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Degradation of Lignin with Aqueous Ammonium-Based Ionic Liquid Solutions under Milder Condition

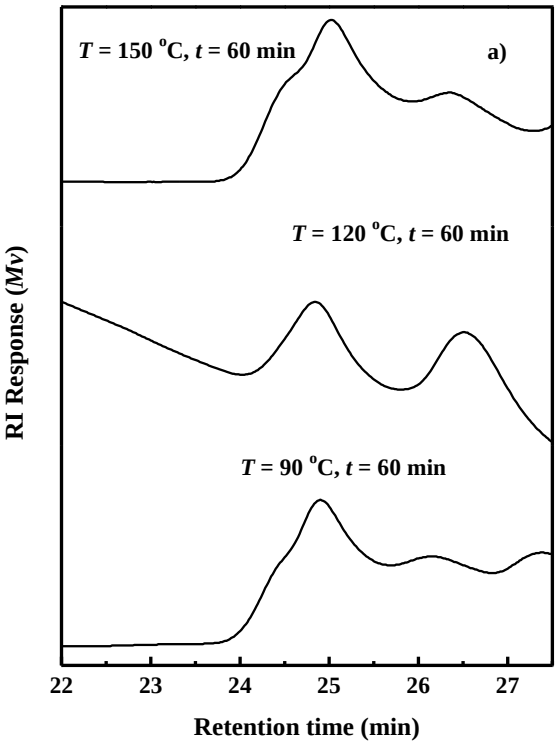
Leta Deressa Tolesa, Bhupender S. Gupta, and Ming-Jer Lee*

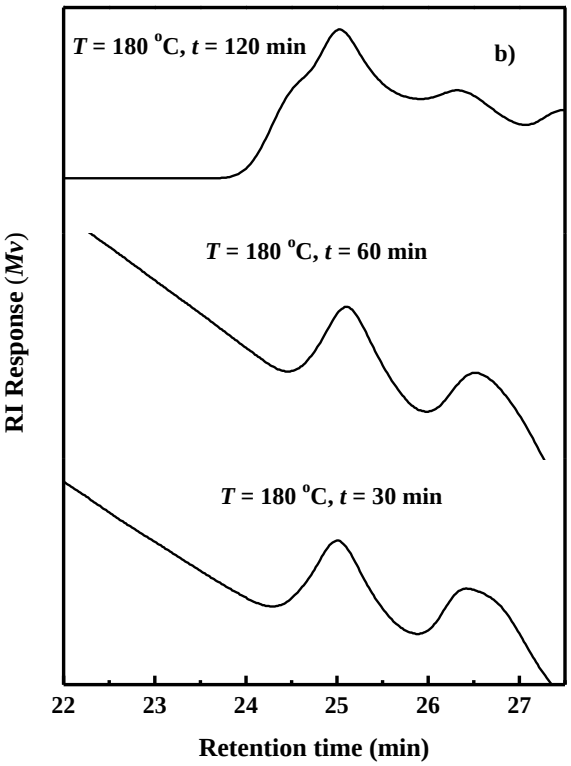
Electronic Supplementary Information

Table S1

The possible functional groups and the corresponding wavenumber of post-treated samples of lignin in aqueous solution of [DMBA][Ac]or [DMBA][B] at various reaction conditions of temperature (*T*) and time interval (*t*).

T (°C)	*t* (min)	wavenumber (cm^{-1})			
		OH	*C - H*	Benzene ring	*C - O*
Lignin in 50 *wt*% [DMBA][Ac]					
90	60	3378	2909	1648	1028, 1045, 1123
120	60	3378	2909	1640	1036, 1084, 1123
150	60	3358	2909	1640	1028, 1076, 1142
180	30	3358	2908	1631	1036, 1134
180	60	3370	2908	1631	1036, 1145
180	120	3382	2908	1631	1036, 1145
Lignin in 80 *wt*% [DMBA][Ac]					
180	30	3345	2921	1631	1036, 1134
180	60	3370	2921	1631	1036, 1145
180	120	3370	2921	1631	1036, 1170
Lignin in 30 *wt*% [DMBA][B]					
180	30	3370	2921	1631	1049, 1182
180	60	3358	2921	1631	1049, 1170
180	120	3370	2921	1631	1036, 1170
Lignin in 50 *wt*% [DMBA][B]					
90	60	3408	2921	1608	1049, 1182
120	60	3408	2921	1608	1049, 1182
150	60	3408	2921	1608	1049, 1182
180	30	3395	2921	1608	1036, 1182
180	60	3370	2921	1608	1036, 1182
180	120	3370	2921	1608	1036, 1182
Lignin in 80*wt*% [DMBA][B]					
180	30	3382	2921	1631	1036, 1145
180	60	3370	2921	1631	1036, 1134
180	120	3370	2921	1631	1036, 1182


T = 150 °C, t = 60 min
a)
T = 120 °C, t = 60 min
T = 90 °C, t = 60 min
RI Response (Mv)
22
23
24
25
26
27
Retention time (min)


T = 180 °C, t = 120 min
b)
T = 180 °C, t = 60 min
T = 180 °C, t = 30 min
RI Response (Mv)
22
23
24
25
26
27
Retention time (min)

