}$	57.69	-76.25	0.98	6.09	196.86	0.67	1.58	156.48	0.94
100 $\text{mg} \cdot \text{L}^{-1}$	36.72	-48.33	0.98	0.51	116.35	0.88	0.25	112.72	0.98

Table. S4.  $R_L$  values for the adsorption of MB dye.

$C_0(\text{mg} \cdot \text{L}^{-1})$	10	20	40	60	80	100	150	200
$R_L$	0.20	0.11	0.06	0.04	0.03	0.025	0.016	0.012