Supporting Information For

Magnetic polydopamine decorated with Mg-Al-LDH nanoflakes as a novel bio-based adsorbent for simultaneous removal of heavy metals and anionic dyes

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Table S1 Theoretical and calculated C_s values, pseudo-second-order rate constants, k_2, and correlation coefficient values (R^2)

		Theoretical C_s(mg/g)	Calculated C_S (mg/g)	k_2(mg/(mg min))
Cu(II)	LDH, $C_{Cu(II)}$=20 mg/L	19.1	20.5	1.5
	MPL_3, $C_{Cu(II)}$=4 mg/L	22.5	25.8	2.3
	MPL_3, $C_{Cu(II)}$=10 mg/L	47.9	28.2	1.2
	MP, $C_{Cu(II)}$=20 mg/L	54.1	59.5	1.6
	MPL_3,$C_{Cu(II)}$=20 mg/L	67.7	67.1	7.6
	MPL_3, MO	200.1	198.4	0.1
	MPL_3, CR	170.6	165.4	0.1

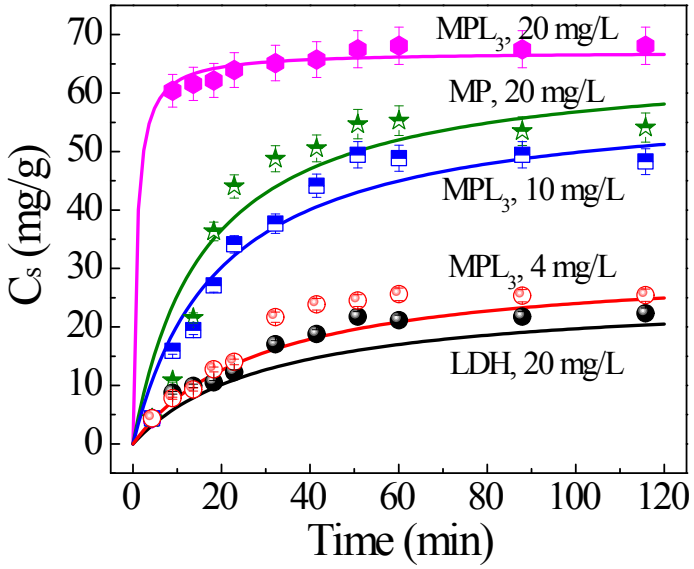


Fig. S1 Time profile of Cu(II) removal by the LDH, MP and MPL_3 assembly at pH = 5.6 ± 0.1, *I*

= 0.01M $NaNO_3$, m/V = 0.1 g/L.

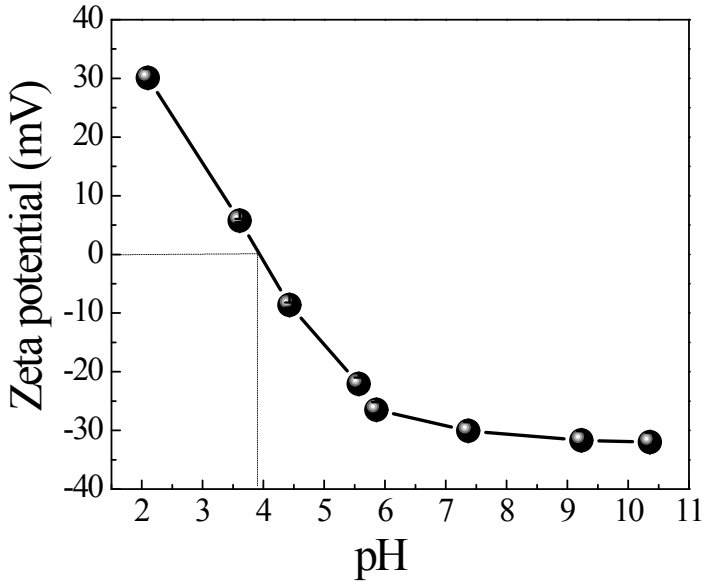


Fig. S2 Zeta potentials of the MPL_3 assembly as a function of solution pH.

