Electronic Supplementary Material (ESI) for Green Chemistry.

Supplementary Information

Facile synthesis of SAPO-34 nanocrystallites with excellent performance for carbohydrates dehydration to 5-hydroxymethylfurfural

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Table S1. Comparison of textural properties and compositions of nanosized/hierarchical SAPO-34 catalysts directed by amine templates

Entry	Sample	Method	Microporous template [a]	Si content	Textural properties [b]					Ref.
					S_{BET}	S_{micro}	S_{ext}	V_{micro}	V_{meso}	
1	S_{H3}	soft-template PDADMAC	MOR	0.13	505	426	79	0.18	0.31	1
2	S_{H3}	soft-template polyethylene glycol	TEA	0.08	513	320	193	0.15	0.31	2
3	SP34-MS	soft-template TPOAC	DEA	0.15	567	455	112	0.21	0.17	3
4	S2	soft-template polyethylene glycol	MOR	0.1	519	360	159	0.16	0.2	4
5	S-DEA-1/5	soft-template DPHAB	DEA	0.11	622	597	25	0.28	0.02	5
6	SP34-M3	soft-template PZPMS	TEA	0.12	604	497	107	0.24	0.17	6
7	S_{H2}	soft-template TPOAC	MOR	0.16	507	384	123	0.18	0.26	7
8	S_2	soft-template polyacrylamide	TEA	0.08	652	615	37	0.23	0.12	8
9	hierarchical SAPO-34-10wt	hard-template rapeseed pollen	TEA	-	683	609	74	0.24	0.1	9
10	S-1	nitric acid post-treatment	TEA	0.13	671	638	33	0.25	0.01	10
11	HZ-SAPO-34-Mor-60	HF-NH_4F post-treatment	MOR	0.16	509	471	38	0.23	0.02	11
12	Sample 1.1	HF in-situ etching	TEA	0.09	544	533	11	0.26	-	12
13	SAPO-34 US30	NH_4F post-treatment	TEA	0.04	488	416	72	0.21	0.24	13
14	SP34-S-2.0	seed assistant	MOR	0.16	600	580	20	0.28	-	14
15	S_{H3}	seed assistant	TEA	0.1	556	536	20	0.27	-	15
16	S34-0.08	$NaHCO_3$ assistant	TEA	0.08	733	675	58	0.24	0.08	16
17	SP34-HEEP-s	amine HEEP assistant	TEA	0.09	583	548	35	0.27	0.12	17
18	SAPO-34-H1	vapor-phase transport method	TEA	0.12	712	679	33	0.25	0.12	18
19	Sample 2	post-synthesis milling and recrystallization method	TEA	0.14	530	479	51	0.22	0.2	19
20	S_{PT}-80-12	mother liquid post-treatment	TEA	0.09	574	516	58	0.24	0.03	20

[a] TEA: triethylamine, MOR: morpholine, DEA: diethylamine. [b] S_{BET}: BET surface area, S_{micro}: micropore surface area, S_{ext}: external surface area, V_{micro}: micropore volume, V_{meso}: mesopore volume

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Table S2. Thermal analysis results of the samples

Sample	Weight loss（%）	
	Physical absorbed water (RT-200 °C)	Organic species (200-900 °C)
SP-M1	6.7	12.6
SP-M2	8.9	13.9
SP-M3	9.7	16.0
SP-M4	9.4	16.3
SP-M5	10.5	16.9

Table S3. Textural properties of the aluminosilicate zeolites

Sample	Surface area (m^2/g)			Pore volume (cm^3/g)	
	S_{BET}[a]	S_{micro}[b]	S_{exter}[b]	V_{micro}[b]	V_{meso}[c]
ZSM-5	323	227	96	0.11	0.05
MCM-22	499	357	142	0.18	0.58
Y	667	594	93	0.28	0.09
Beta	570	403	167	0.19	0.33

[a] Total surface area is determined by the BET equation. [b] Micropore surface area, micropore volume and external surface area are determined by the t-plot method. [c] Mesopore volume is determined from the adsorption isotherm by the BJH method.

