

Electronic Supplementary Material (ESI) for Green Chemistry.
This journal is © The Royal Society of Chemistry 2019

Supporting Information

Catalytic production of 1,4-Pentanediol from furfural in a fix-bed system under mild conditions

Qiaoyun Liu,^{a,b} Botao Qiao,^a Fei Liu,^{*a} LeiLei Zhang,^a Yang Su,^a Aiqin Wang,^{*a,c} and Tao Zhang^{a,c}

^a *Key Laboratory of Science and Technology on Applied Catalysis, Chinese Academy of Sciences, Dalian 116023, China. E-mail: fei.liu@dicp.ac.cn, aqwang@dicp.ac.cn.*

^b *University of Chinese Academy of Sciences, Beijing, 100049, PR China.*

^c *State Key Laboratory of Catalysis, Dalian Institute of Chemical Physics, Chinese Academy of Sciences, Dalian 116023, China.*

Table S1. Optimization of the reaction parameters over Ru-6.3FeOx/AC catalyst (A) and Amberlyst-15 solid catalysts (B). ^[a]

Entry	A/B (mg/mg)	P _{H2} (MPa)	Conv [%]	Selectivity(%)						
				1,4-PD	GVL	3-AP	FA	THFA	LA	other
1	30/40	0.2	100	86	10	0	0	2.5	0	1.5
2	30/40	1	100	52	18	0	0	26	0	4
3	30/40	4	100	26	17.5	0	0	44	0	12.5
4	30/40	-	ND	-	-	-	-	-	-	-
5	30/65	0.2	100	0	0	11	0	3.5	-	85.5
6	30/52	0.2	100	0	7	71	0	2	11	9
7	30/35	0.2	100	59	6	31	0	0	1	3
8	30/30	0.2	93	0	7	62	27	0	4	0
9	30/20	0.2	95	0	0	1.5	97	0	0	0.5
10	25/40	0.2	100	17	5	56	0	2	14	6
11	20/40	0.2	100	1	4.5	72	0	2	14	6.5
12 ^b	30/40	0.2	100	<1	99	-	-	-		-

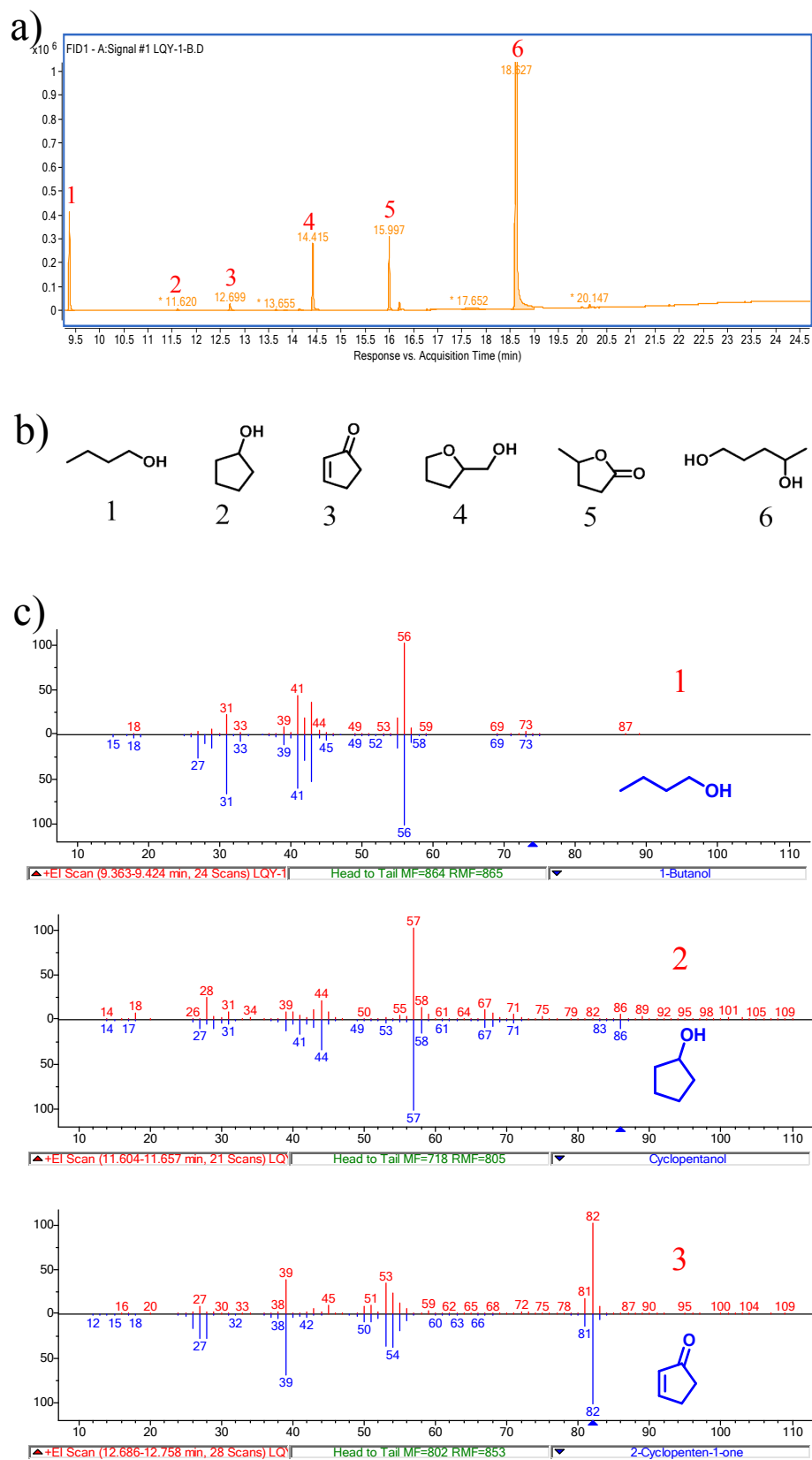
[a] Reaction conditions: 353 K, 20h; 5 g 2 wt% aqueous solution of furfural were used for each test. [b] LA as the starting material.