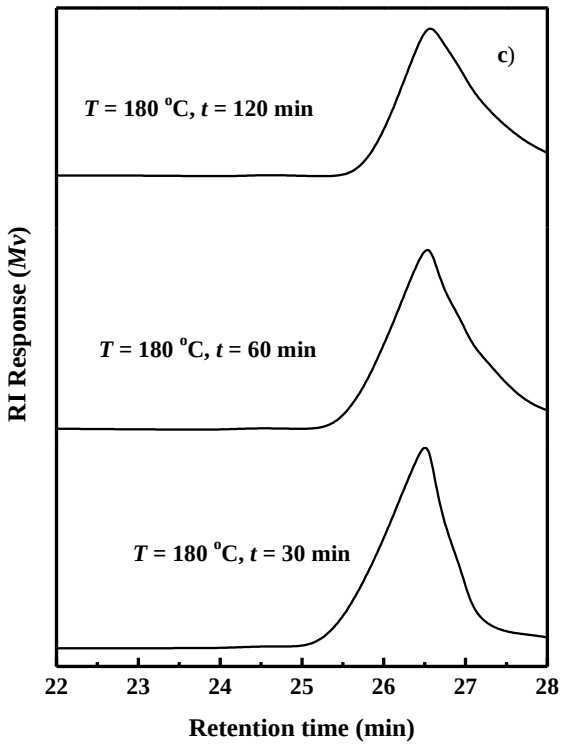
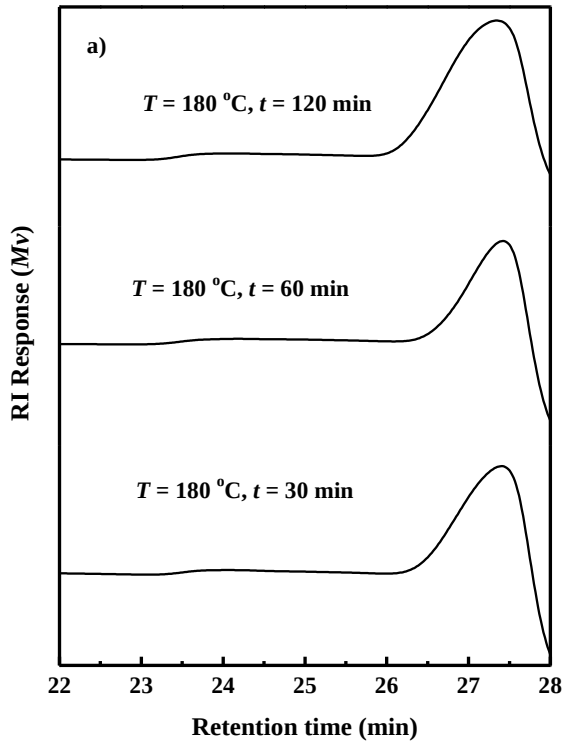
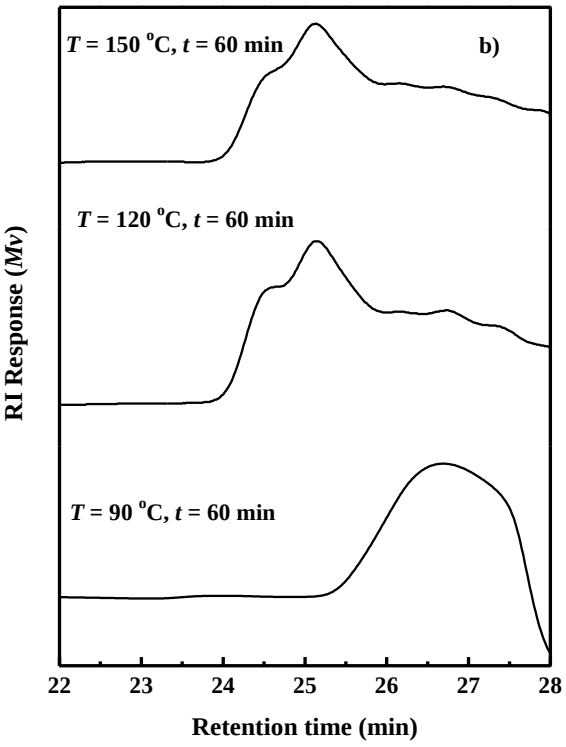


Fig. S1 The GPC analyses ofdepolymerized lignin in 50 *wt*% (a,b) and 80 *wt*% (c) of [DMBA][Ac] aqueous solutions at different experimental conditions.


a)
T = 180 °C, t = 120 min
T = 180 °C, t = 60 min
T = 180 °C, t = 30 min
RI Response (Mv)
22
23
24
25
26
27
28
Retention time (min)


T = 150 °C, t = 60 min
b)
T = 120 °C, t = 60 min
T = 90 °C, t = 60 min
RI Response (Mv)
22
23
24
25
26
27
28
Retention time (min)