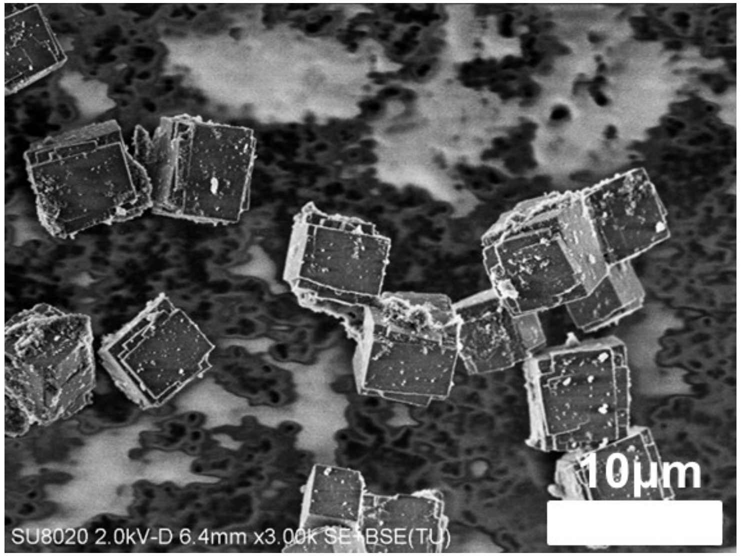

Fig. S1 SEM image of calcined SP-C.

