Electronic Supplementary Material (ESI) for Journal of Materials Chemistry A.

Supporting Information

Remove Total Chromium in Wastewater via Simultaneous Photocatalysis and Adsorption by Using Calcium Silicate Hydrates-Based Composite

Min Liu, [a, #] Qi Liu, [b, #] Xue-Ting Jin, [a] Ya-Chen Zou, Di-Ning Li, [a] Pan Feng, [b, *] and Yang-Hui Luo [a,*]

[a] *School of Chemistry and Chemical Engineering, Southeast University, Nanjing, 211189, P.R. China*

[b] *Jiangsu Key Laboratory of Construction Materials, School of Materials Science and Engineering, Southeast University, Nanjing 211189, China*

*E-mail: pan.feng@seu.edu.cn (P. Feng); luoyh2016@seu.edu.cn (Y.-H. Luo)

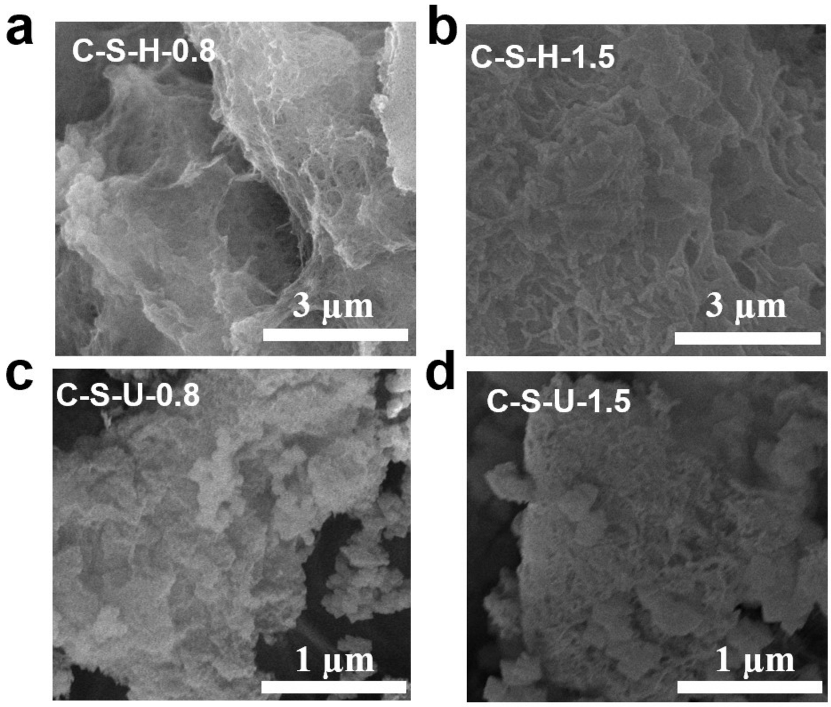

Fig. S1 SEM images of (a) C-S-H-0.8, (b) C-S-H-1.5, (c) C-S-U-0.8 and (d) C-S-U-1.5.

