

From Cellulose to 1,2,4-Benzenetriol via Catalytic Degradation over Wood-based Activated Carbon Catalyst

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Table S1 Textural properties derived from the N₂ adsorption-desorption isotherms.

Samples	S _{BET} (m ² /g)	S _{meso} (m ² /g)	S _{micro} (m ² /g)	Pore Volume (cm ³ /g)	Average pore diameter (nm)
CSP ₁	1115 ± 123	152 ± 9	963 ± 96	0.65 ± 0.1	2.34 ± 0.2
CSP ₄	269 ± 22	175 ± 12	94 ± 18	0.17 ± 0.1	4.01 ± 0.3

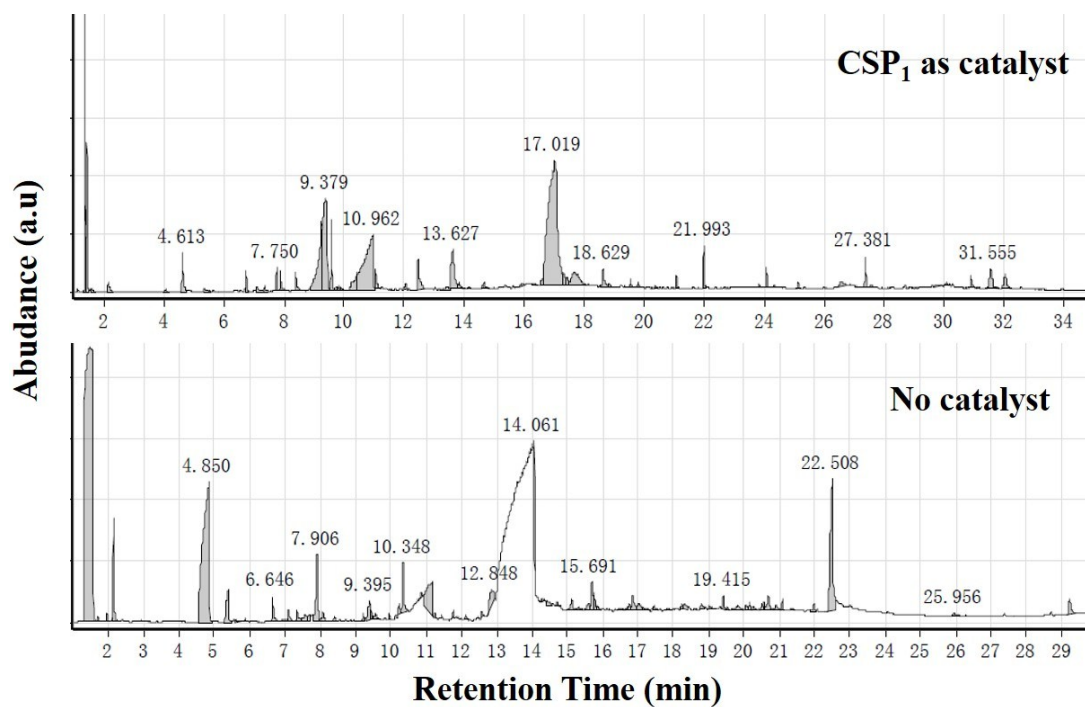


Fig.S1 GC chromatographs of products distribution with and without catalysts:

Cellulose (0.2 g), catalyst (0.4 g), N₂ (1 MPa), 210 °C, 1 h.

Table S2 The typical compounds from cellulose in this study with and without catalysts.