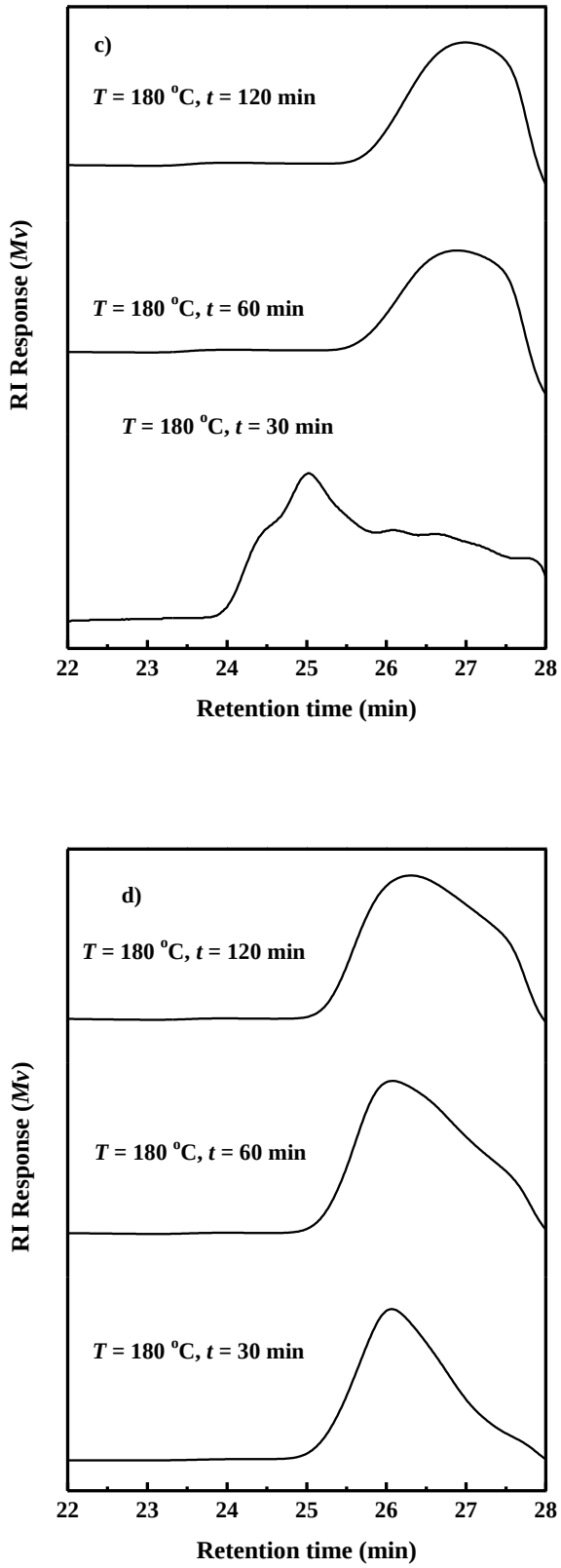
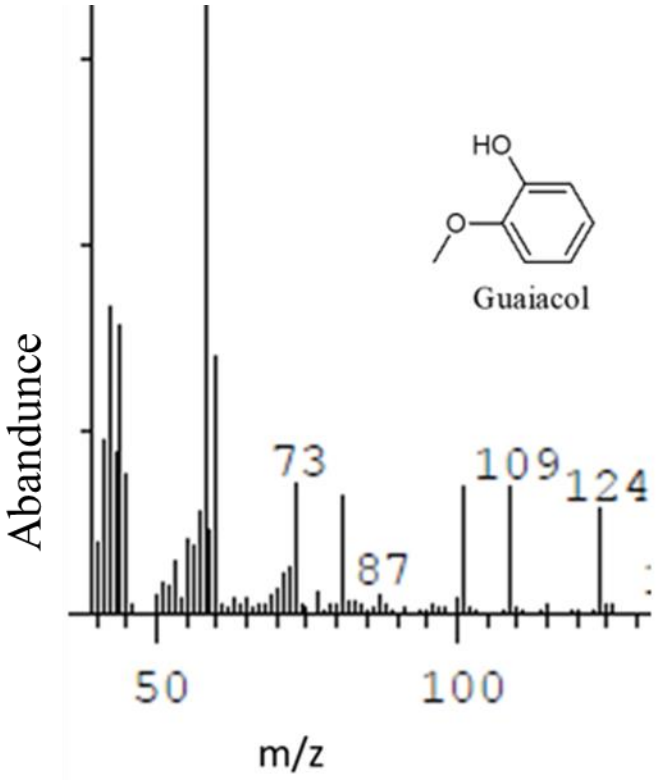
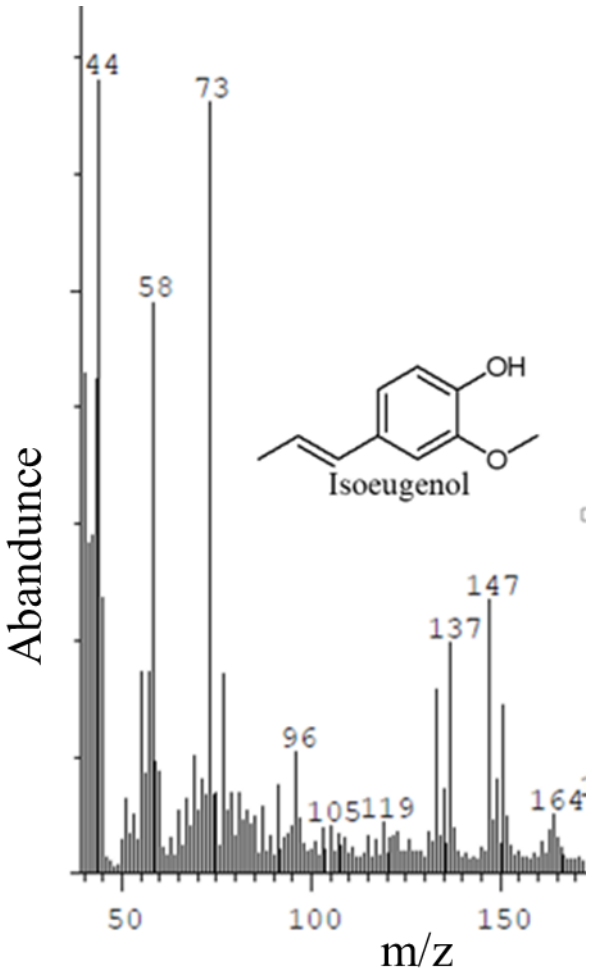
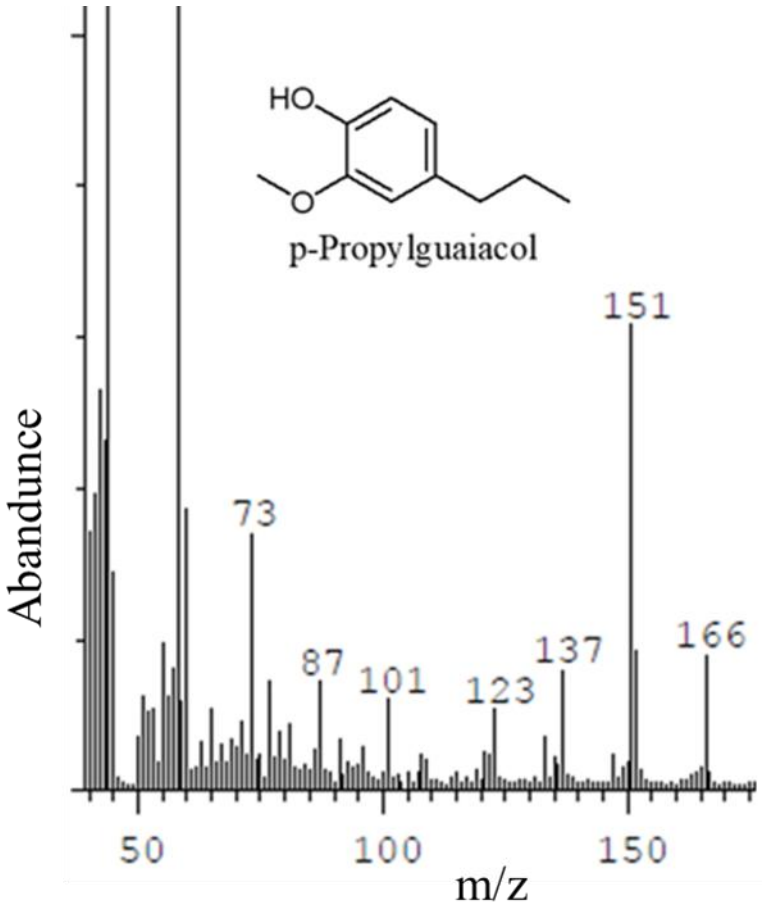
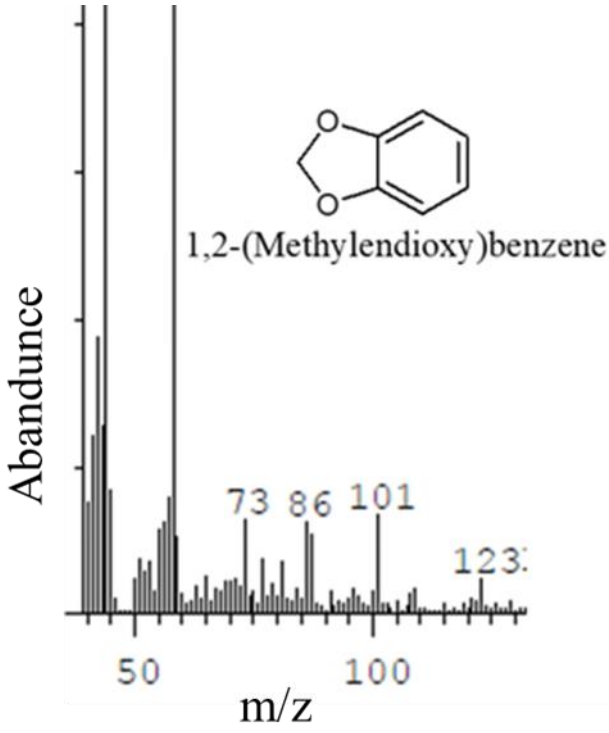