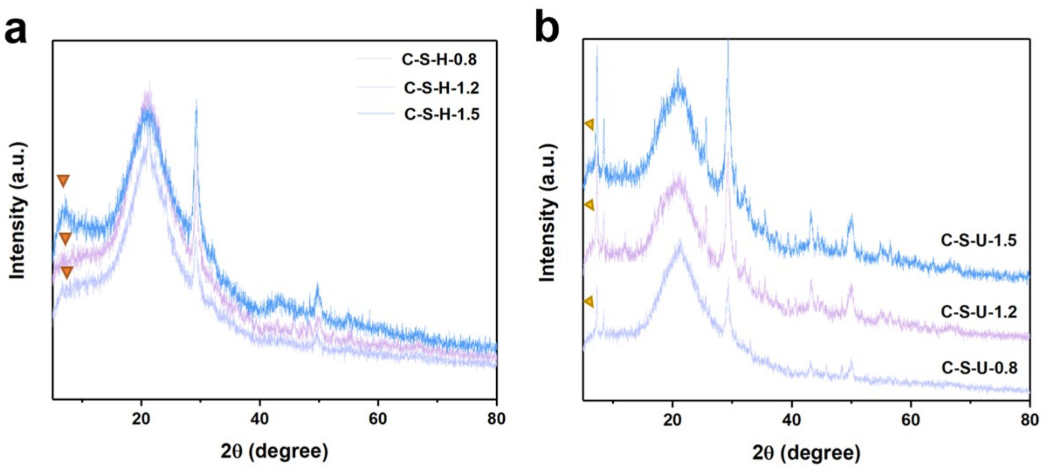

Fig. S2 XRD patterns of (a) C-S-H and (b) C-S-U with different Ca/Si.

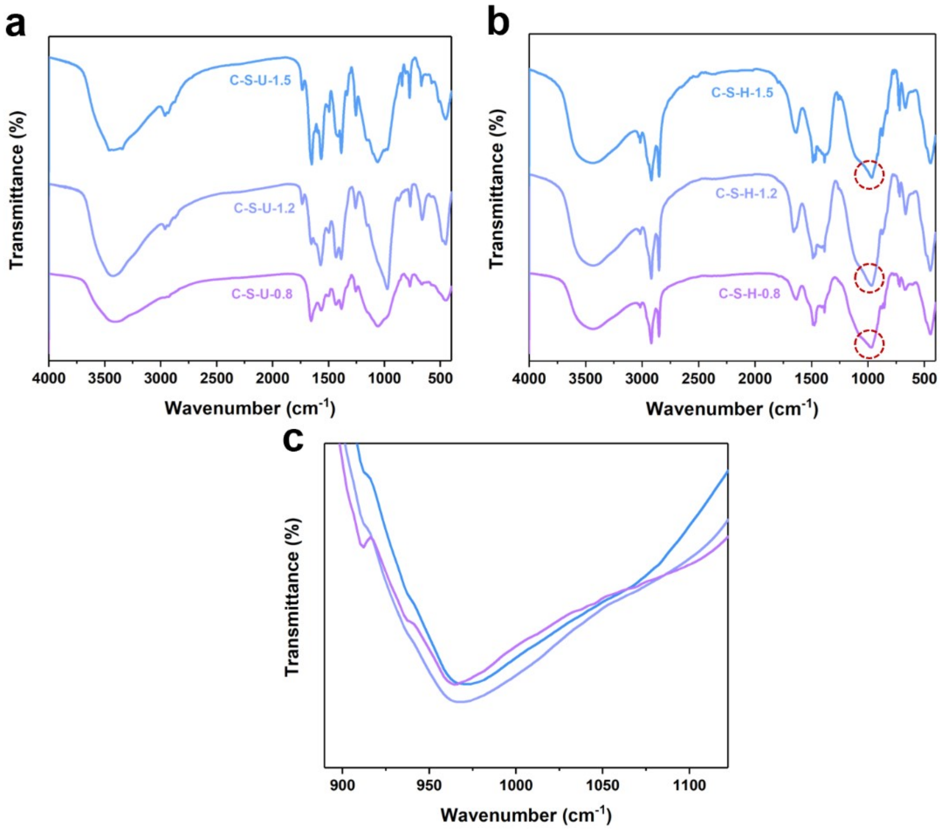

Fig. S3 FTIR spectra of (a) C-S-H and (b) C-S-U with different Ca/Si. The partial magnification of FTIR spectra for C-S-H at 960 cm^{-1}.

