Supporting Informations

Enhanced visible-light-induced photocatalytic activities of bimetallic Mn-Fe MOFs for highly efficient reductive removal of Cr(VI)

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Preparation of bimetallic MOFs

STA-12(Mn, Fe) [$(0.5Mn + 0.5Fe)_2L.4.14H_2O$]: Ferrous chloride tetrahydrate (Merck, 0.256 g, 1.29 mmol), Manganese(II) acetatete trahydrate(Merck, 0.316 g, 1.29 mmol), H_4L (0.355 g, 1.29 mmol), potassium hydroxide (Merck, 0.218 g, 3.9 mmol) and water (20 mL) were mixed, to give a reaction ratio of 1:1:1:3:900, in a Teflon lined autoclave (40 mL). The reaction was stirred for 1h and an initial pH of 5.5 was recorded. The autoclave was then sealed and heated at 180 ºC for 72 h. The resulting powder was collected by filtration, washed with water, and dried overnight at 50 ºC. The other MOFs were obtained by change of percentages of Fe:Mn while the other conditions were invariable. Elemental mapping of Mn and Fe using energy dispersive spectroscopy (EDS) are dipected in Figure S8, indicating that these elements are homogeneously distributed and co-localized throughout the MOFs. (for more information on catalysts identification and data analysis, see Table S1 and Figure S5-S9 and reference[19]).

Table S1. ICP (ICP-AES) Elemental analysis results for as-prepared MOFs.

STA-12-Mn-Fe	Mn%	Fe%
(80:20)	15.18	8.46
(70:30)	14.27	9.51
(50:50)	11.80	11.86
(30:70)	9.41	14.33
(20:80)	8.38	15.47

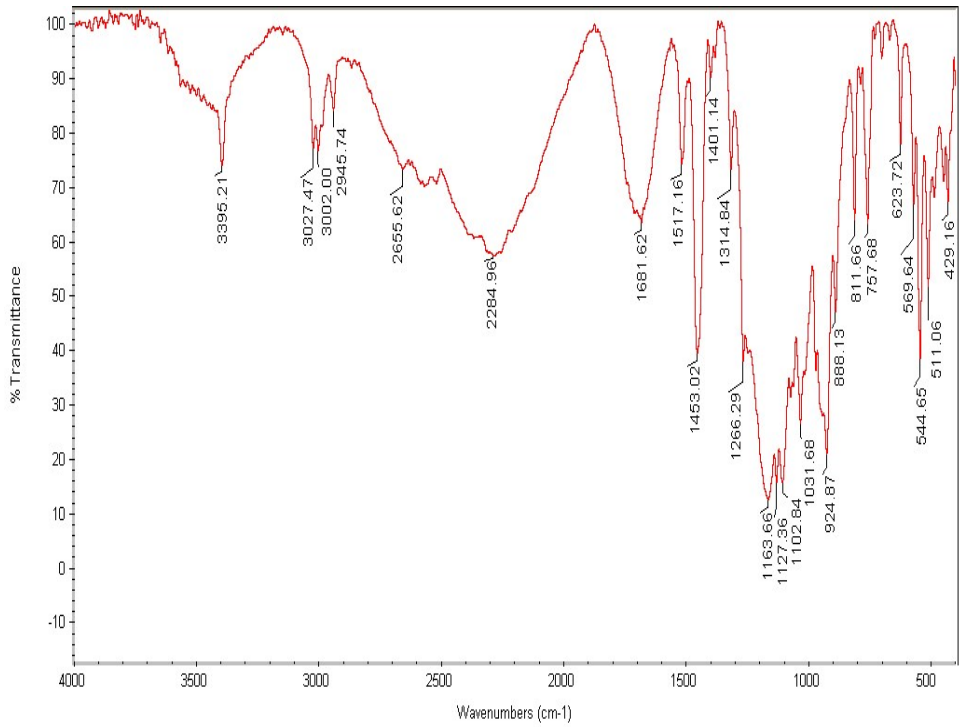

Fig. S1. IR spectrum of Ligand H_4L.