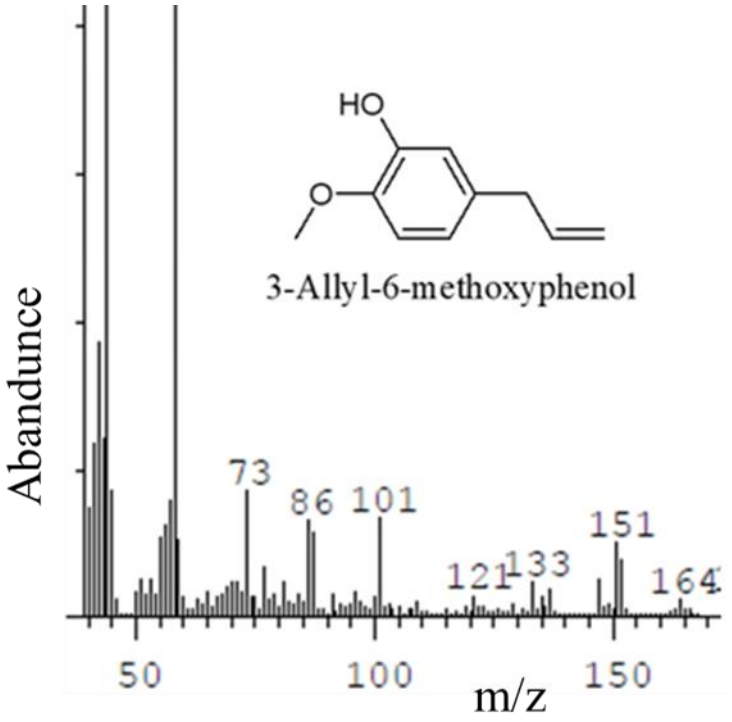
Fig. S2 The GPC analyses of depolymerized ligninsin 30 *wt*% (a), 50 *wt*% (b, c) and 80 *wt* % (d) of [DMBA][B] aqueous solutions at different experimental conditions.

