Electronic Supplementary Material (ESI) for RSC Advances.

Supporting Information

Selective catalytic degradation of lignin model compound into phenol over transition metal sulfates

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Materials

Benzyl phenyl ether (BPE, GC), chromium sulfate ($Cr_2(SO_4)_3·6H_2O$, AR), manganese sulfate ($MnSO_4·H_2O$, AR), ferrous sulfate ($FeSO_4·7H_2O$, AR), cobaltous sulfate ($CoSO_4·7H_2O$, AR), nickel sulfate (NiSO4·6H2O, AR), copper sulfate ($CuSO_4·5H_2O$, AR), zinc sulfate ($ZnSO_4·7H_2O$, AR), nickel chloride ($NiCl_2·6H_2O$, AR), nickel nitrate ($NiNO_3·6H_2O$, AR), nickel carbonate ($NiCO_3$, AR), phenol (GC), benzyl methyl ether (GC), benzyl alcohol (GC) were supplied by Aladdin bio-chem technology Co., Ltd. (Beijing, China). Methanol (GC) and tetrahydrofuran (GC) were purchased from Merck (Germany).

Characterization

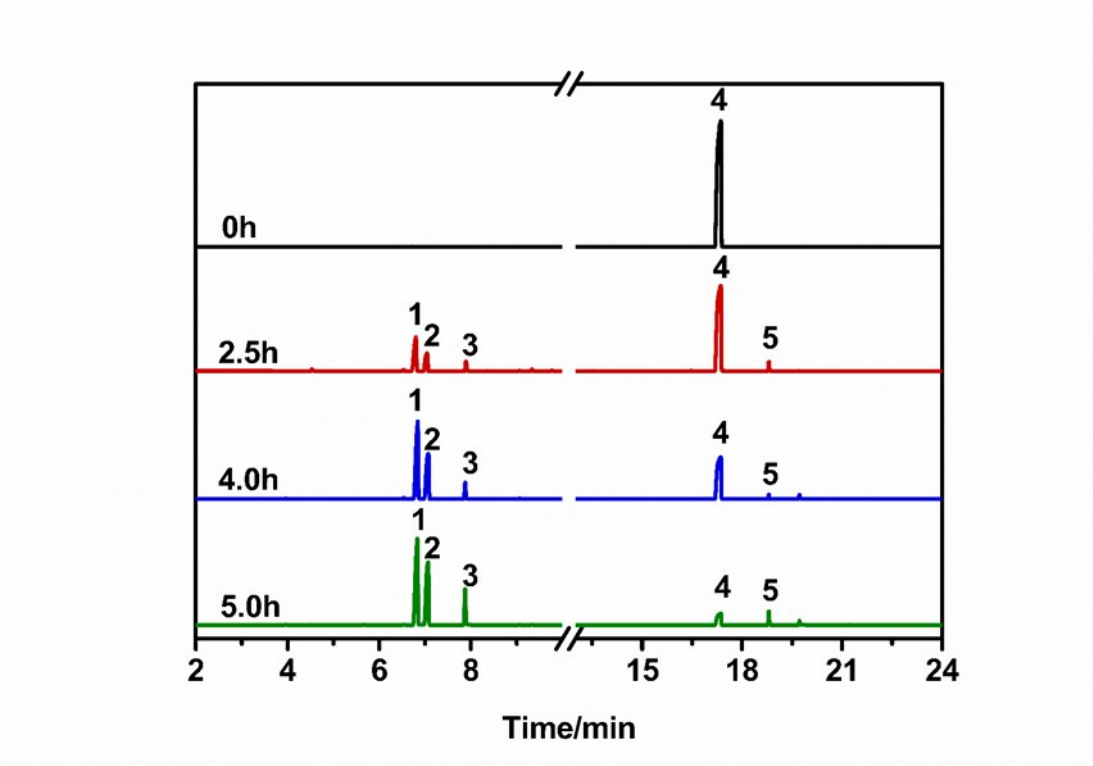


Fig. S1 GC-MS spectra of BPE degradation products. Condition: 0.3000 g BPE, 1.4 mmol $NiSO_4·6H_2O$, 200 °C.