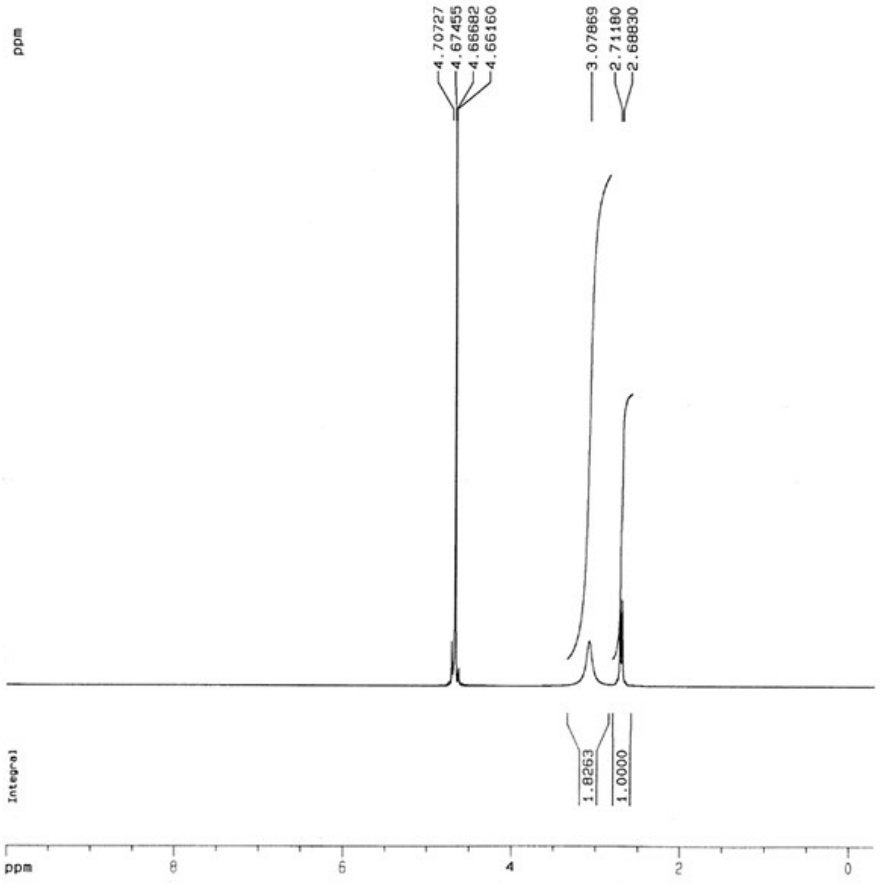

Fig. S2. ^{1}H NMR spectrumof Ligand H_4L.

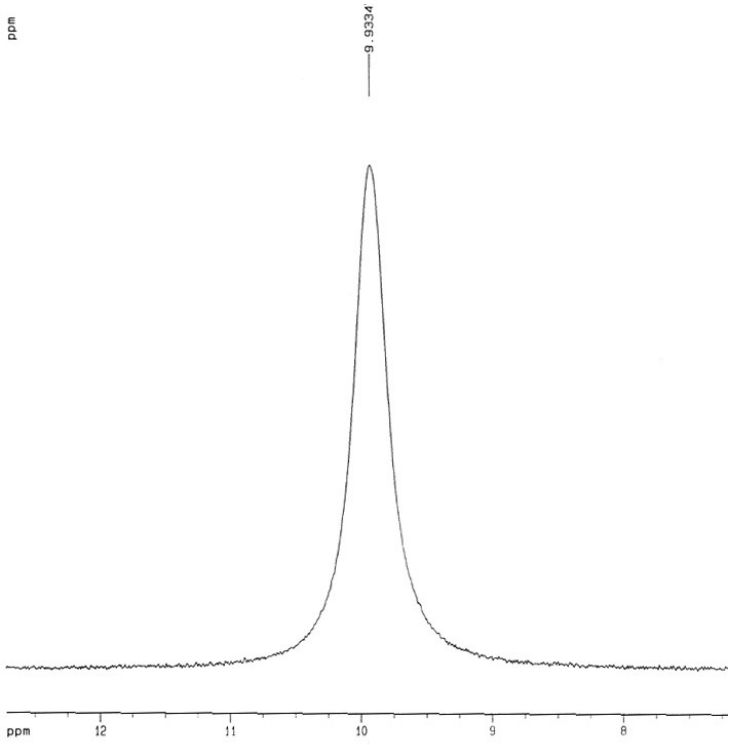

Fig. S3. $^{31}P\{H\}$ NMR spectrum of Ligand H_4L.