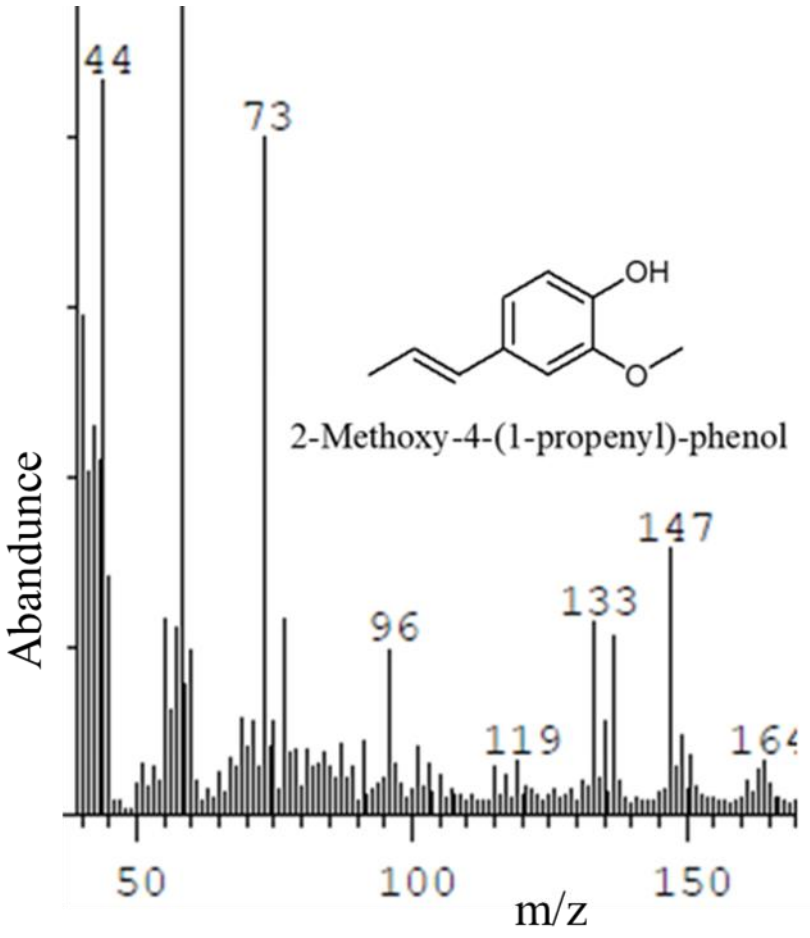

HO
O
Guaiacol
Abandunce
73
87
109
124
50
100
m/z

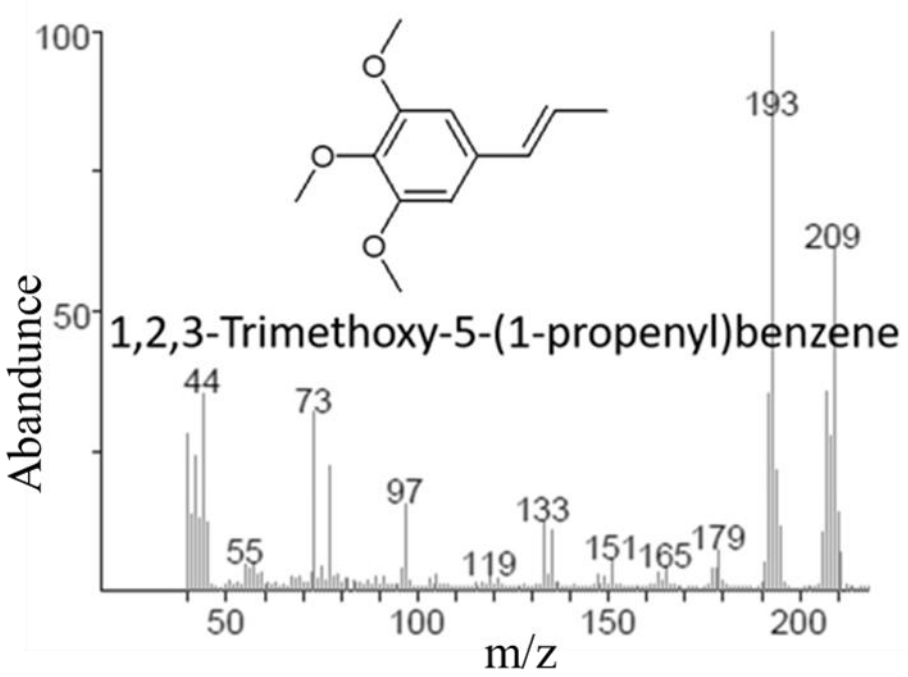

44
73
58
OH
O
Isoeugenol
147
137
96
105
119
164
Abandunce
50
100
150
m/z

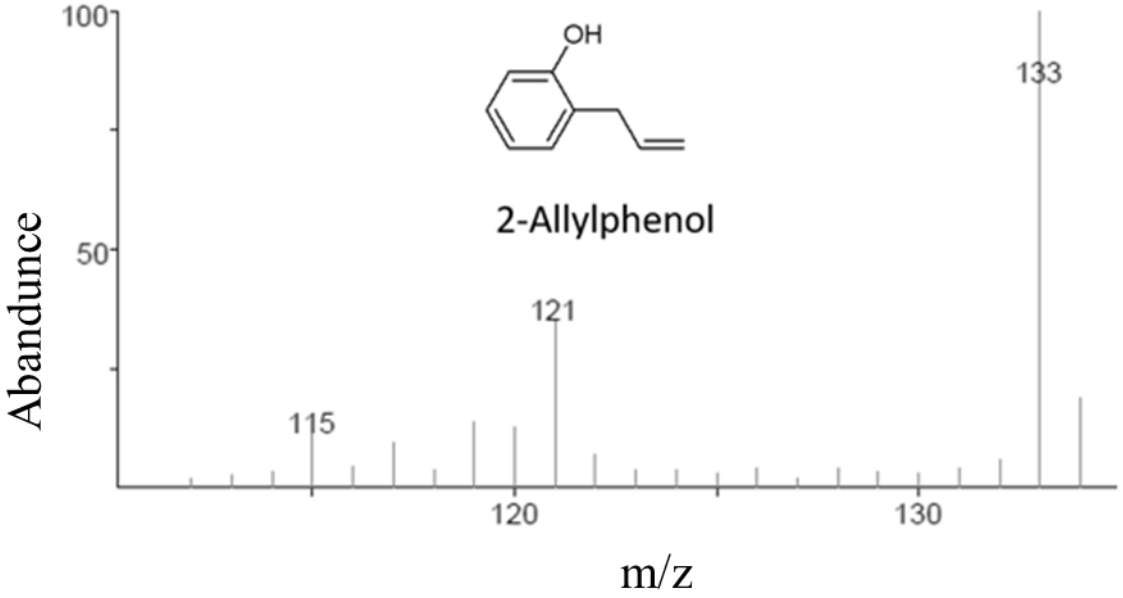

HO
O
p-Propylguaiacol
151
73
87
101
123
137
166
Abandunce
50
100
150
m/z

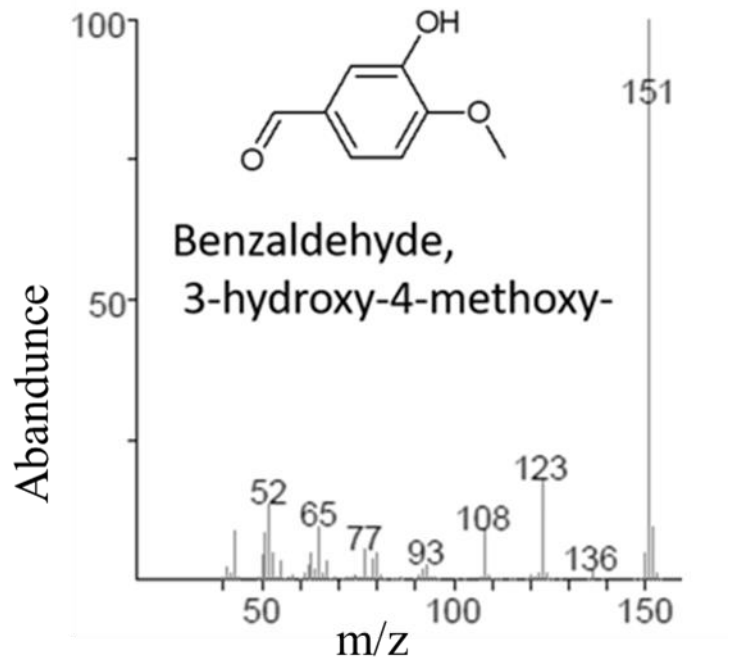

O
O
1,2-(Methylendioxy)benzene
73
86
101
123
Abandunce
50
100
m/z

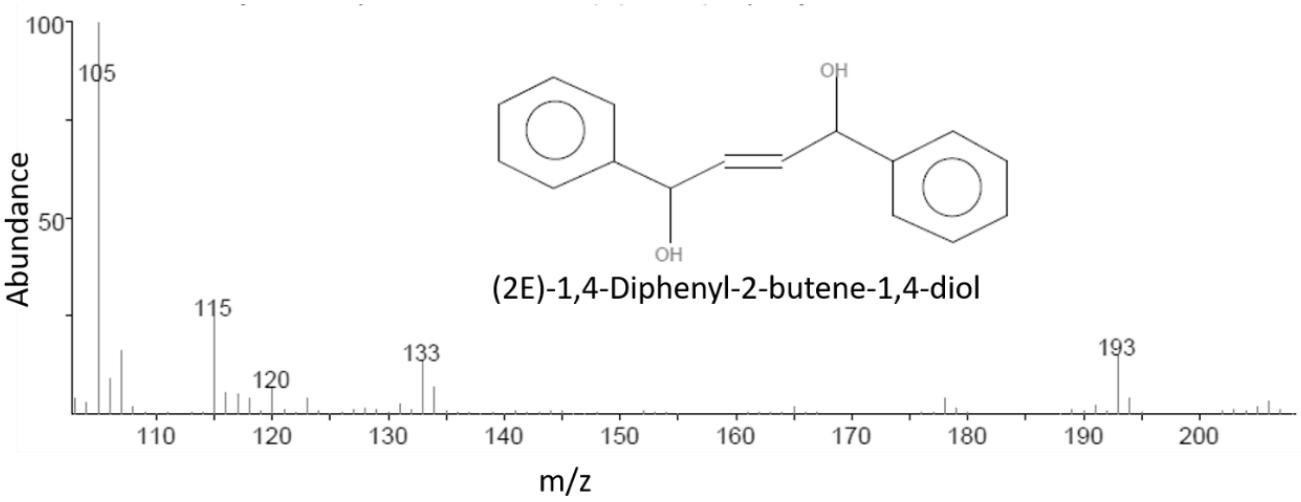

HO
O
3-Allyl-6-methoxyphenol
Abandunce
73
86
101
121
133
151
164
50
100
150
m/z


OH
O
2-Methoxy-4-(1-propenyl)-phenol
Abandunce
44
73
96
119
133
147
164
50
100
150
m/z


100
50
Abandunce
1,2,3-Trimethoxy-5-(1-propenyl)benzene
193
209
44
73
97
133
55
119
151
165
179
50
100
150
200
m/z


100
50
Abandunce
OH
2-Allylphenol
133
121
115
120
130
m/z


100
50
Abandunce
OH
O
151
Benzaldehyde,
3-hydroxy-4-methoxy-
52
65
77
93
108
123
136
50
100
150
m/z


100
50
Abundance
105
115
120
133
193
OH
OH
(2E)-1,4-Diphenyl-2-butene-1,4-diol
110
120
130
140
150
160
170
180
190
200
m/z

