Electronic Supplementary Information

Efficient conversion of glucose into 5-hydroxymethylfurfural using a bifunctional Fe^{3+} modified Amberlyst-15 catalyst.

Siquan Xu [a], Chunyu Yin [b], Donghui Pan [a], Feng Hu [a], Yuanfeng Wu [a], Yanan Miao [a], Lijing Gao [a], Guomin Xiao [a]*

[a] School of Chemistry and Chemical Engineering, Southeast University, Nanjing 211189, China

[b] School of Pharmacy, Nanjing Medical University, Nanjing, 211189, China

* Corresponding author: Guomin Xiao

Tel: +86-25-52090612; Fax: +86-25-52090612;

E-mail: xiaogm@seu.edu.cn;

Table S1. Comparisons of catalytic behavior of 10%-Fe/AR and representative catalytic systems for conversion of glucose to HMF

Entry	Catalyst	Reaction system	Load[a]	Temperature (°C)	Time (min)	HMF yield (%)	Ref
1	SAPO-34	GVL	6.2%	170	40	93.6	26
2	Al-MCM-41	H_2O/MIBK	3.4%	195	150	63	27
3	Nb-SBA-15	H_2O/THF	1.3%	165	180	61.8	28
4	H_3PO_4-SiO-$FePO_4$[b]	H_2O/acetone	4.0%	170	100	76.3	29
5	SiO_2-ATS-PTA[c]	H_2O/acetone	4.7%	160	140	78.3	30
6	Sn-Beta/HCl	H_2O	10.0%	140	120	57	31
7	$CrCl_3$	[EMIM]Cl	6.0%	80	180	70	32
8	10%-Fe/AR	H_2O/THF	1.3%	160	60	68	This work

[a] Load = $m_{glucose}$: ($m_{glucose}$ + $m_{solvent}$)

[b] silica-supported phosphate and ironic phosphate

[c] silica-supported phosphotungstic acid

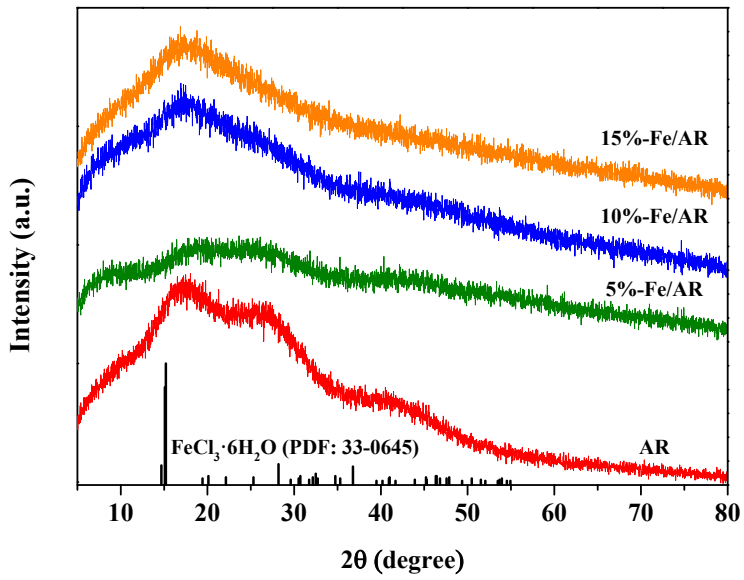

Fig. S1. XRD patterns of 5%-Fe/AR, 10%-Fe/AR and 15%-Fe/AR catalysts.

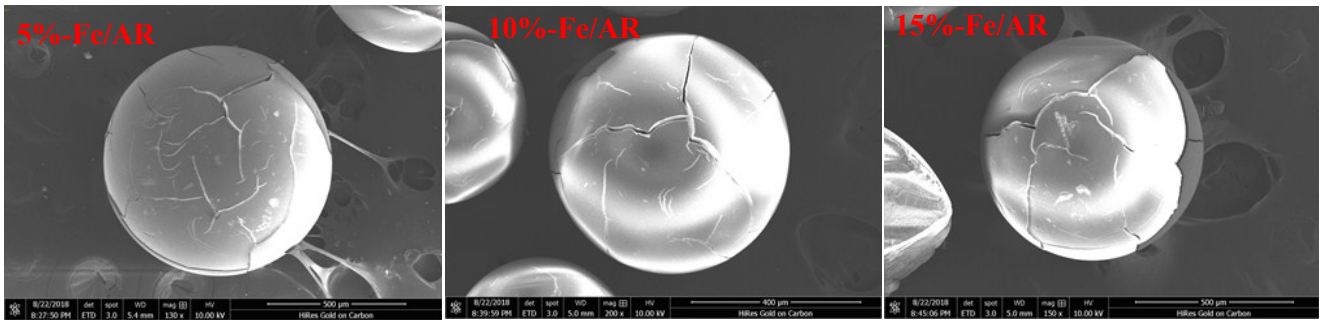

Fig. S2. SEM images of 5%-Fe/AR, 10%-Fe/AR and 15%-Fe/AR catalysts.