Retention time (S)	Compound	Selectivity %	
		No catalyst	CSP ₁
2.141	Propanoic acid, ethyl ester	1.47	0.46
4.039	2-Butenoic acid, 2-methyl, methyl ester	--	0.12
4.613	3-Furaldehyde	14.60	1.71
5.322	2-Butanone	1.31	0.16
6.646	Ethanone, 1-(2-furanyl)-	0.54	--
6.728	1,3-Diocepane, 2-methyl-2-propyl-	--	0.56
7.091	2-Pentenoic acid, 4-hydroxy-	--	0.22
7.195	2,5-Hexanedione	0.31	--
7.359	2,4-Dimethyl-3-pentanol acetate	--	0.16
7.693	trans-2-Pentenoic acid	0.61	--
7.863	2-Furancarboxaldehyde, 5-methyl-	2.01	0.81
8.376	Phenol	0.12	0.86
9.238	Hexanoic acid	--	7.20
9.379	2-Cyclopenten-1-one, 2-hydroxy-3-methyl-	0.67	11.46
9.577	Hexanal dimethyl acetal	--	2.14
9.751	2(3H)-Furanone, 5-butyldihydro-	--	0.13
9.822	2,5,5-Trimethyl-3-hexyn-2-ol	--	0.16
9.879	2-Cyclopenten-1-one, 3-ethyl-2-hydroxy-	0.08	0.19
9.947	4H-Pyran-4-one, 2-ethyl-6-methyl-	0.09	--
10.962	4-Oxopentanoic acid	3.23	15.64
11.042	2,5-Cyclohexadiene-1,4-dione,2-hydroxy-5-methyl-	--	0.84
11.765	2,3-Dihydroxybenzaldehyde	0.14	--
12.459	Catechol	0.10	1.77
13.392	1-Methoxy-3,5-dimethylcyclohexene	--	0.23
13.627	Hydroquinone	--	4.22
14.061	5-Hydroxymethylfurfural	58.12	1.85
14.169	Bicyclo [3.1.0] hexane-6-methanol, 2-hydroxy-1,4,4-trimethyl-	--	0.11
15.691	1,2-Benzenediol	0.83	--
15.754	Benzenemethanol, alpha-ethyl-4-methoxy-	0.48	--
15.945	5-tert-Butylpyrogallol	--	0.33
16.604	2,4,6-Trimethoxytoluene	--	0.33
16.842	3-Buten-2-one, 3-methyl-4-(1,3,3-trimethyl-7-oxabicyclo heptan)	0.63	--
17.019	1,2,4-Benzenetriol	0.21	36.97
17.123	3-buten-2-one, 4-(5,5- dimethyl-1-oxaspiro [2.5] oct-4-yl)	0.09	--
17.654	3,4,5-Trihydroxytoluene	--	2.88

18.818	2,5-Heptadienoic anhydride,2,3,4,5,6-pentamethyl-	--	0.16
19.415	5,6,6-Trimethyl-5-(3-oxobut-1-enyl)-1-oxaspiro [2.5] octan-4-one	0.55	--
19.548	11-Oxatetracyclo [5.3.2.0(2,7).0(2,8)] dodecan-9-one	--	0.24
20.363	2,2,6,7-Tetramethyl-10-oxatricyclo [4.3.1.0(1,6)] decan-5-ol	--	0.11
21.079	1,2-Benzenedicarboxylic acid, bis(2-methylpropyl) ester	--	0.29
21.993	n-Hexadecanoic acid	--	1.15
22.508	5,6,6-Trimethyl-5-(3-oxobut-1-enyl)-1-oxaspiro-4-one	6.21	--
24.079	Octadecanoic acid	--	0.58
25.139	2-Benzofurancarboxylic acid	--	0.20
27.381	Phenol, 2,2'-methylenebis[6-(1,1-dimethylethyl)-4-methyl-	--	0.85
29.227	Zearalenone	0.68	--

Reaction conditions: Cellulose (0.2 g), catalyst (0.4 g), N₂ (1MPa), 210 °C, 1 h.

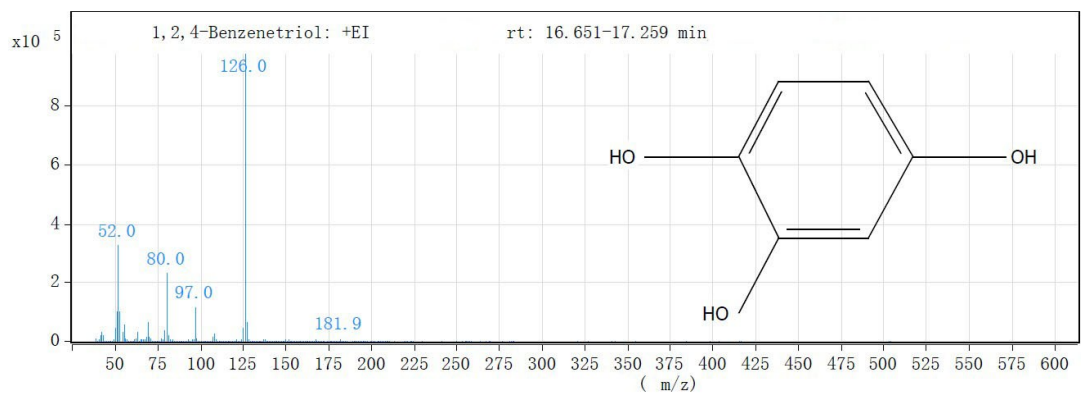


Fig.S2 MS spectrogram of 1,2,4-Benzenetriol. Reaction conditions: Cellulose (0.2 g), CSP₁ as catalyst (0.4 g), N₂ (1MPa), 210 °C, 1h.

