Supporting Information

Eu-MOF/EDTA-NiAl-CLDH fluorescent micromotors for sensing and removal of Fe^{3+} from water

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This file includes Videos S1-S3, Fig.S1 and Tables S1-S2.

Video S1. Motion of Eu-MOF/EDTA-NiAl-CLDH-M in 5 wt.% H_2O_2 and 0.5 wt.% SDS.

Video S2. Motion of Eu-MOF/EDTA-NiAl-CLDH-M in 3 wt.% H_2O_2 and 0.5 wt.% SDS.

Video S3. Motion of Eu-MOF/EDTA-NiAl-CLDH-M in 1 wt.% H_2O_2 and 0.5 wt.% SDS.

Fig. S1 XRD patterns of AlOOH and NiAl-LDH.

Table S1. The BET surface area and pore structure parameters.

Table S2. Parameters of kinetic models.

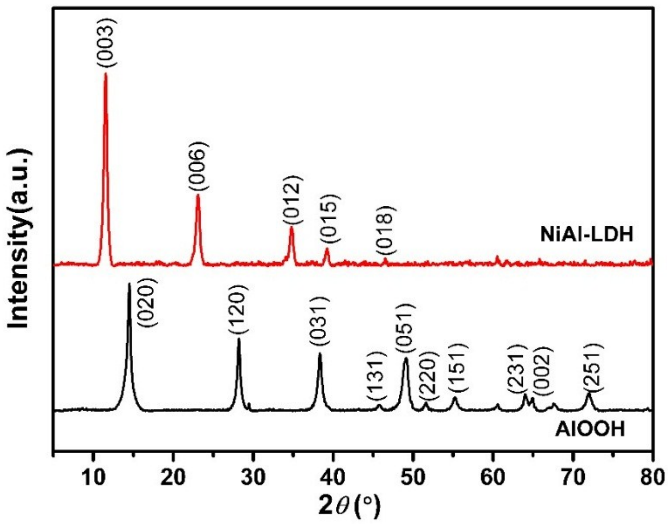

Fig. S1. XRD patterns of AlOOH and NiAl-LDH.

Table S1. The BET surface area and pore structure parameters of the as-synthesized samples.[a]

Sample	S_{BET} ($m^2 \cdot g^{-1}$)	V_{Total} ($cm^3 \cdot g^{-1}$)	D_p (nm)
Eu-MOF/EDTA-NiAl-CLDH-M	131.33	0.29	8.97
EDTA-NiAl-CLDH/MnO_2	64.15	0.14	12.12

[a] S_{BET}: BET specific surface area; V_{Total}: total pore volume; Dp: average pore diameter.

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Kinetic models and adsorption isotherms

The pseudo-first-order kinetic model was given as Eq. S1:[1]

$$\ln\left(q_e - q_t\right) = lnq_e - K_1 t \qquad (1)$$

where q_e and q_t (mg·g^{-1}) are the Fe^{3+} adsorbed amounts at equilibrium and at any time t (h), respectively, and K_1 (h^{-1}) is the adsorption rate constant of pseudo-first-order equation. The pseudo-second-order was expressed by the following equation Eq. S2:[1]

$$\frac{t}{q_t} = \frac{1}{K_2 {q_e}^2} + \frac{1}{q_e}t \qquad (2)$$

where q_e is the amount of Fe^{3+} adsorbed at equilibrium, and K_2 is the rate constant of the pseudo-second-order model. The K_2, q_e and correlation coefficient R^2 are determined by plotting t/q_t against t.

The Langmuir isotherm equation was given by Eq. S3:[2]

$$\frac{C_e}{q_e} = \frac{1}{q_{max}K_L} + \frac{C_e}{q_{max}} \qquad (3)$$

where C_e (mg/L) is the equilibrium concentration of Fe^{3+}, and q_e (mg·g^{-1}) is the equilibrium adsorption capacity, q_{max} (mg·g^{-1}) refers to maximum adsorption capacity. K_L represents the Langmuir constant. A straight line with a slope of $1/q_{max}$ and an intercept of $1/q_{max}K_L$ can be obtained when C_e/q_e is plotted against C_e. The Freundlich isotherm is derived by assuming a heterogeneous surface with a non-uniform distribution of heat of sorption over the surface. The well-known logarithmic form of the Freundlich model was given by Eq. S4:[2]

$$lnq_e = lnK_F + \frac{1}{n}lnC_e \qquad (4)$$

where K_F and n are Freundlich constants related to adsorption capacity and adsorption intensity, respectively. The plot of ln q_e versus ln C_e gives a straight line with a slope of $1/n$ and an intercept of ln K_F. The constants of n and K_F are determined by plotting ln q_e versus ln C_e.

Table S2 Parameters of kinetic models.

Kinetic model	Parameter	Eu-MOF/EDTA-NiAl-CLDH-M	Eu-MOF/EDTA-NiAl-CLDH-N	Eu-MOF/NiAl-CLDH-M	Eu-MOF/NiAl-CLDH-N
Pseudo-first-order	q_e (mg·g^{-1}) exp.	78.73	55.25	22.30	14.26
	q_e (mg·g^{-1}) model	55.40	38.21	9.54	5.74
	K_1 (h^{-1})	0.5574	0.5728	0.5483	0.3874
	R^2	0.9550	0.9492	0.9610	0.9572

	q_e (mg·g^{-1}) model	81.24	56.72	23.01	14.51
Pseudo-second-order	K_2 (mg·g^{-1}·h^{-1})	0.0310	0.0491	0.0019	0.0047
	R^2	0.9959	0.9959	0.9998	0.9974
	K_L (L·mg^{-1})	0.1158	0.0957	0.0534	0.0281
Langmuir	q_{max} (mg·g^{-1})	111.98	95.60	55.56	41.67
	R^2	0.9948	0.9924	0.9582	0.9666
	K_F (L·mg^{-1})	23.4995	19.3988	8.1481	4.8790
Freundlich	n	2.56	2.63	2.48	2.48
	R^2	0.9051	0.9481	0.7957	0.9241

References

1 F. Ji, J. Li, X.L. Cui, J.Liu, X.M. Bing, Appl. Clay Sci., 2018, **162**, 182-191.

2 J. Li, N. Zhang, D.H.L. Ng, J. Mater. Chem. A, 2015, **3**, 21106-21115.