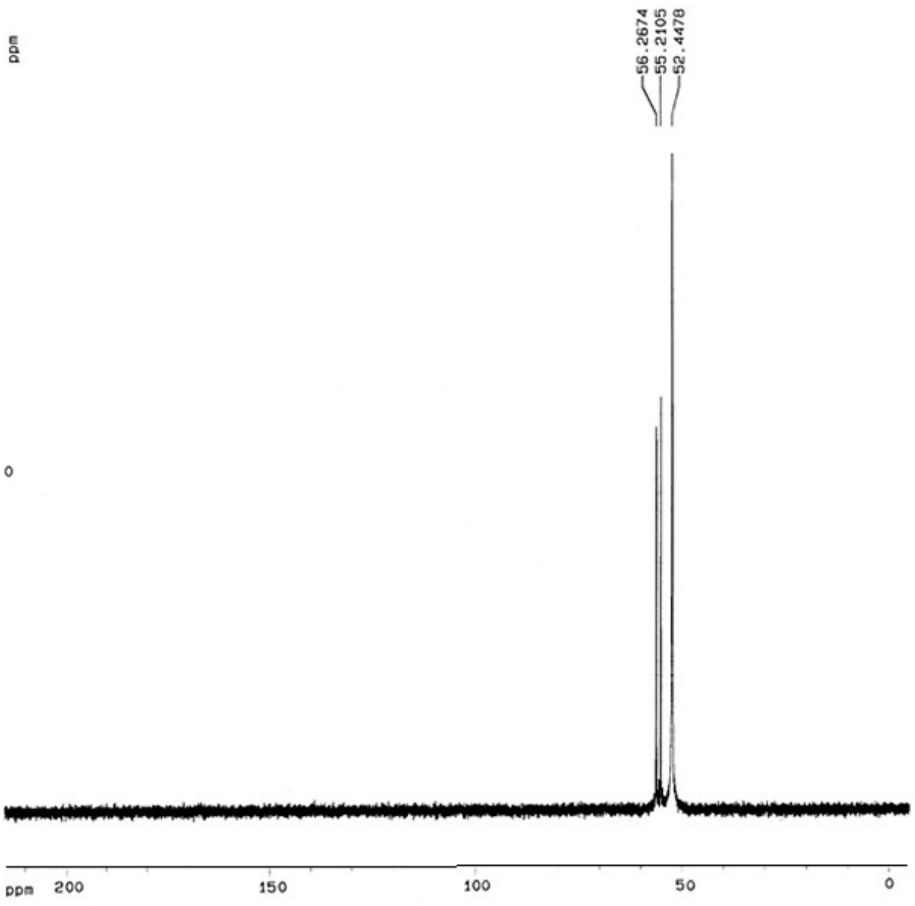

Fig. S4. ^{13}C NMR spectrum of Ligand H_4L.