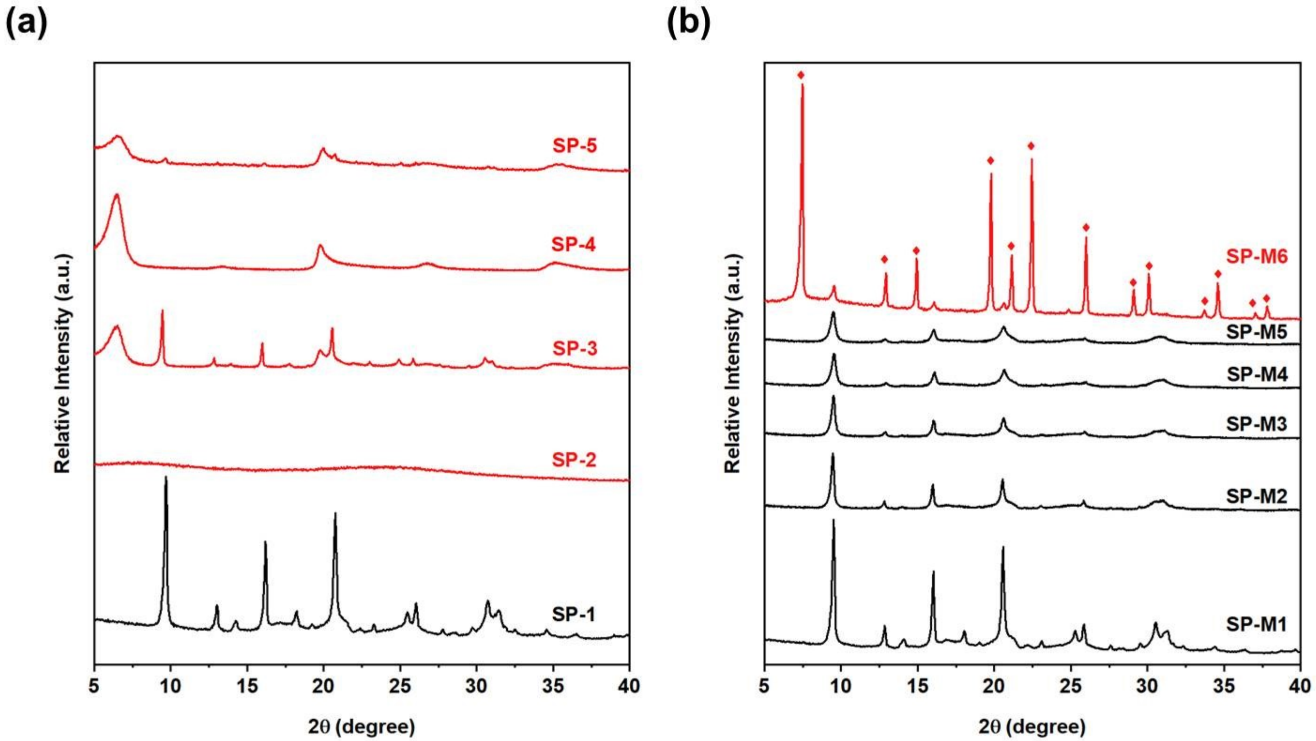

Fig. S2 XRD patterns of the as-synthesized SP-n (a) and SP-Mn (b). Diamonds indicate the AFI phase.

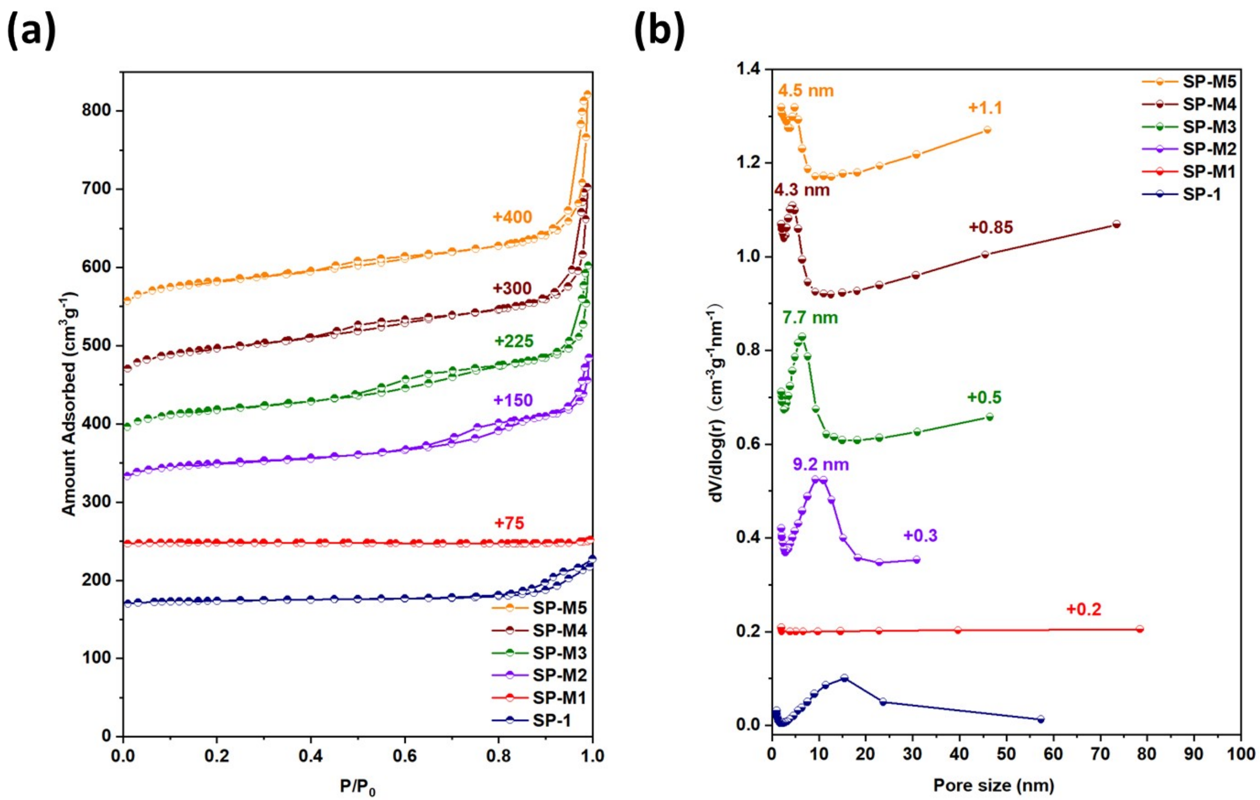

Fig. S3 N_2 sorption isotherms (a) and pore size distributions (b) of the samples.