Table S2. Catalytic performance over Ru-6.3FeOx/AC catalyst (A) and Amberlyst-15 catalysts (B)

Entry	Substrate	T (°C)	A/B (mg/mg)	H ⁺ /Ru	Conv [%]	Selectivity(%)						
						1,4-PD	GVL	3-AP	F A	THFA	LA	Others
1	Furfural	80	30/40	148	100	86	10	0	0	2.5	0	1.5
2	Furfural	80	25/40	177	100	17	5	56	0	2	14	6
3	Furfural	100	30/40	148	100	53	32	5	0	5	5	0
4	Furfural	100	25/40	177	100	0	5	19	3	0	24	49
5	1,4-PD	100	25/40	177	8	-	0	0	0	0	0	100*

Reaction conditions: 2wt% aqueous solution, 20h, 0.2MPa H₂. *2-methy-THF

Figure S1. The GC-MS spectra of the reaction mixture. a) FID signal; b) identified products and c) comparison of identified products with library compounds.



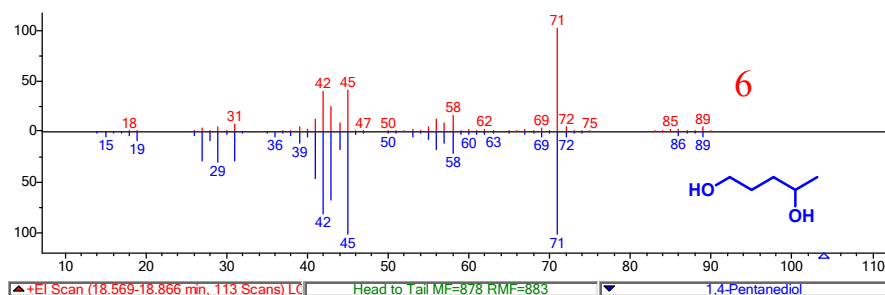
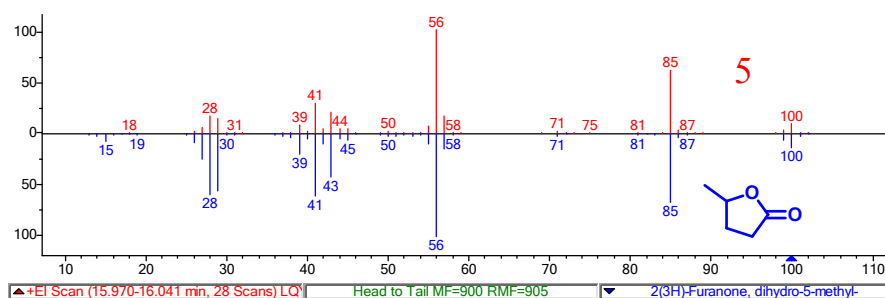
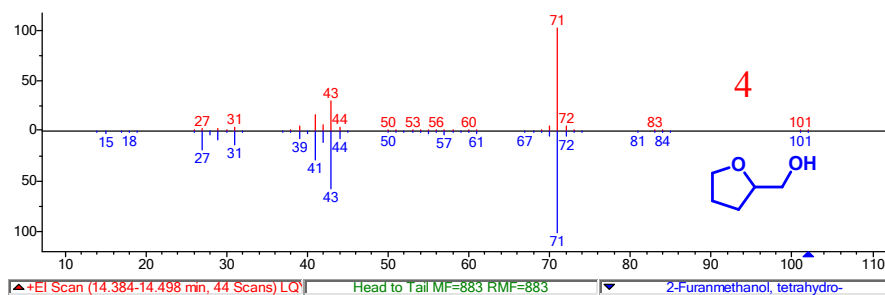