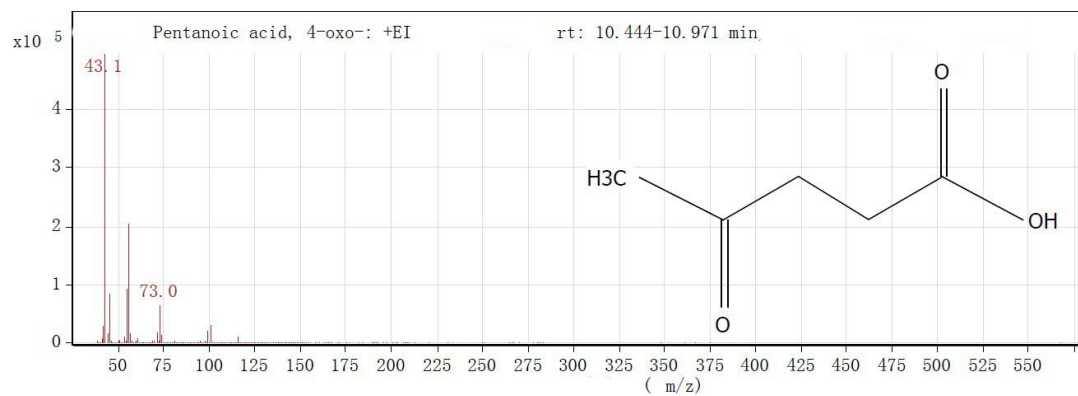


Fig.S3 MS spectrogram of Pentanoic acid, 4-oxo. Reaction conditions: Cellulose (0.2 g), CSP₁ as catalyst (0.4 g), N₂ (1MPa), 210 °C, 1h.

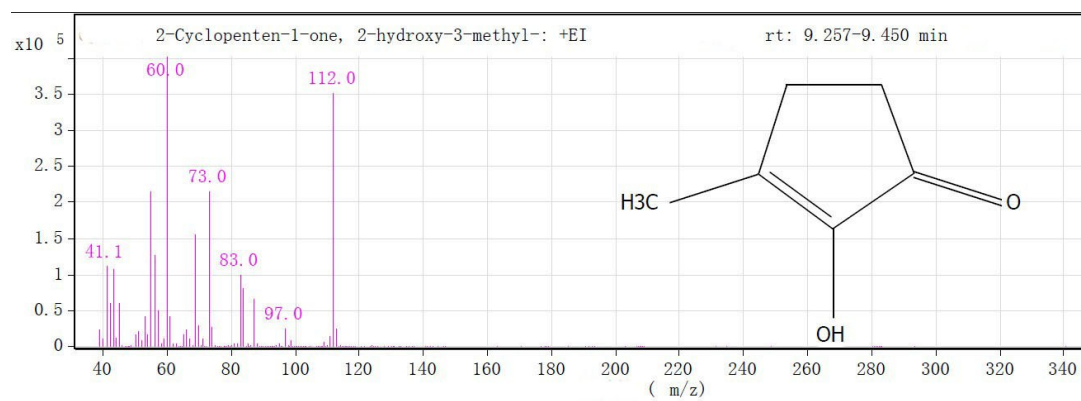


Fig.S4 MS spectrogram of 2-Cyclopenten-1-one, 2-hydroxy-3-methyl-. Reaction conditions: Cellulose (0.2 g), CSP₁ as catalyst (0.4 g), N₂ (1MPa), 210 °C, 1h.