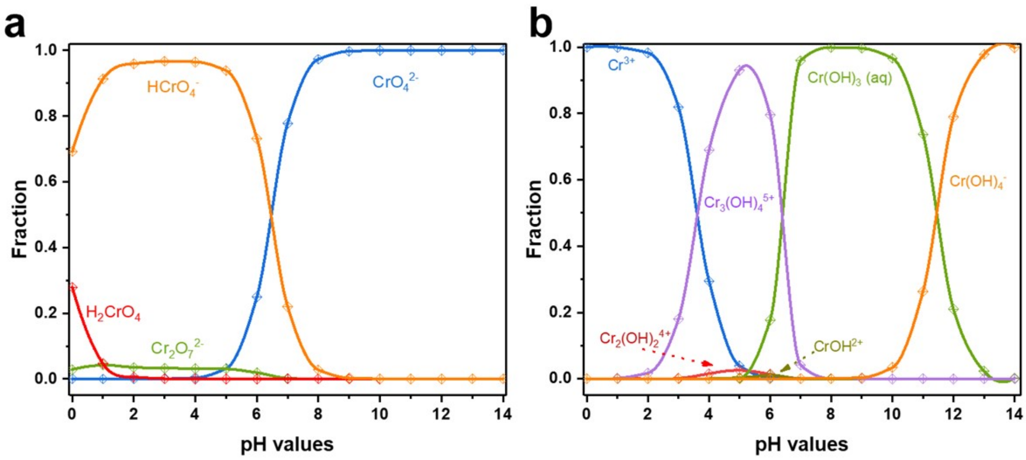

Fig. S4 Species distribution of (a) Cr(VI) and (b) Cr(III) under different pH solutions.

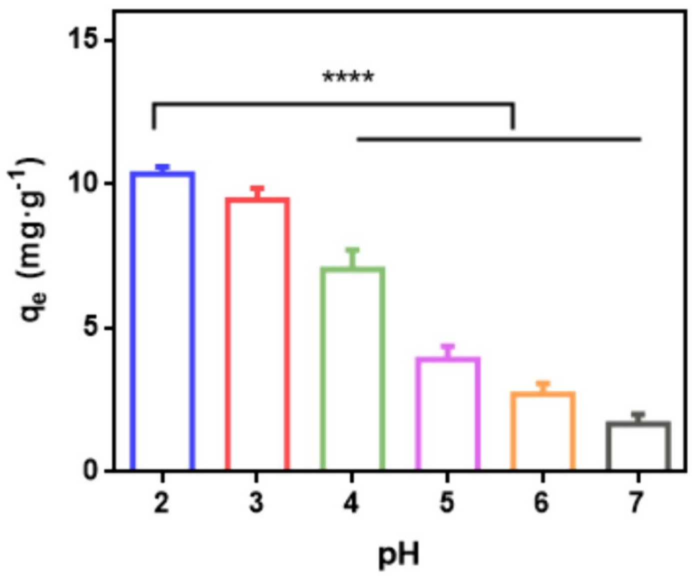

Fig. S5 The influences of pH values for adsorption capacity on C-S-U-1.2 towards Cr(VI).

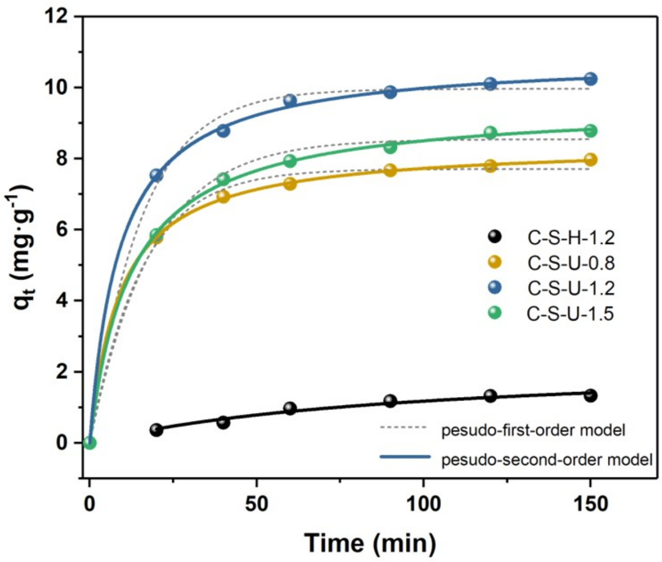

Fig. S6 The adsorption kinetics of Cr(VI) on C-S-H-1.2 and C-S-U (with different Ca/Si).