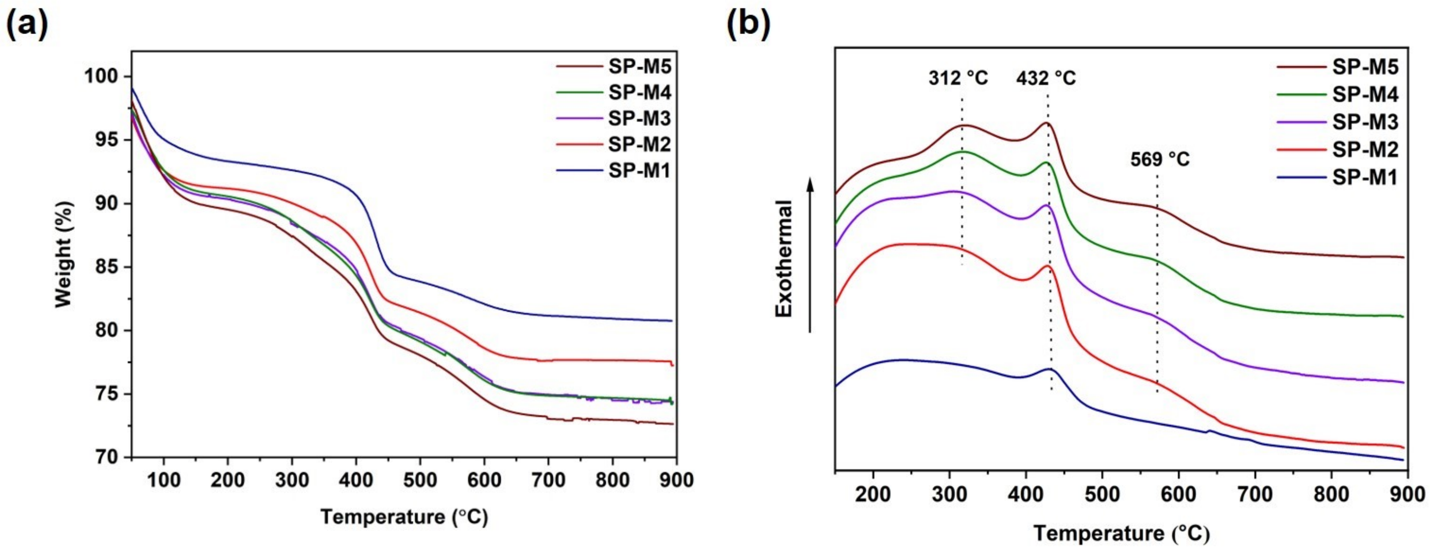

Fig. S4 TG (a) and DTA (b) curves of the as-synthesized samples.