Figure S2. NH_3 -TPD profiles of Ru-yFeO_x/AC catalysts

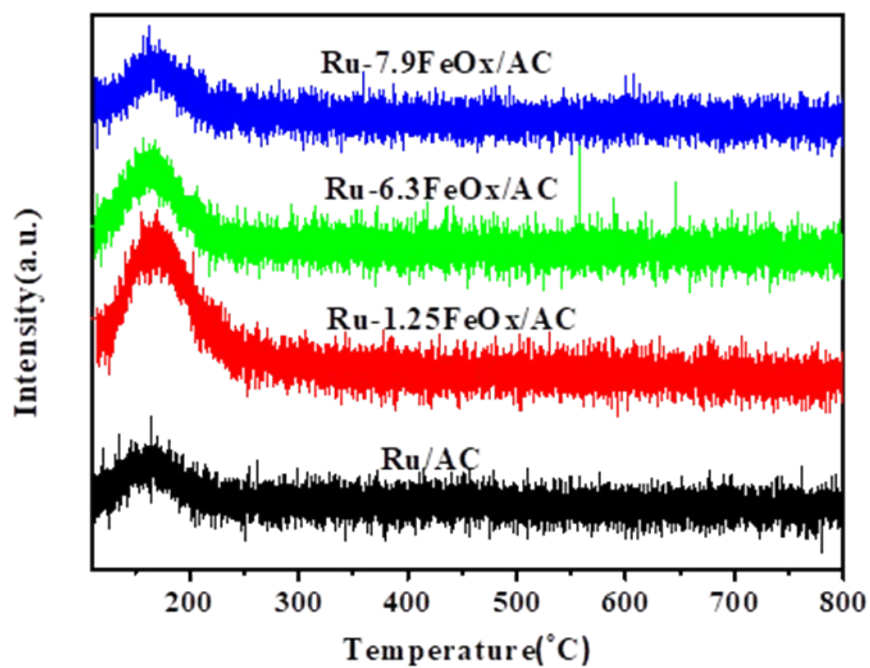
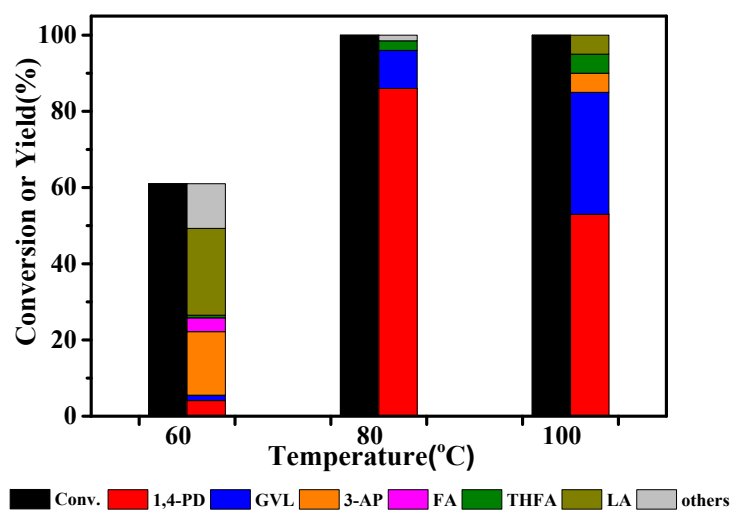


Figure S3. The effect of temperature on the catalytic performance



Reaction conditions: 0.2 MPa H₂, 20h; 30mg Ru-6.3FeOx/AC catalyst and 40mg Amberlyst-15, 5 g 2 wt% aqueous solution of furfural were used for each test.