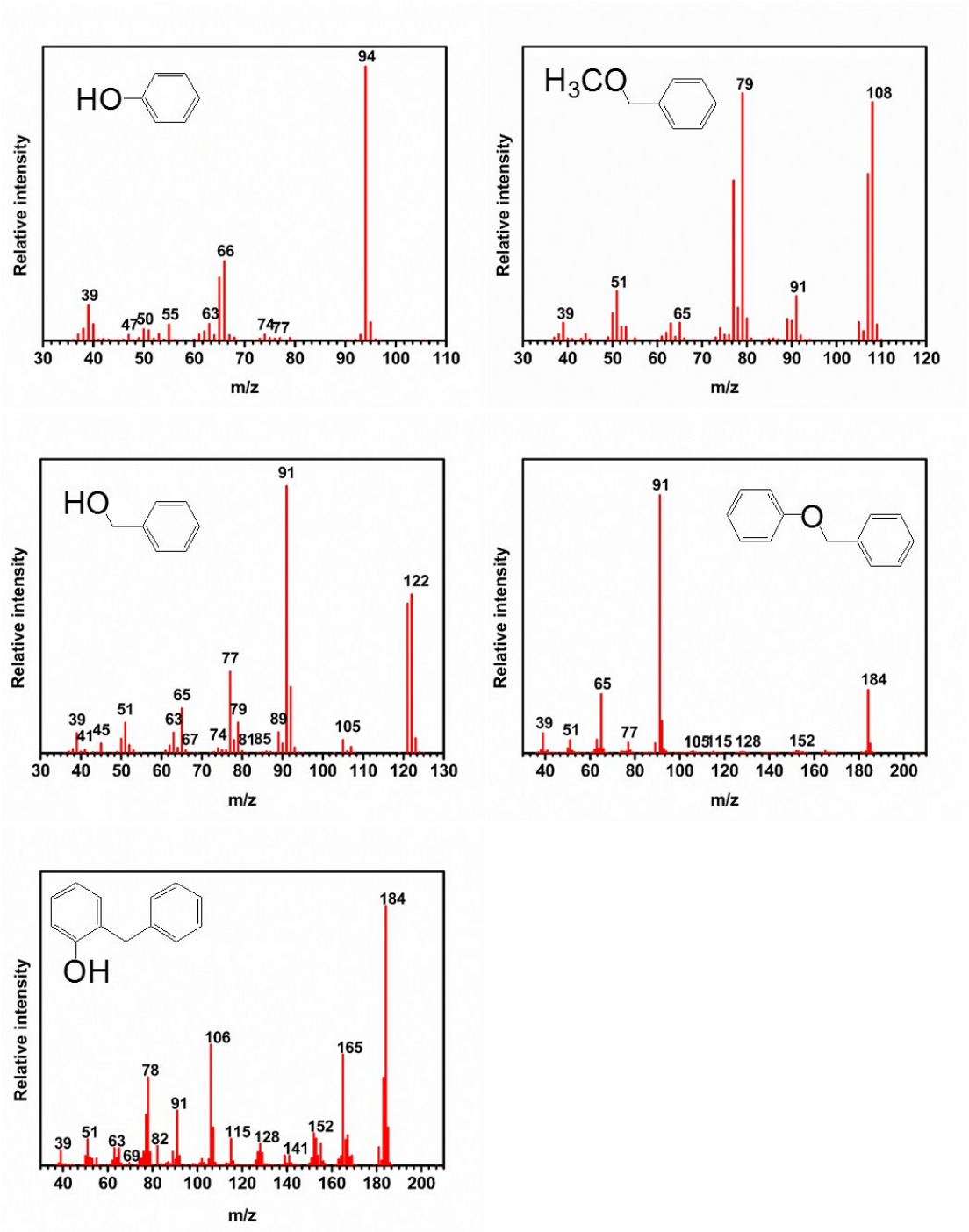


Fig. S2 MS of BPE primary degradation products. Condition: 300 mg BPE, 1.4 mmol $NiSO_4 \cdot 6H_2O$, 200 °C.

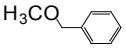
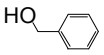
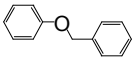
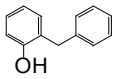
Table S1 The effect of transition metal salts on BPE degradation efficiency and phenol selectivity.

Run	Catalyst	pH	Total Degradation (%)	Phenol Selectivity (%)
1	-	-	3.6	-
2	$Cr_2(SO_4)_3 \cdot 6H_2O$	2.94	38.5	14.9
3	$MnSO_4 \cdot H_2O$	4.21	18.7	-
4	$FeSO_4 \cdot 7H_2O$	2.16	57.2	20.1
5	$CoSO_4 \cdot 7H_2O$	3.72	28.3	12.9
6	$NiSO_4 \cdot 6H_2O$	2.89	90.4	48.6
7	$CuSO_4 \cdot 5H_2O$	2.62	65.7	24.5
8	$ZnSO_4 \cdot 7H_2O$	4.15	43.6	22.7
9	$NiCl_2 \cdot 6H_2O$	3.44	52.2	3.2
10	$NiNO_3 \cdot 6H_2O$	5.46	30.9	4.3
11	$NiCO_3$	7.96	18.8	-

Condition: 300 mg BPE, 1.4 mmol transition metal salts, 20 mL methanol, 200 °C, 5 h.

- Without catalyst.

Table S2 The component of primary degradation products.

Run	Name	Structure	Retention time(min)
1	phenol		6.810
2	benzyl methyl ether		7.048
3	benzyl alcohol		7.888
4	benzyl phenyl ether		17.235
5	2-Benzyl phenol		18.800

Condition: 300 mg BPE, 1.4 mmol $NiSO_4 \cdot 6H_2O$, 20 mL methanol, 200 °C.

Table S3 The selectivity of each products.

R.T	BPE	Phenol	Benzyl methyl ether	Benzyl alcohol
	dep%	sel%	sel%	sel%
0.5h	5.63	16.34	9.21	1.59
1.0h	8.56	18.57	15.40	1.83
1.5h	15.62	31.03	24.76	3.69
2.0h	32.20	34.45	26.57	4.97
2.5h	37.10	41.36	31.72	8.13
3.0h	61.16	46.18	31.82	10.41
4.0h	75.60	53.14	32.10	10.84
5.0h	90.82	48.65	31.22	11.39

Condition: 0.3000 g BPE, 1.4 mmol $NiSO_4 \cdot 6H_2O$, 20 mL methanol, 200 °C.