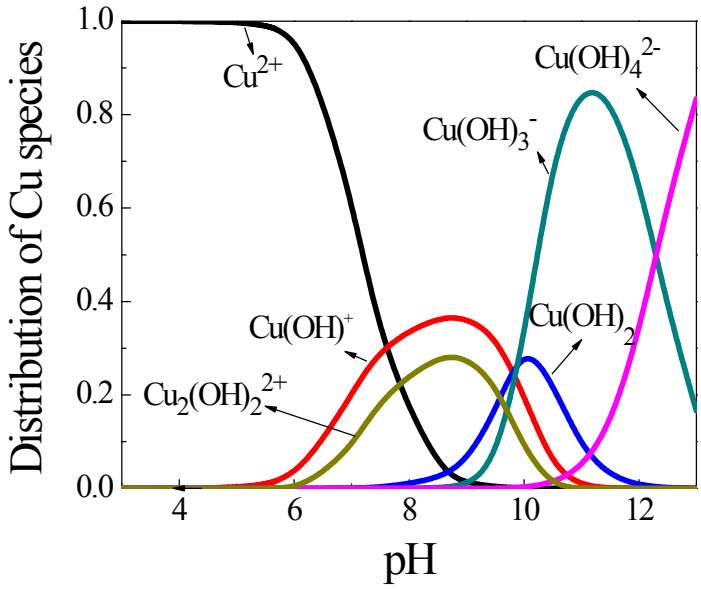


Fig. S3 Distribution of Cu(II) species as a function of pH based on the equilibrium constants.

Table S2 Physicochemical characteristics of the studied dyes

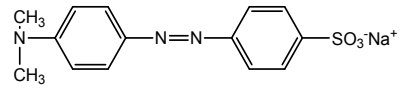
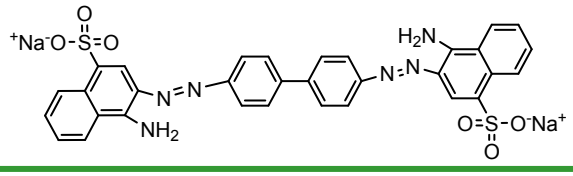
Dyes	Molecular structure	Dimensions (nm)	Molecular weight	λ_{max} (nm)
MO		1.31×0.55×0.18	327	465
CR		2.62×0.74×0.43	697	695

Table S3 Parameters for Langmuir and Freundlich isotherm models

	Langmuir model			Freundlich model		
	$C_{s\ max}$ (mg/g)	b (L/mg)	R^2	K_F ($mg^{1-n}L^n/g$)	n	R^2
MPL_3, Cu(II)	75.013	2.523	0.923	44.607	0.208	0.984
MPL_3, Cd(II)	65.812	0.158	0.969	16.437	0.476	0.985
MPL_3, Pb(II)	55.517	0.277	0.979	15.024	0.394	0.993
MPL_3, MO	624.893	0.025	0.897	344.843	0.544	0.995
MPL_3, CR	584.563	0.024	0.925	276.662	0.157	0.988
LDH, Cu(II)	23.909	0.470	0.964	8.563	0.379	0.973
LDH, Cd(II)	21.489	0.425	0.973	7.201	0.404	0.989
LDH, Pb(II)	19.745	0.136	0.956	3.079	0.568	0.961

Table S4 Summary of Cu(II), MO and CR adsorption isotherm constants and characteristics for the binary-solute Freundlich isotherm

Dye concentration (mg/L)		0	30	90	150
		Cu(II)+MO			
Cu(II)	K_F ($mg^{1-n}L^n/g$)	44.607	45.727	50.136	55.425
	n	0.208	0.491	0.613	0.392
	R^2	0.984	0.978	0.981	0.987
		Cu(II)+CR			
Cu(II)	K_F ($mg^{1-n}L^n/g$)	44.607	48.835	55.321	64.083
	n	0.208	0.316	0.505	0.418
	R^2	0.984	0.976	0.982	0.975