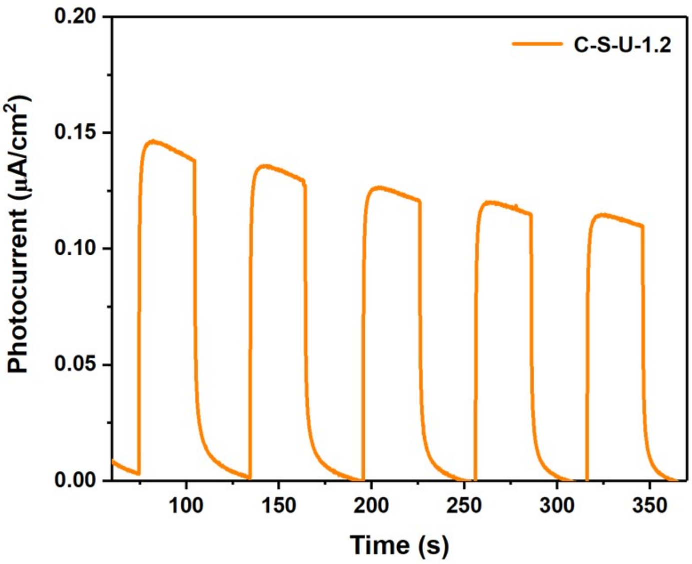

Fig. S7 The photocurrent response of C-S-U-1.2.

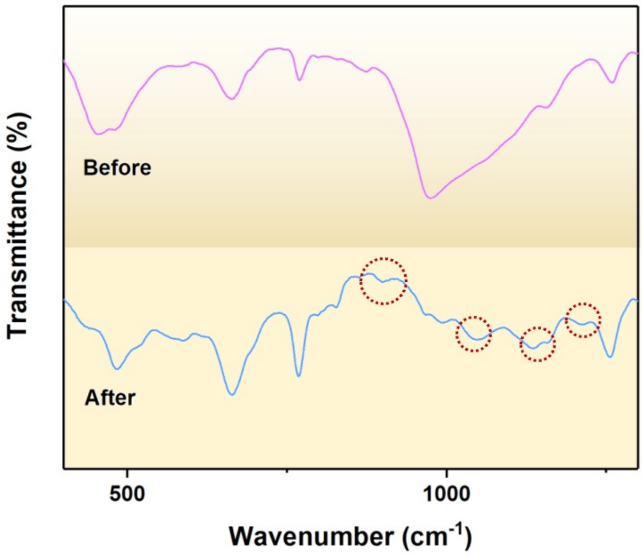

Fig. S8 The FT-IR spectra of C-S-U-1.2 before and after Cr(III) adsorption.

Table S1. Isotherms parameters for adsorption of Cr(III) by C-S-H and C-S-U.

Adsorption isotherms models	Parameters	Absorbents	
		C-S-H-1.2	C-S-U-1.2
Langmuir model	q_{max} (mg/g)	185.375	217.918
	b (L/mg)	0.0349	0.03228
	R_1^2	0.9924	0.9981
Freundlich model	K_F ((mg/g)·(L/mg)$^{1/n}$)	20.035	21.837
	n	2.299	2.230
	R_2^2	0.9748	0.9768

Table S2. Summary of photocatalytic performance of MOFs and MOFs-based composites for Cr(VI) in water.