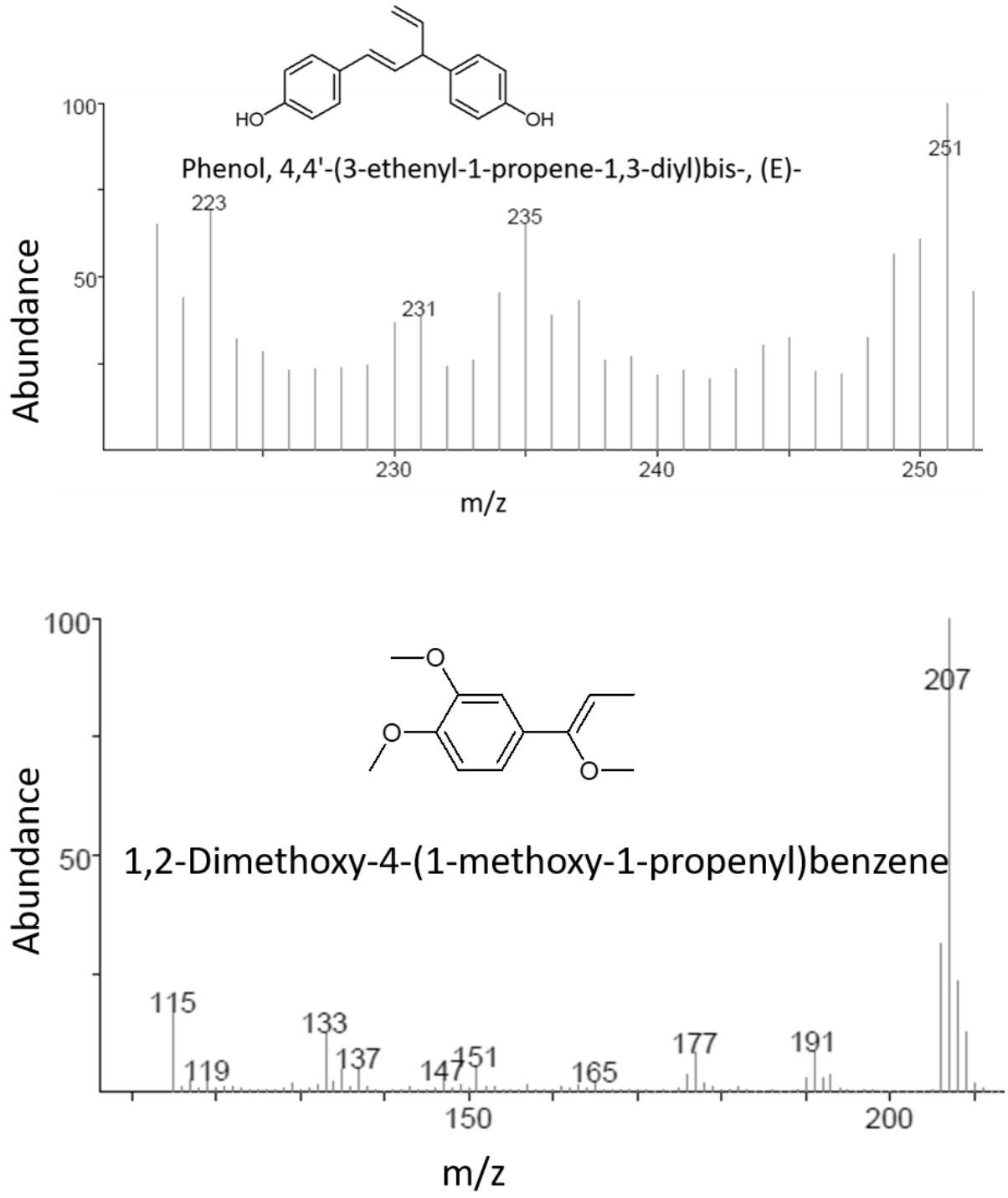


Fig. S3 The mass spectra and molecular structures of the major phenolic compounds obtained from depolymerized lignin in aqueous [DMBA][Ac] and [DMBA][B] solutions.

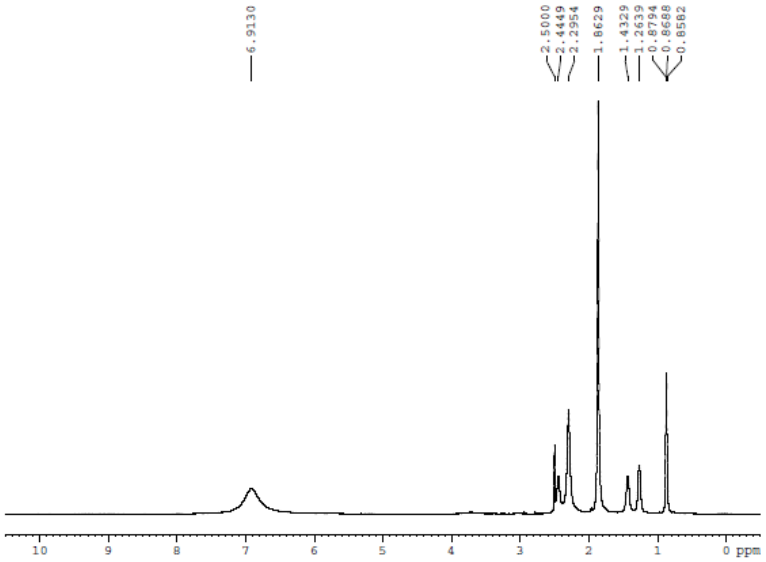


Fig. S4 The [1]HNMR spectrum of depolymerized lignin in 50*wt*% [DMBA][Ac] aqueous solutions at favorable reaction conditions (at 180 ˚C for 60 min).