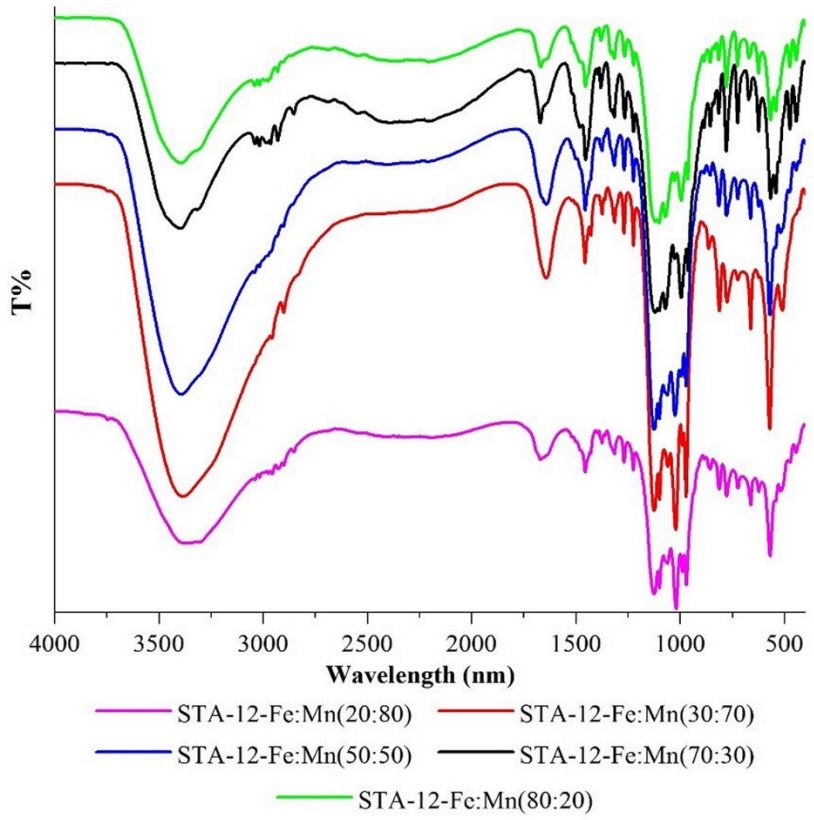

Fig. S5. FT-IR spectra of STA-12-Mn-Fe MOFs.

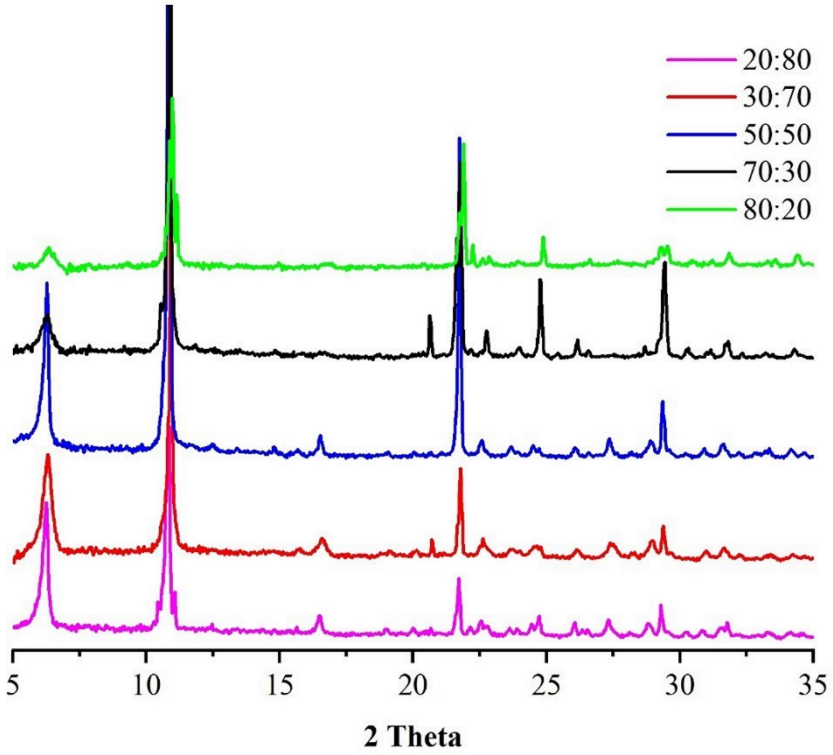

Fig. S6. X-ray diffraction patterns of STA-12-Mn-Fe MOFs.[1]