Materials	Conditions	Time	Reduction efficiency (%)	Ref.
NH_2-MIL-125	[Cr(VI)]=48 mg/L, [Mats]=0.5 g/L, pH 2.1	60	97	1
NH_2-MIL-88B	[Cr(VI)]= 8 mg/L, [Mats]=0.5 g/L, pH 2	45	100	2
UiO-66-NH_2	[Cr(VI)]=10 mg/L, [Mats]=0.5 g/L, pH 2	80	97	3
MIL-68- NH_2	[Cr(VI)]=20 mg/L, [Mats]=1 g/L, pH 6	180	97	4
MIL-53	[Cr(VI)]=20 mg/L, [Mats]=1 g/L, pH 4	40	100	5
MIL-101	[Cr(VI)]= 8 mg/L, [Mats]=0.5 g/L, pH 2	60	100	2
g-C_3N_4/MIL-53	[Cr(VI)]=10 mg/L, [Mats]=0.4 g/L, pH 2-3	180	100	6
MIL-100	[Cr(VI)]=20 mg/L, [Mats]=1 g/L, pH 4	24	100	7
This work	[Cr(VI)]=20 mg/L, [Mats]=0.4 g/L, pH 2	60	100	/

Table S3. Summary of adsorption ability of MOFs and MOFs-based composites for Cr(VI) and Cr(III) in water.

Materials	Conditions	q_{max} (mg/g)	Ref.

		Cr(III)	Cr(VI)	
ZIF-67	[Cr(VI)]=6-15 mg/L, [Mats]=1 g/L, natural pH	/	15.43	8
UiO-66-NH_2	[Cr(VI)]=5 mg/L, [Mats]=1 g/L, pH 6.5	/	32.36	9
ZIF-8	[Cr(VI)]=2.5 mg/L, [Mats]=20 g/L, pH 7	/	0.15	10
MOF-867	[Cr(VI)]=50 mg/L, [Mats]=0.5 g/L	/	53.4	11
TMU-6	[Cr(III)]=0.1 mg/L, [Mats]=7 mg/30mL, pH 10	118	/	12
TMU-5	[Cr(VI)]=0.1 mg/L, [Mats]=7 mg/30mL, pH 10	123	/	12
This work	[Cr(VI)]=10-20 mg/L, [Mats]=0.2-0.4 g/L, pH 2	217.9	11.23	/

Reference:

1. 1 H. Wang, X. Yuan, Y. Wu, G. Zeng, X. Chen, L. Leng, Z. Wu, L. Jiang, H. Li, *J. Hazard. Mater.* 2015, **286,** 187-194.

2. L. Shi, T. Wang, H. Zhang, K. Chang, X. Meng, H. Liu, J. Ye, *Adv. Sci.* 2015, **2,** 1500006.
3. L. Shen, S. Liang, W. Wu, R. Liang, L. Wu, *Dalton Trans.* 2013, **42**, 13649-13657.
4. R. Liang, L. Shen, F. Jing, W. Wu, N. Qin, R. Lin, L. Wu, *Appl. Catal. B: Environ.* 2015, **162**, 245-251.
5. R. Liang, F. Jing, L. Shen, N. Qin, L. Wu, *J. Hazard. Mater.* 2015, **287**, 364-372.
6. W. Huang, N. Liu, X. Zhang, M. Wu, L. Tang, *Appl. Surf. Sci.* 2017, **425,** 107-116.
7. R. Liang, F. Jing, L. Shen, N. Qin, L. Wu, *Nano Res.* 2015, **8,** 3237-3249.
8. X. Li, X. Gao, L. Ai, J. Jiang, *Chem. Eng. J.* 2015, **274**, 238-246.
9. S. Wu, Y. Ge, Y. Wang, X. Chen, F. Li, H. Xuan, X. Li, *Environ. Technol.* 2017, **39,** 1937-1948.
10. M.D. Ogden, E.M. Moon, A. Wilson, S.E. Pepper, *Chem. Eng. J.* 2017, **317**, 80-89.
11. Q. Zhang, J. Yu, J. Cai, L. Zhang, Y. Cui, Y. Yang, B. Chen, G. Qian, *Chem. Commun.* 2015, **51**, 14732-14734.
12. E. Tahmasebi, M.Y. Masoomi, Y. Yamini, A. Morsali, *Inorg. Chem.* 2015, **54**, 425-433.