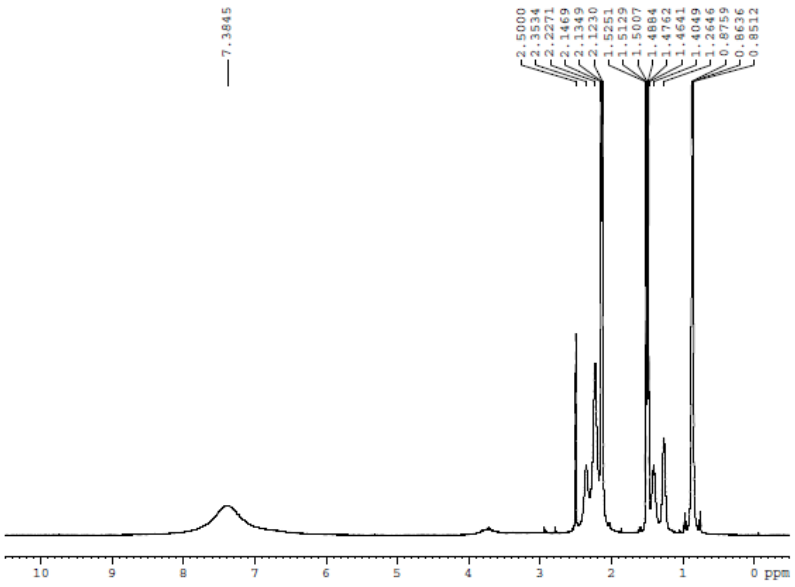


Fig. S5 The [1]HNMR spectrum of depolymerized lignin in 50 *wt*% [DMBA][B] aqueous solutions at favorable reaction conditions (at 180 ˚C for 60 min).

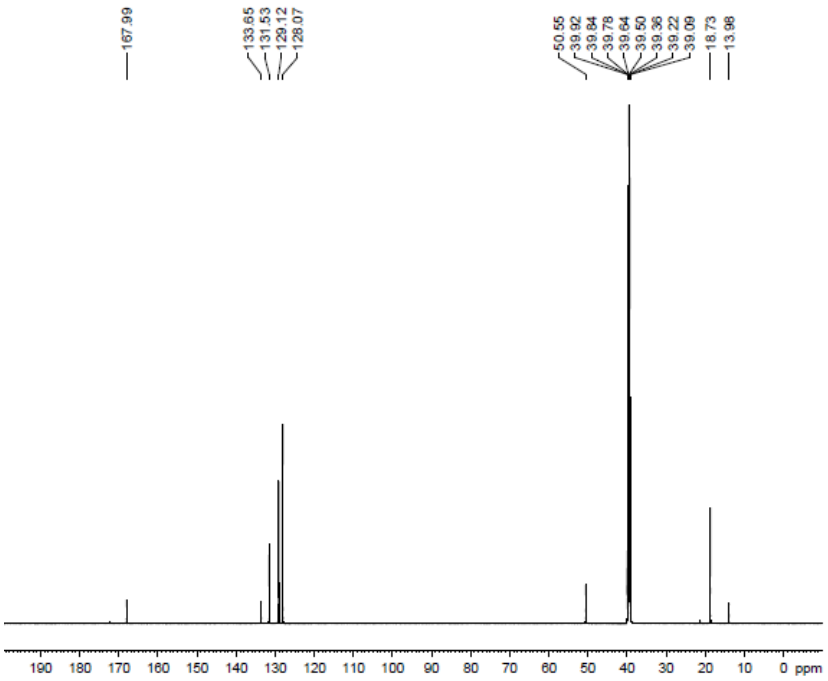


Fig. S6 The ^{13}CNMR spectrum of depolymerized lignin in 50*wt*% [DMBA][Ac] aqueous solutions at favorable reaction conditions (at 180 ˚C for 60 min).

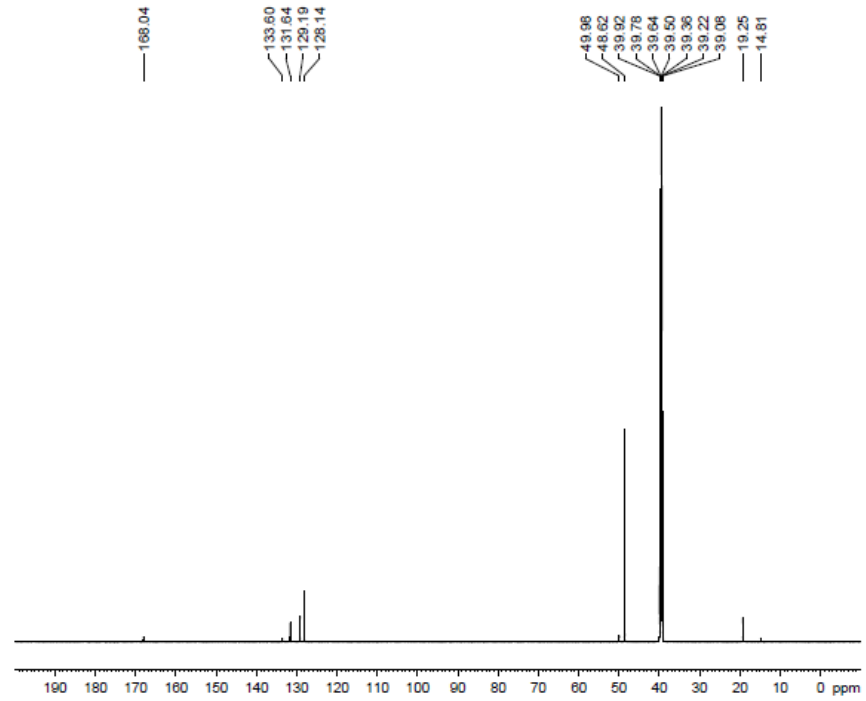


Fig. S7 The ^{13}CNMR spectrum of depolymerized lignin in 50 *wt*% [DMBA][B] aqueous solutions at favorable reaction conditions (at 180 ˚C for 60 min).