Table S5 Summary of competition coefficients for the binary systems

a_{ij}		Dye concentration (mg/L)			
		0	30	90	150
i+j Cu(II)+MO	5	0	3.21	3.56	3.98
	10	0	2.34	2.76	3.01
	15	0	1.32	1.68	1.73

a_{ij}		Dye concentration (mg/L)			
		0	30	90	150
i+j Cu(II)+CR	5	0	3.54	3.87	4.06
	10	0	1.23	1.34	3.15
	15	0	0.45	0.67	1.98

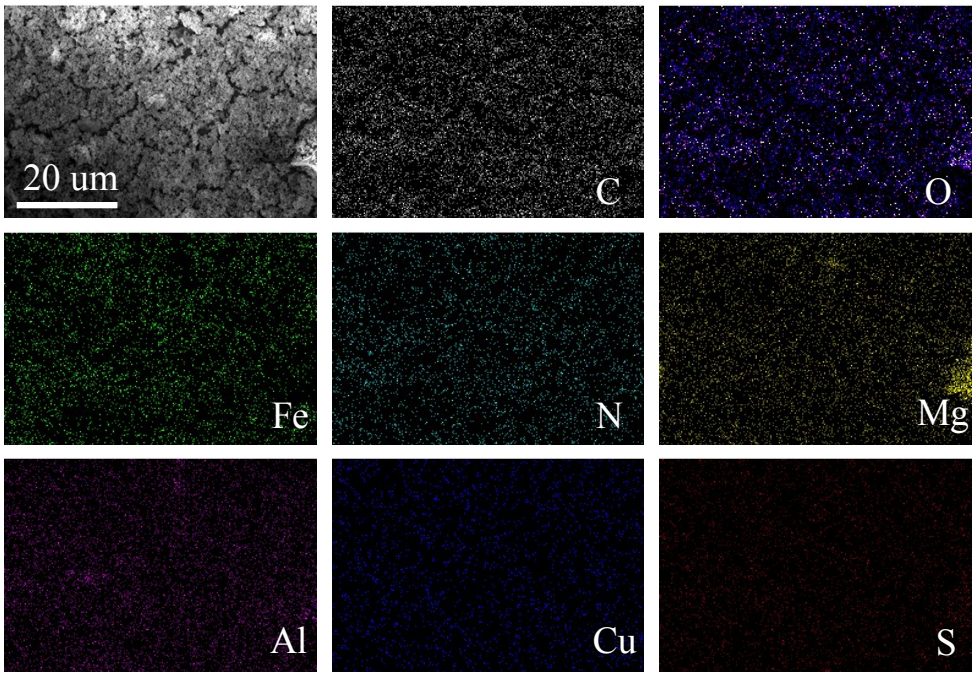


Fig. S4 SEM image and the elemental distribution mapping of MPL_3 assembly after simultaneous

removal of Cu(II) and MO (initial concentration: 10 mg/L Cu(II) and 100 mg/L MO).