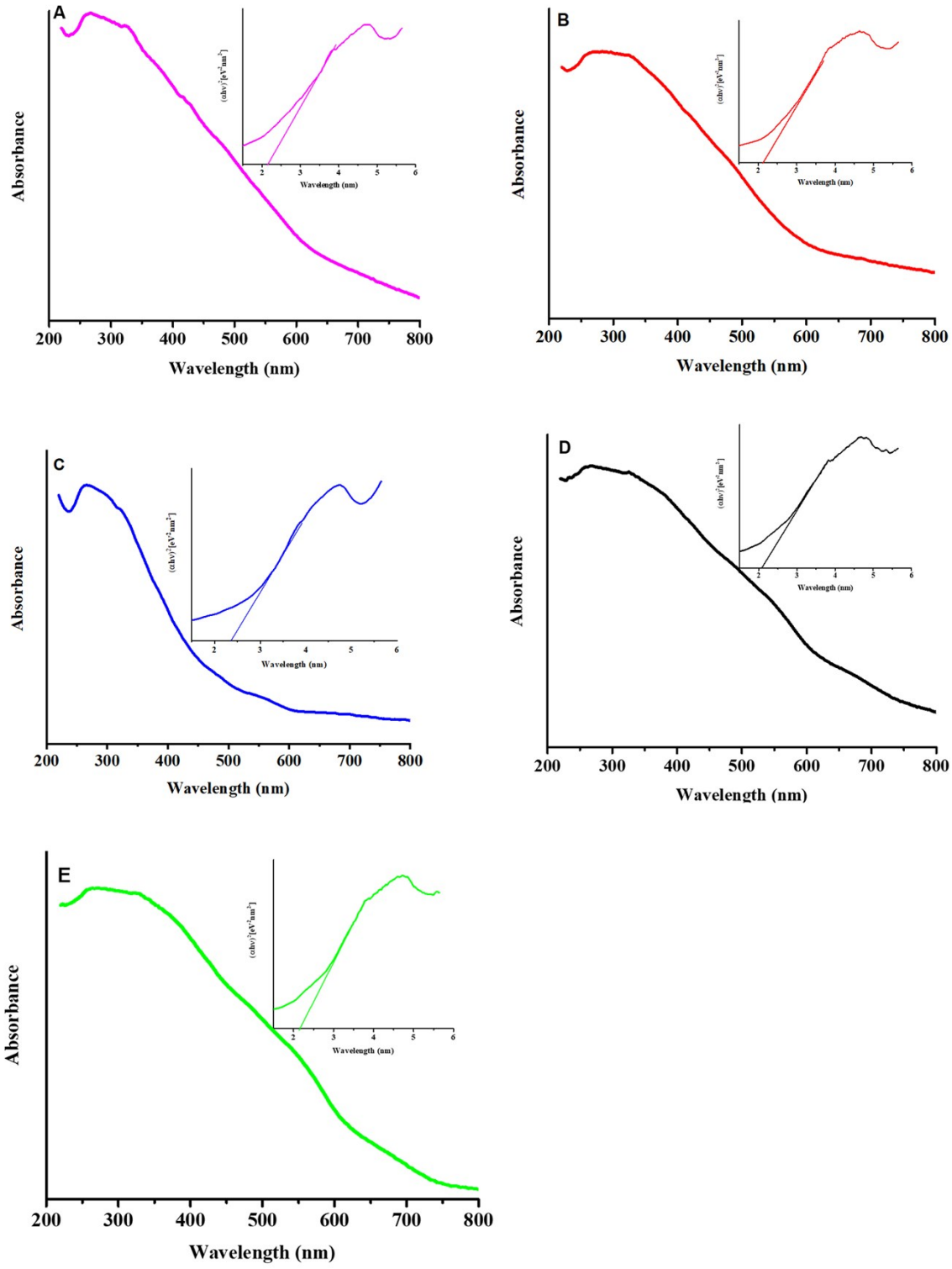

Fig. S7. Diffuse reflectance UV-vis spectra of STA-12-Fe-Mn, (A) 20:80, (B) 30:70, (C) 50:50, (D) 70:30, and (E) 80:20 (the insets are the tauc's plots).