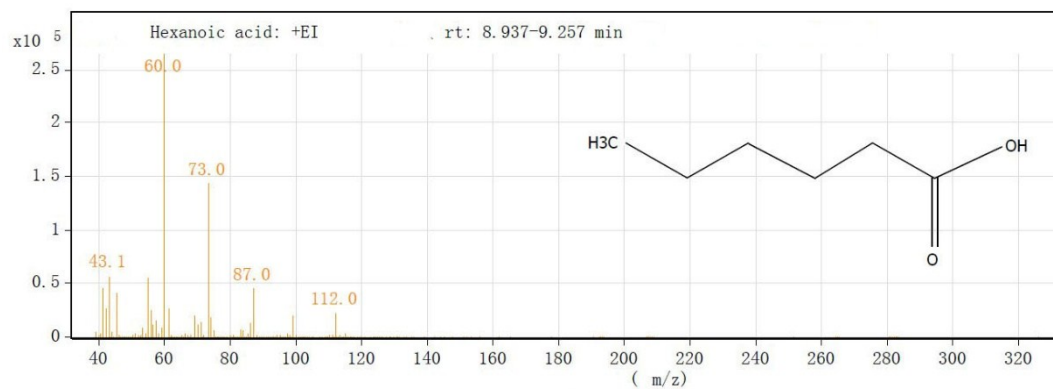


Fig.S5 MS spectrogram of Hexanoic. Reaction conditions: Cellulose (0.2 g), CSP₁ as catalyst (0.4 g), N₂ (1MPa), 210 °C, 1h.

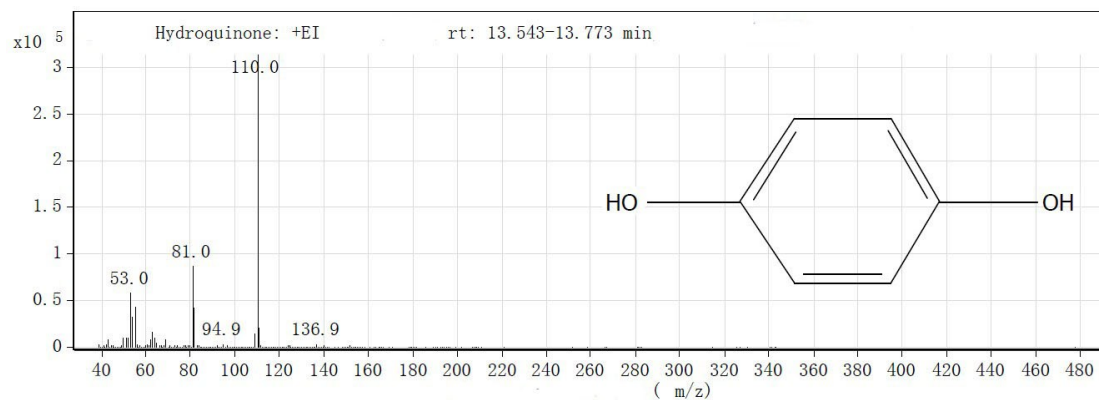


Fig.S6 MS spectrogram of Hydroquinone. Reaction conditions: Cellulose (0.2 g), CSP₁ as catalyst (0.4 g), N₂ (1MPa), 210 °C, 1h.

Table S3 The conversion of cellulose, selectivity and yield of products.

Catalysts	Catalyst Amount (g)	Time (h)	Temperature (°C)	Pressure (MPa)	Conversion (%)	Selectivity %	Yield %
CSP _{0.5}					98.5	18.73	18.45
CSP ₁					>99.9	36.97	36.93
CSP ₂	0.4	1	210	1	>99.9	30.27	30.24
CSP ₄					>99.9	26.71	26.68
CSP ₆					>99.9	21.50	21.46
	0				43.6	0.21	0.09
	0.1				93.8	10.63	9.97
CSP ₁	0.2	1	210	1	>99.9	22.63	22.60
	0.3				>99.9	28.65	28.62
	0.5				>99.9	21.41	21.38
	0.6				>99.9	11.62	11.60
		0.5			96.4	28.66	27.62
		1.5			>99.9	27.64	27.61
CSP ₁	0.4	2.0	210	1	>99.9	25.92	25.89
		2.5			>99.9	17.45	17.43
		3.0			>99.9	11.76	11.74
			190		86.3	8.46	7.30
CSP ₁	0.4	1	230	1	>99.9	42.30	42.25
			250		>99.9	35.17	35.13
			270		96.6	23.18	22.39
				0	35.7	3.25	1.16
CSP ₁	0.4	1	210	2.0	>99.9	23.51	23.47
				3.0	>99.9	13.33	13.31