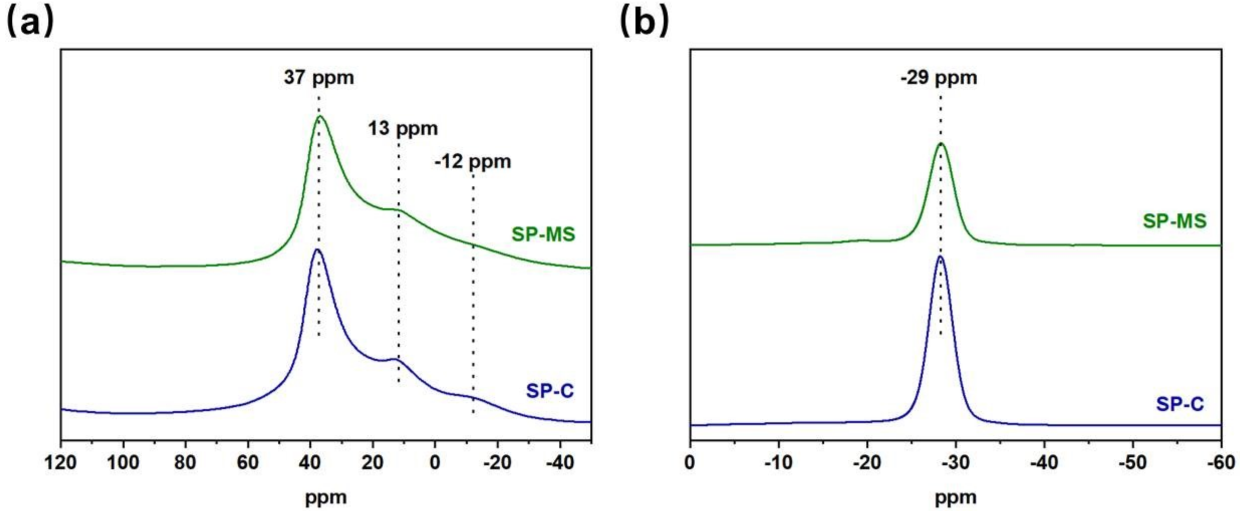

Fig. S5 ^{27}Al MAS NMR spectra (a) and ^{31}P MAS NMR spectra (b) of the as-synthesized samples.

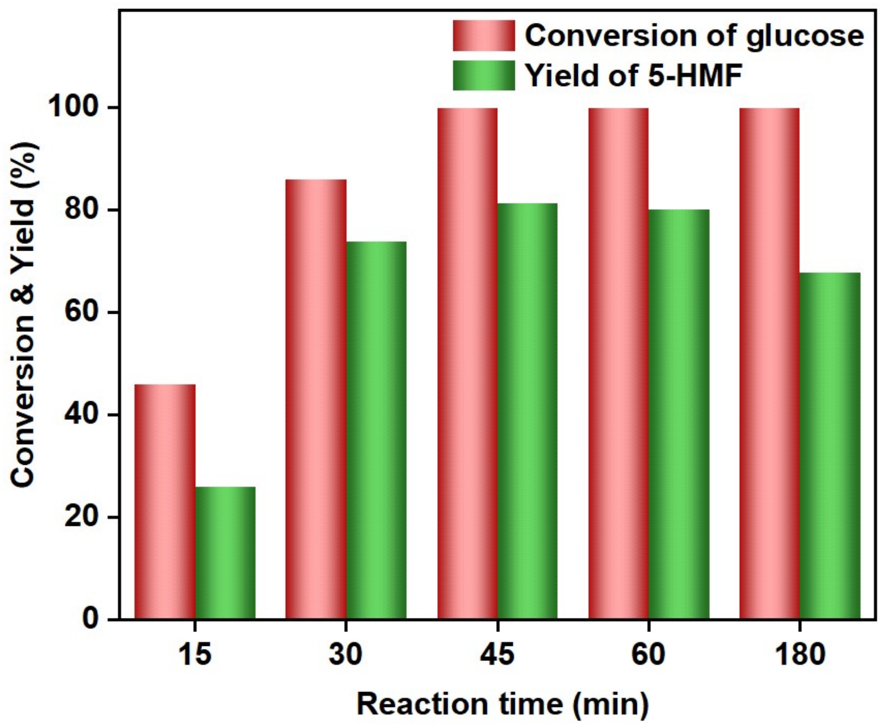

Fig. S6 Effect of reaction time on conversion of glucose and 5-HMF yield. Reaction condition: 0.1 g glucose, 0.1 g SP-MS, 2 mL NaCl-H_2O + 8 mL MIBK, 170 °C.