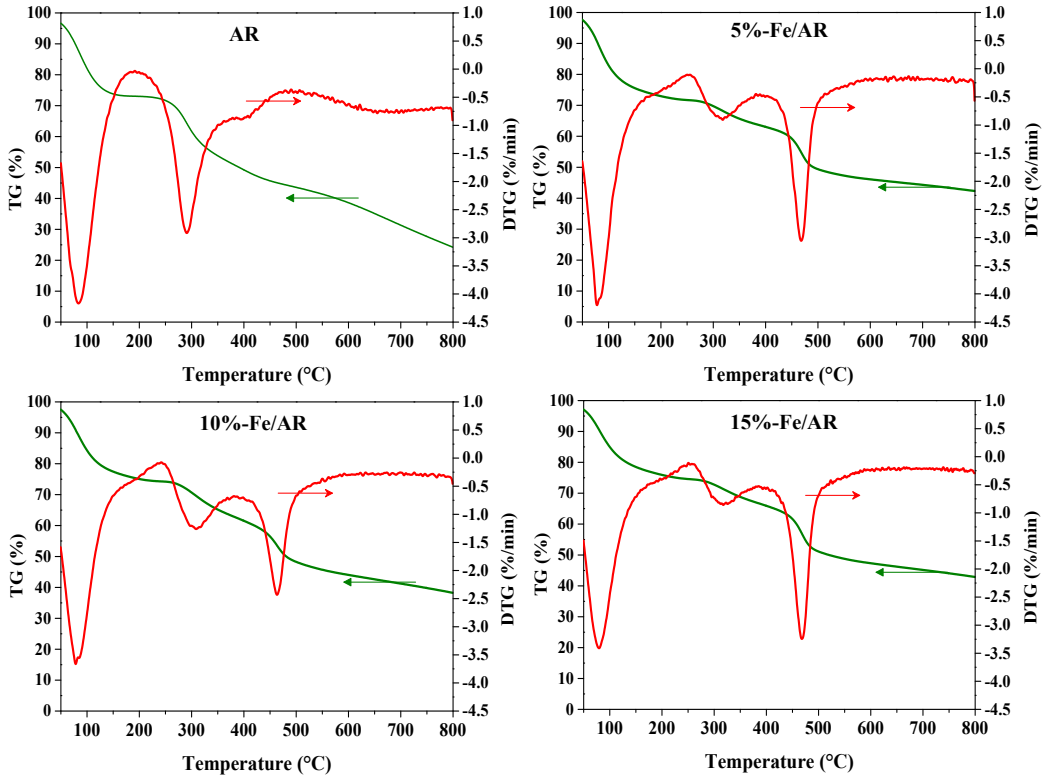

Fig.S3. Thermogravimetric analysis of 5%-Fe/AR, 10%-Fe/AR and 15%-Fe/AR catalysts.

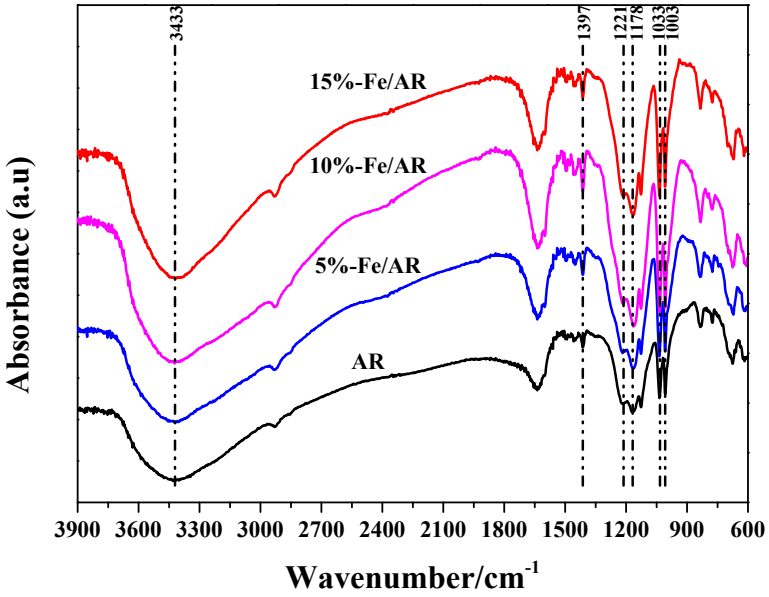

Fig. S4. FTIR spectroscopy analysis of the Fe/AR catalysts.