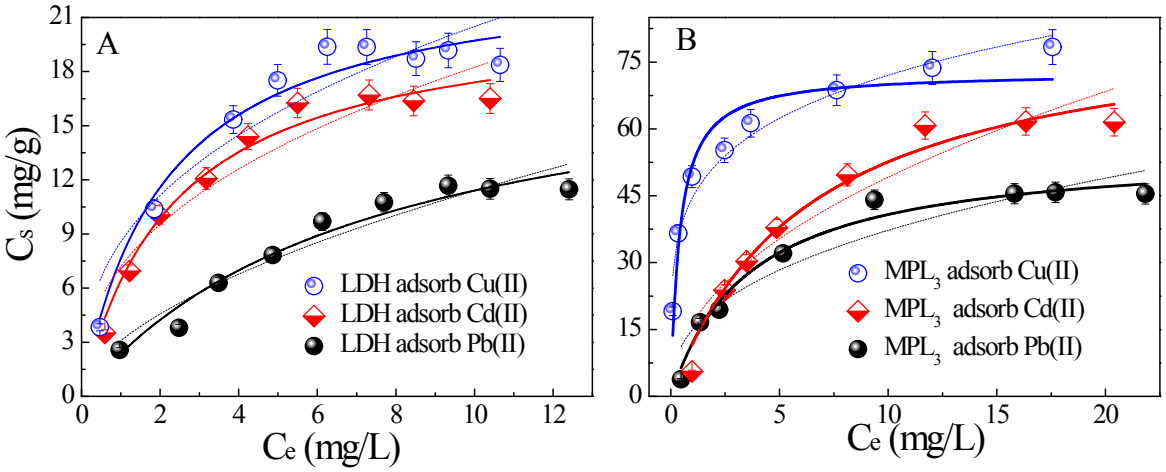


Fig. S5 Removal isotherm of different metal ions onto LDH (A) and MPL_3 assembly (B) simulated by the Langmuir model (solid line) and Freundlich model (dash line). pH = 5.6 ± 0.1, *I* = 0.01M $NaNO_3$, m/V = 0.1 g/L.

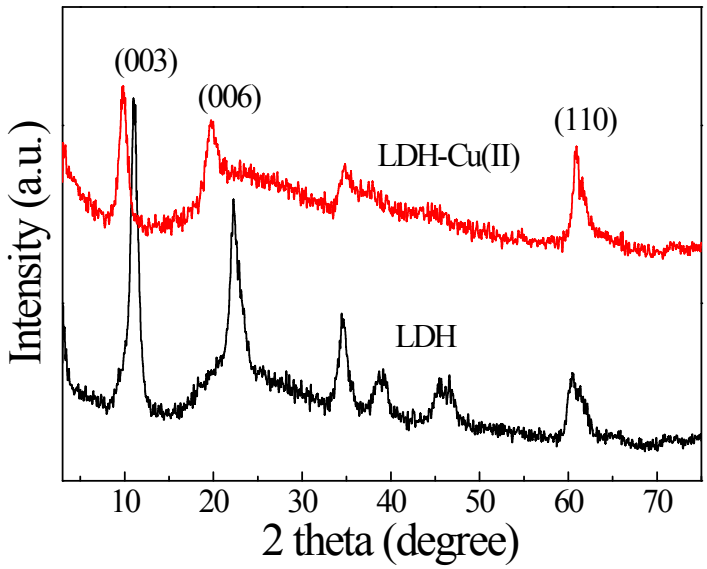


Fig. S6 XRD patterns of LDH before and after the removal of Cu(II).

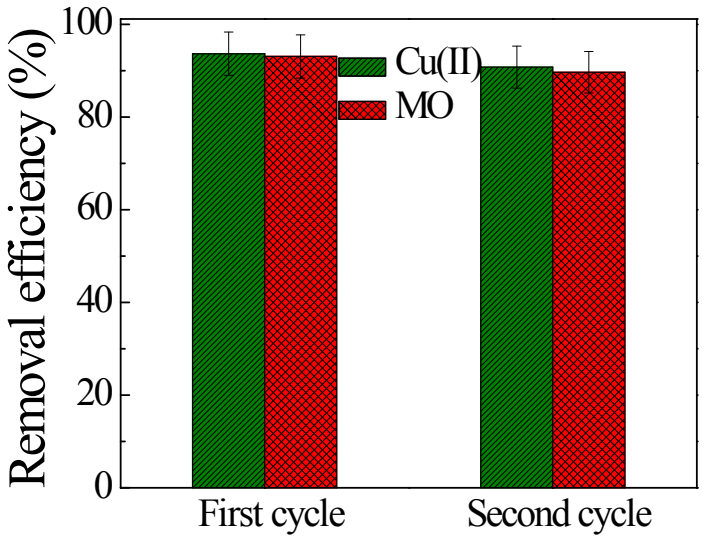


Fig. S7 Evaluating the removal efficiency and reusability of MPL_3 assembly in model textile effluent.