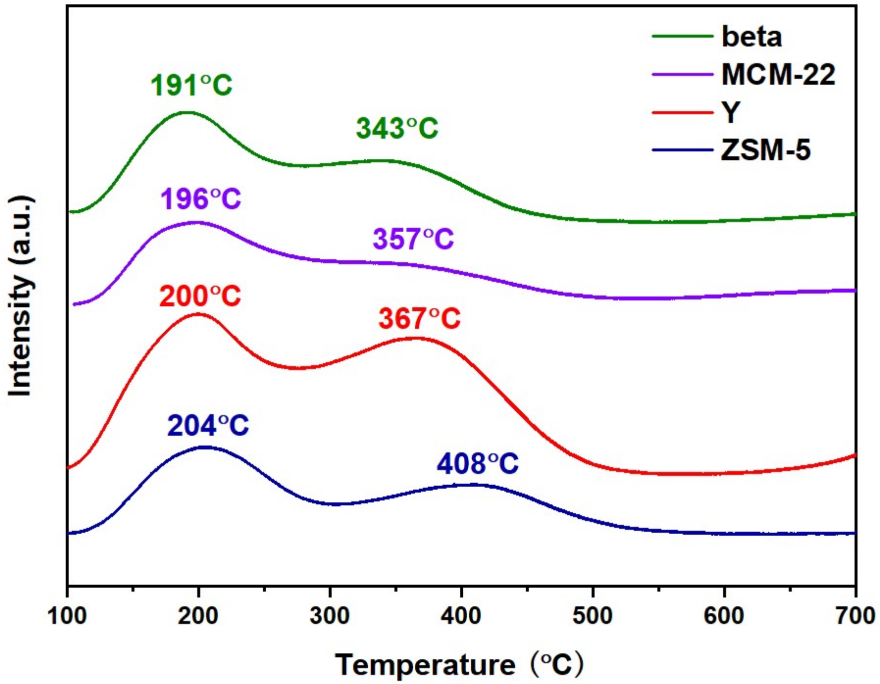

Fig. S7 NH_3-TPD profiles of aluminosilicate zeolites.