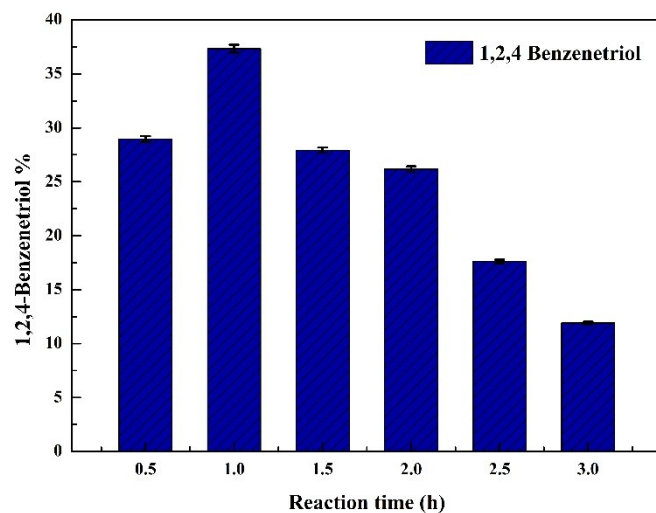


Fig.S7 Effect of reaction time on 1,2,4- Benzenetriol production. Reaction conditions: Cellulose (0.2 g), CSP₁ as catalyst (0.4 g), N₂ (1MPa), 210 °C.

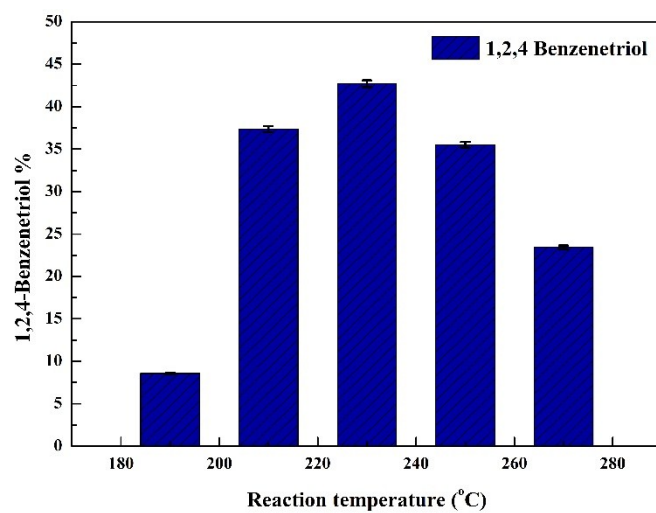


Fig.S8 Effect of reaction temperature on 1,2,4- Benzenetriol production. Reaction conditions: Cellulose (0.2 g), CSP₁ as catalyst (0.4 g), N₂ (1MPa), 1 h.

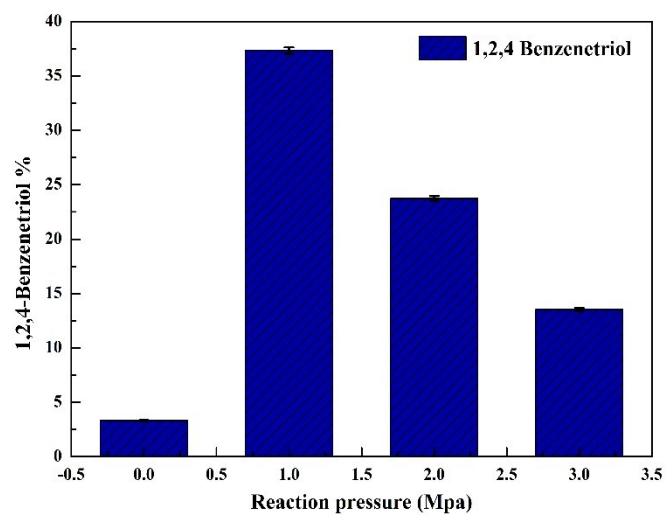


Fig.S9 Effect of reaction pressure on 1,2,4- Benzenetriol production: Cellulose (0.2 g), CSP₁ as catalyst (0.4 g), 1 h, 210 °C.