Table S1 Alkaline lignin oxidation products in MeOH and its DES system

No.	Product	Structure	Content(%) in different system			
			MeOH	MeOH-ChCl 1:1	MeOH-ChCl 4:1	MeOH-ChCl 8:1
1	Methyl formate	-	2.44	-	-	18.59
2	Methyl acetate	-	6.68	13.74	-	-
3	4-Methyl-3-Heptanone	-	14.97	-	-	-
4	2-Methyl-3-Pentanone	-	1.46	-	-	-
5	Methyl 2-Methylbutyrate	-	1.98	-	-	-
10	Glycolic acid	-	3.49	-	-	-
11	Cyclopentanone	-	0.78	-	-	-
12	1,3,5-Trioxane	-	0.66	-	-	-
13	Dimethyl sulfone	-	0.63	-	-	-
14	3-Tetrahydrofuranmethanol	-	-	-	-	0.96
15	Dimethyl oxalate	-	-	-	0.66	1.53
16	Acetic acid	-	31.41	36.35	16.36	26.51
17	Formic acid	-	-	-	4.26	3.47
18	Dimethyl sulfoxide	-	-	14.07	58.01	32.35
19	1,2-ethanediol	-	-	3.95	3.06	1.16
20	Guaiacol	G	3.53	5.40	2.75	2.40
21	Dimethyl sulfone	-	-	-	1.32	-
22	3-(2-furyl)-3-Penten-2-one	-	0.52	-	-	-
23	1,5-Dihydroxynaphthalene	-	0.50	-	-	-
24	4-Vinyl-2-Methoxy-Phenol	G-CH=CH_2	0.70	2.04	-	-
25	2,4-Di-Tert-Butylphenol	$(CH_3)_3C$-H-$C(CH_3)_3$	0.52	-	-	-
26	2,3-Dihydrobenzofuran	-	0.44	-	-	-
27	Phenol	H	2.12	-	-	-
28	2-Coumaranone	-	5.96	-	-	-
29	Vanillin	G-CHO	12.12	13.88	6.24	8.74
30	Vanillic acid	G-COOH	-	2.23	-	-
31	Vanillic acid methyl ester	G-$COOCH_3$	1.69	-	3.56	2.97
32	Acetovanillone	G-$COCH_3$	1.65	2.08	1.27	1.33
	4-Hydroxy-3-	G-CH_2COCH_3		-	1.07	-
33	Methoxypropiophenone		0.42			
34	6-Methoxycoumarin-7-Ol-3-One	-	0.49	-	-	-
	2,5-Dicyclopentenyl-	-		-	-	-
35	Cyclopentanone		0.65			
36	P-Hydroxybenzaldehyde	H-CHO	0.65	-	-	-
	4-Hydroxy-3-Methoxy-	G-$CH_2CH_2CH_2OH$	3.54	6.25	1.44	-
37	Phenylpropanol					

G, guaiacyl; H, p-hydroxyphenyl

Table S2 Nuclear magnetic resonance assignment of different lignin

Label	δ_C/δ_H (ppm) [a]	δ_C/δ_H (ppm) [b]	δ_C/δ_H (ppm) [c]	δ_C/δ_H (ppm) [d]	δ_C/δ_H (ppm) [e]	Assignment
IC_β	48.94/3.18	-	-	-	55.66/3.41	C_β-H_β in phenylcoumaran substructures（IC）
B_β	-	49.05/3.17	49.06/3.18	48.79/3.13	-	C_β-H_β in β-β (resinol) substructures（B）
B_β	-	53.63/3.1	53.66/3.11	53.54/3.16	53.58/3.13	C_β-H_β in β-β (resinol) substructures（B）
B_β	-	-	-	56.39/3.11	57.70/4.55	C_β-H_β in β-β (resinol) substructures（B）
OMe	-	55.96/3.83	-	55.58/3.83	-	C-H in methyl's（OMe）
OMe	-	-	-	55.62/3.46	-	C-H in methyl's（OMe）
A_γ	60.42/3.6	-	-	-	55.59/3.83	C_γ-H_γ in β-O-4 substructure（A）
A'_γ	-	-	67.87/4.15	67.35/3.84	-	C_γ-H_γ in γ-hydroxylated β-O-4 substructures（A'）
IC_γ	-	63.23/3.39	66.81/3.57	67.34/3.47	64.01/3.73	C_γ-H_γ in phenylcoumaran substructures（IC）
B_γ	-	70.27/3.51	70.27/3.52	-	67.38/3.84	C_γ-H_γ in β-β (resinol) substructures（B）
B_γ	-	-	-	-	67.39/3.42	C_γ-H_γ in β-β (resinol) substructures（B）
B_α	84.59/4.27	-	-	-	-	C_α-H_α in β-β (resinol) substructures（B）
A_α	71.64/4.75	-	-	-	-	C_α-H_α in β-O-4 substructures linked to a G（A）
$A_{\beta(S)}$	85.6/4.62	-	-	89.69/4.49	-	C_β-H_β in β-O-4 substructures linked to a S（A）
IC_α	87.24/5.46	-	-	-	-	C_α-H_α in phenylcoumaran substructures（IC）
G'_2	111.19/7.4	-	-	-	-	C_2-H_2 in guaiacyl units（G）
G_5	-	-	-	-	116.1/6.83	C_5-H_5 in guaiacyl units（G）
G_6	119.5/6.76	-	-	-	-	C_6-H_6 in guaiacyl units（G）
$S'_{2,6}$	-	-	-	-	104.84/7.33	$C_{2,6}$-$H_{2,6}$, C(α)=O in syringyl units（S'）
$H_{2,6}$	126.6/7.42	-	-	-	-	$C_{2,6}$-$H_{2,6}$ in p-hydroxyphenyl units（H）
$pCA_{2,6}$	-	-	129.38/7.72	-	130.87/7.56	$C_{2,6}$-$H_{2,6}$ in p-coumarate（*p*CA）
F'_β	126.18/6.96	-	-	-	-	C_β-H_β in cinnamaldehyde end groups（F）

a: Alkaline lignin

b: Solid residuals after alkaline lignin oxidation

c: Regenerated solid derived from dissolved lignin

d: Liquid fraction of alkaline lignin oxidation

e: DES-lignin