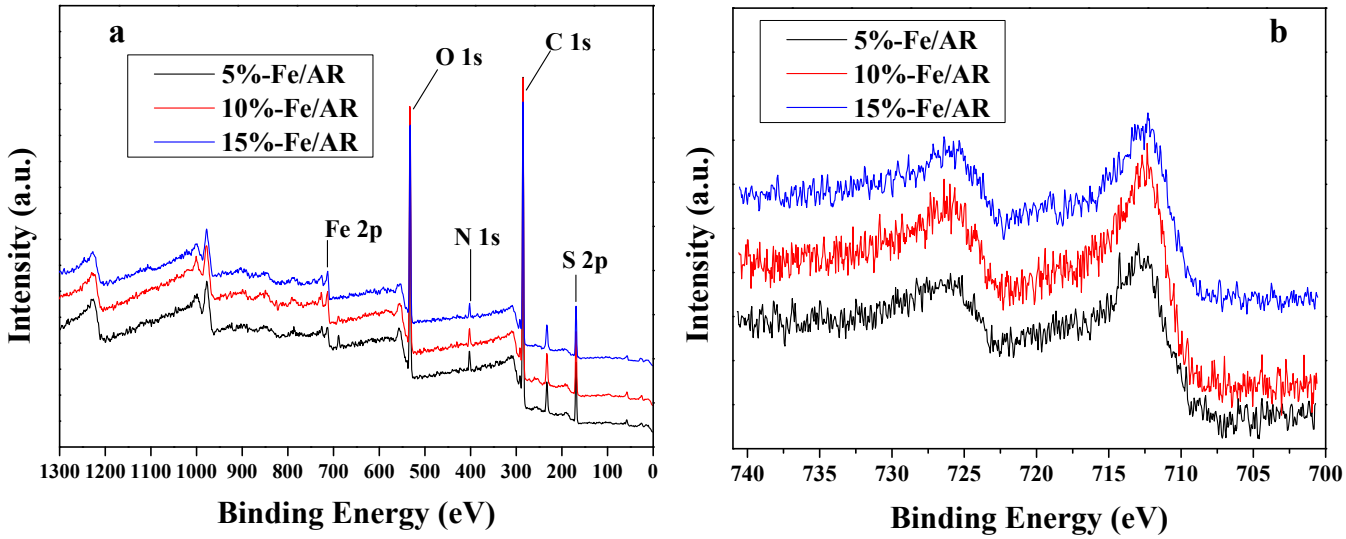

Fig.S5. XPS spectra of the Fe/AR catalysts (a) and the Fe 2p region (b).

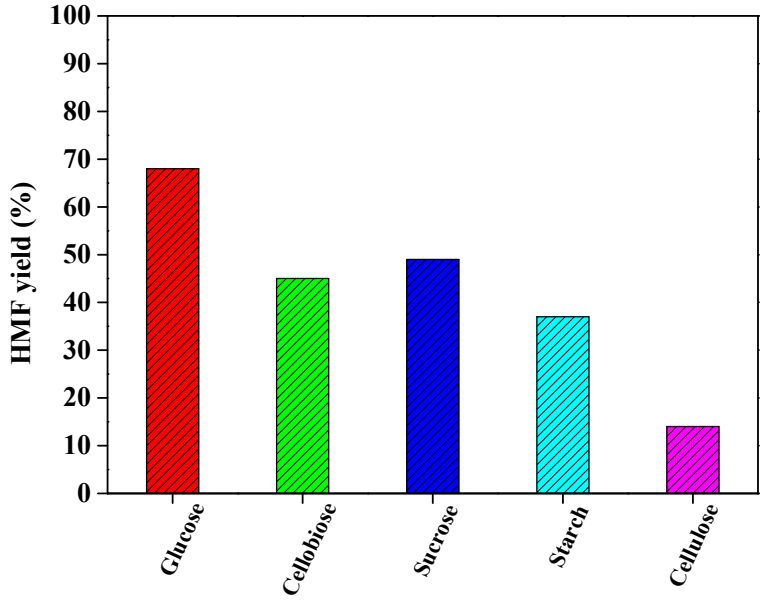

Fig. S6. The effect of different substrates on HMF yield.

Reaction conditions: substrate (1.0 g), 10%-Fe/AR (0.2 g), H_2O (10 mL), THF (30 mL), NaCl (3.5 g) and 160 °C.