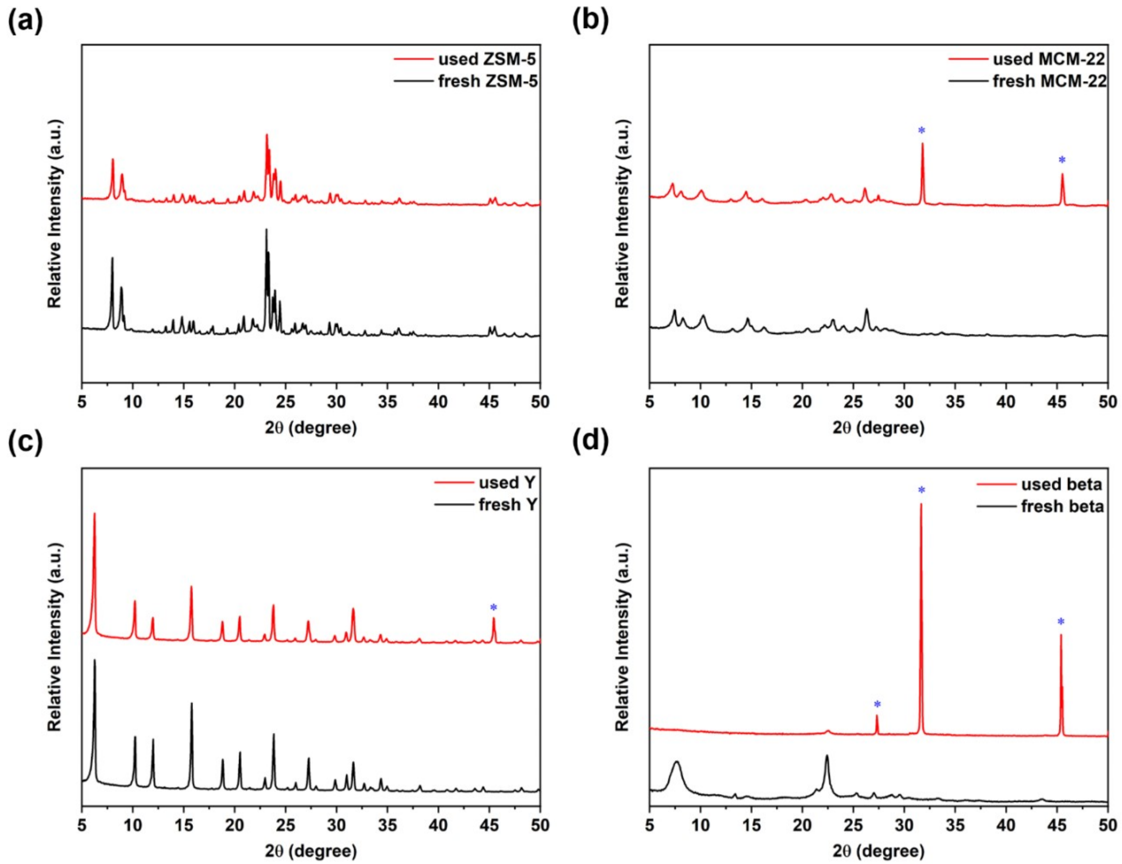

Fig. S8 XRD patterns of the fresh and used catalysts. Asterisk indicate the NaCl. All the used samples were washed with deionized water and dried overnight.

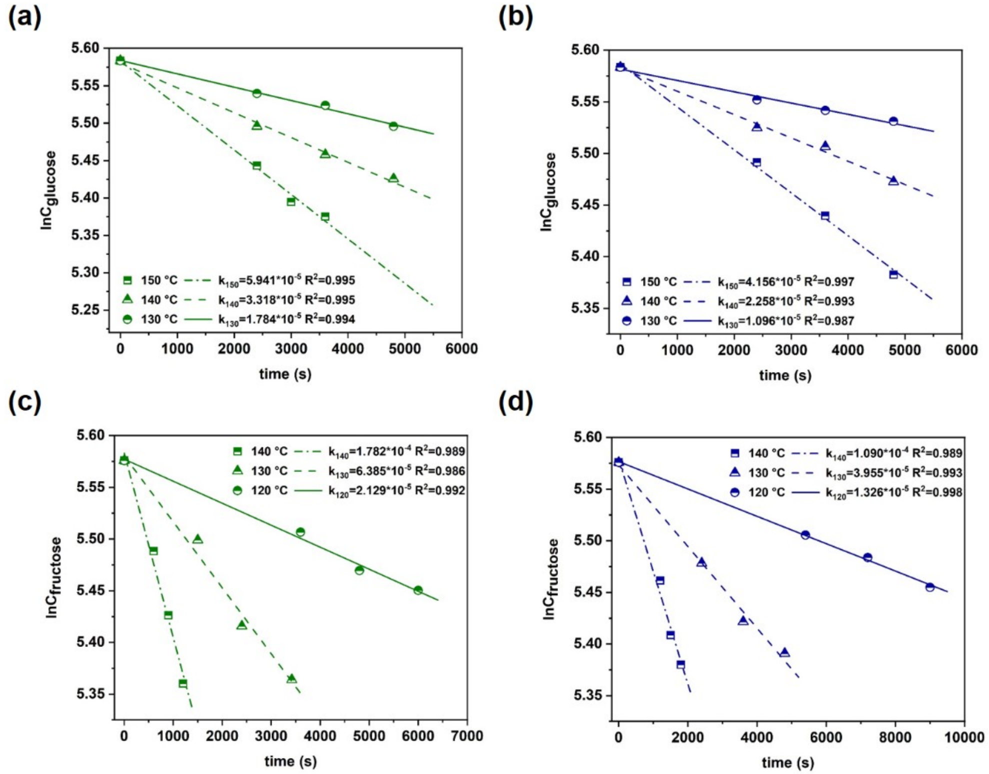

Fig. S9 First order kinetic fit for the conversion of glucose over SP-MS (a), SP-C (b), and fructose over SP-MS (c), SP-C (d). Reaction condition: 0.1 g substrate, 2 mL saturated solution of NaCl + 8 mL MIBK, 0.1 g catalyst for glucose conversion, 0.02g catalyst for fructose conversion.