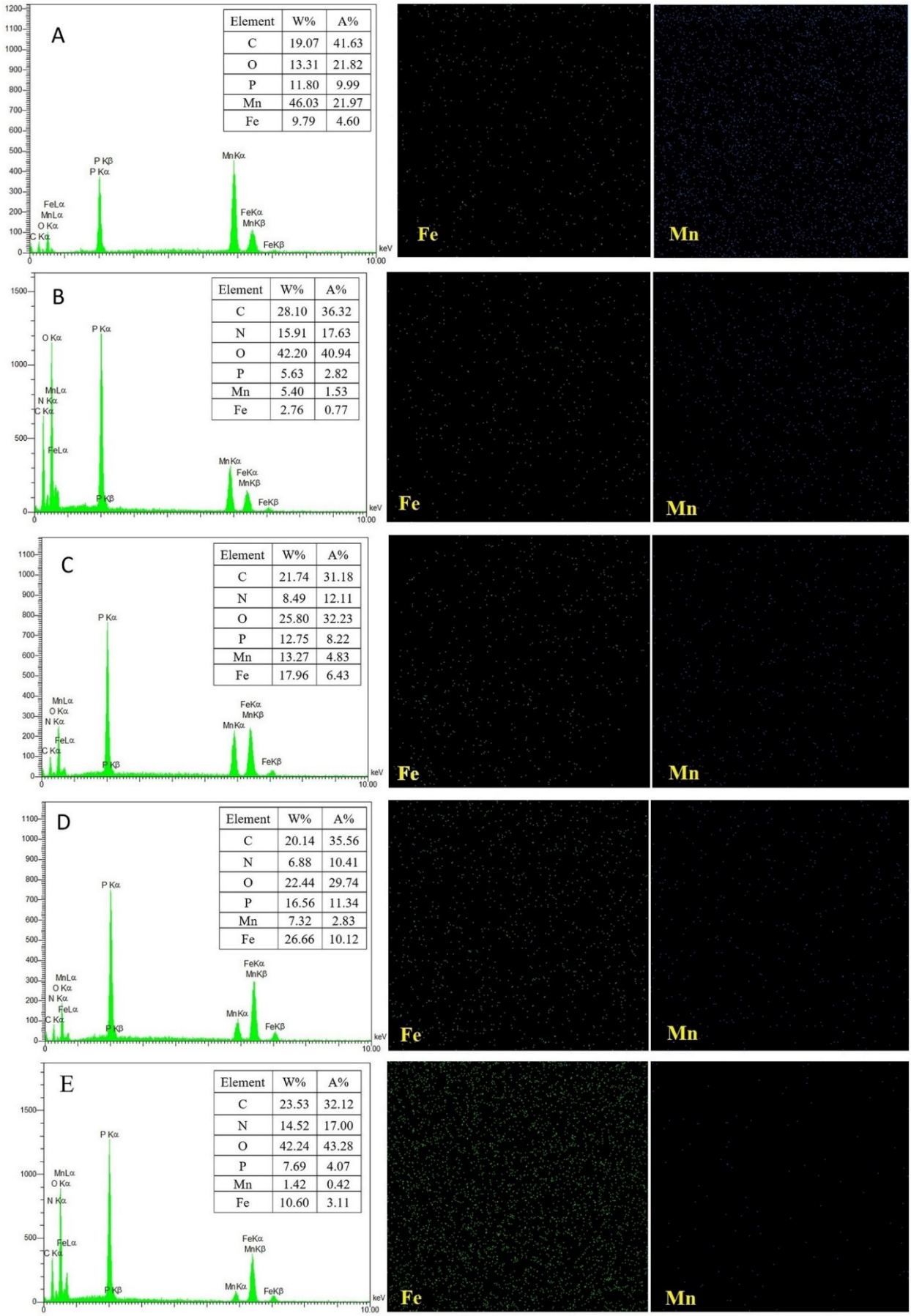

Fig. S8. EDS spectra and mappings of Mn/Fe content for as-prepared MOFs. STA-12-Mn-Fe (80:20) (A), (70:30) (B), (50:50) (C), (30:70) (D) and (20:80) (E).

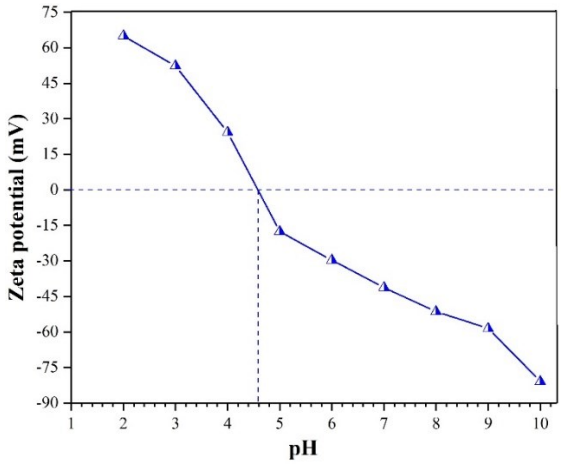

Fig. S9. Zeta-potential of STA-12-Mn-Fe (50:50) different pH.