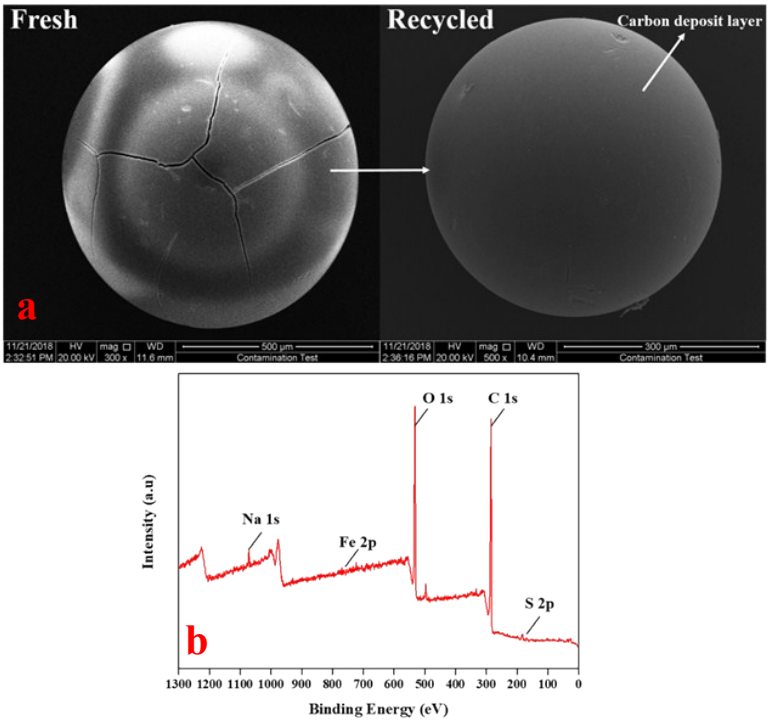

Fig. S7. SEM and XPS analysis of the spent 10%-Fe/AR.

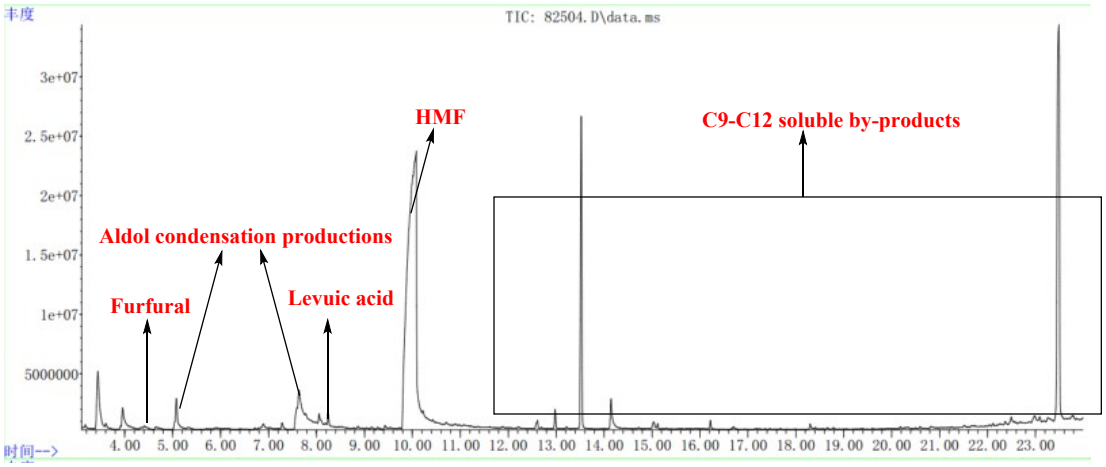

Fig. S8. GC-MS plot for the liquid products produced from the catalytic conversion of glucose at 160 ℃.

Reaction conditions: glucose (1.0 g), 10%-Fe/AR (0.2 g), H_2O (10 mL), THF (30 mL), NaCl (3.5 g), 160 °C and 60 min.

The products were analyzed by a GC chromatography (Agilent Technologies 7890A) equipped with a capillary column (Agilent PH-5; 0.32 mm × 30 m) and flame ionization detector (FID) under ramping temperature from 40 to 280 ℃. Mass spectrometric analysis of the liquid products was performed with a 5975C inert MSD mass analyzer (Agilent Technologies) employing Triple-Axis Detector.