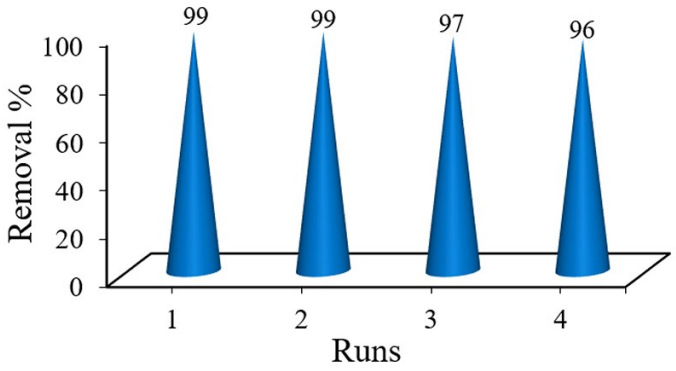

Fig. S10. Recyclability of STA-12-Mn-Fe (50:50)

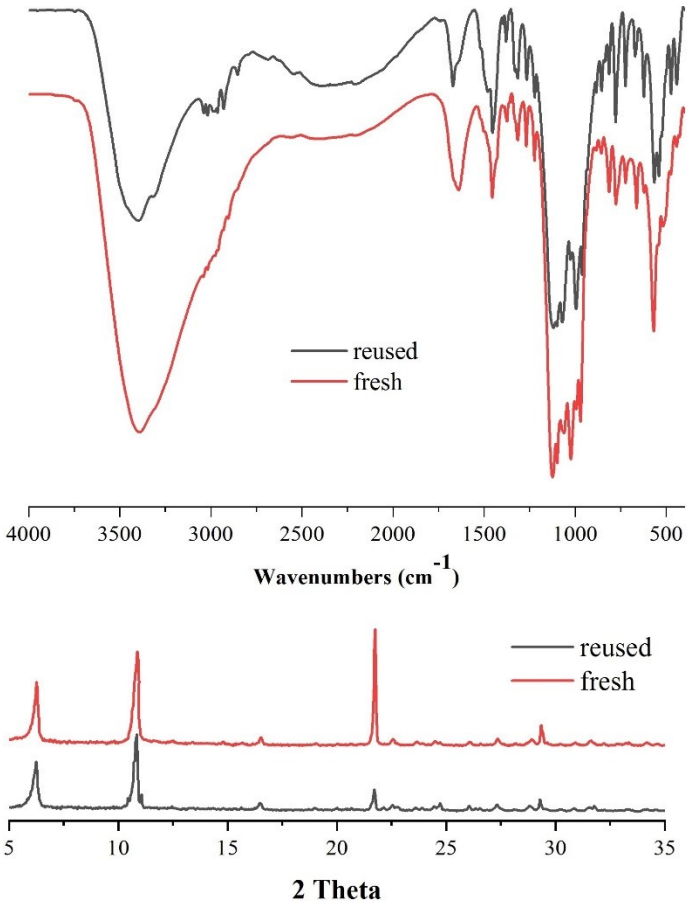

Fig. S11. FTIR spectra (up) and PXRD (down) of STA-12-Mn-Fe after four catalytic reactions.

Table S2. The ANOVA results of the response surface quadratic model for reduction of Cr(VI).

Source	**Sum of Squares**	**df**	**Mean Square**	**F Value**	**p-value**	
Block	684.92	2	342.46			
Model	20141.16	8	2517.65	87.22	< 0.0001	**significant**
A-pH	11617.32	1	11617.32	402.49	< 0.0001	
B-CrConc.	4115.23	1	4115.23	142.57	< 0.0001	
C-Cat	13.76	1	13.76	0.48	0.4983	
D-Time	85.69	1	85.69	2.97	0.1011	
AB	1809.44	1	1809.44	62.69	< 0.0001	
CD	610.71	1	610.71	21.16	0.0002	
A^2	848.44	1	848.44	29.39	< 0.0001	
B^2	1245.71	1	1245.71	43.16	< 0.0001	
Residual	548.41	19	28.86			
Lack of Fit	520.75	16	32.55	3.53	0.1633	**not significant**
Pure Error	27.67	3	9.22			
Cor Total	21374.49	29				

Reference:

[1] J. A. Groves, S. R. Miller, S. J. Warrender, C. Mellot-Draznieks, P. Lightfoot, P. A. Wright, *Chem. Commun.* **2006**, 3305.