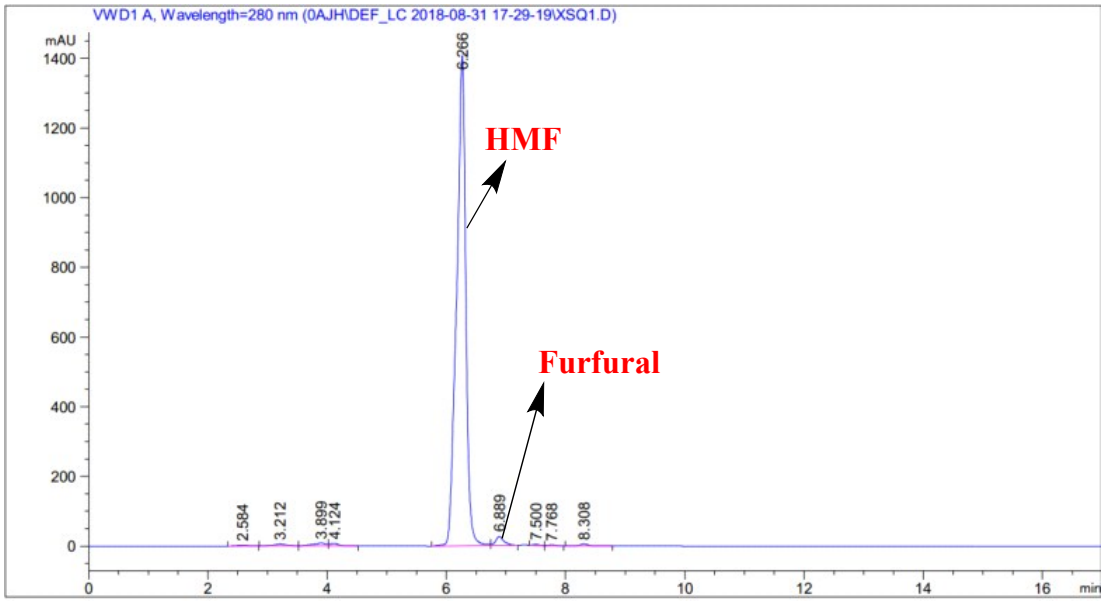

Fig.S9. HPLC analysis (UV detector) of the liquid products produced from the catalytic conversion of glucose.

Reaction conditions: glucose (1.0 g), 10%-Fe/AR (0.2 g), H_2O (10 mL), THF (30 mL), NaCl (3.5 g), 160 °C and 60 min.

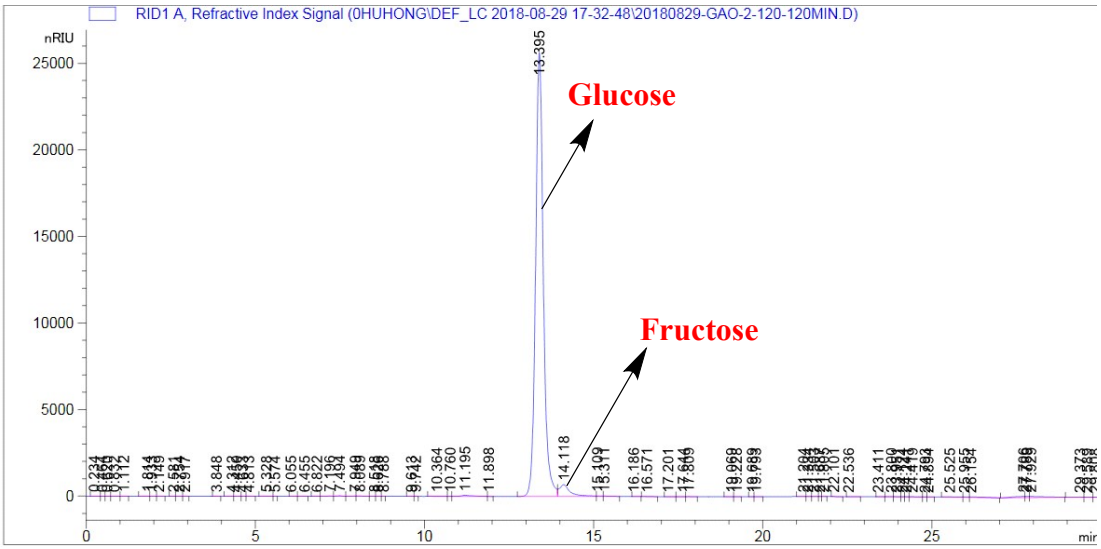

Fig.S10. HPLC analysis (Refractive index detector) of the liquid products produced from the catalytic conversion of glucose.

Reaction conditions: glucose (1.0 g), 10%-Fe/AR (0.2 g), H_2O (10 mL), THF (30 mL), NaCl (3.5 g), 140 °C and 60 min.