Supporting information for:

Novel biphasic DES/GVL solvent for effective biomass fractionation and valorization

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Table S1. Sugars and other derivatives in the pretreated liquor after biphasic solvent pretreatment under different pretreatment temperatures.

Degradation products (g/L)	Temperature (°C)		
	120	130	140
Glucose	0.35	0.28	0.13
Xylose	0.28	0.26	0.19
Furfural	3.40	4.49	3.41
Lactic acid	0.04	0.08	0.06
Formic acid	0.135	0.169	0.221
Acetic acid	0.828	1.058	1.564
Levulinic acid	0.174	0.155	0.134
HMF	0.139	0.137	0.154
Arabinose	0.011	0.021	0.031

Table S2 Recovery yield and polysaccharides content of recovered lignin.

Sample (Temp (°C)/Time (min))	Lignin recovery (%)	Glucose (%)	Xylose (%)	Arabinose (%)
$L_{120/60}$	96.48	0	0.05	0
$L_{130/60}$	95.21	0	0.06	0
$L_{140/60}$	95.24	0	0	0
$L_{130/30}$	98.59	0.03	0.02	0
$L_{130/60}$	95.21	0	0	0
$L_{130/90}$	98.29	0	0	0

Table S3 Lignin depolymerization and product distribution.

	Phenolic monomer yield (%)						
	1	2	3	4	5	6	Total
CEL	0.5	8.7	4.3	6.2	2.1	10.1	31.9
L_{120}	0	4.1	3.5	4.2	1.2	8.9	21.9
L_{130}	0	0.1	2.5	0.2	0.1	0.9	3.8
L_{LA}	0	0	0	0	0	0	0

Table S4. Quantification of CEL and Regenerated Lignin.

Sample	β-β (%)	β-5 (%)	FA (%)	PCE (%)
CEL	4.11	5.44	6.12	25.14
L_{120}	1.94	3.22	0	33.45
L_{130}	1.85	2.11	0	30.10
L_{140}	1.53	0.69	0	22.19

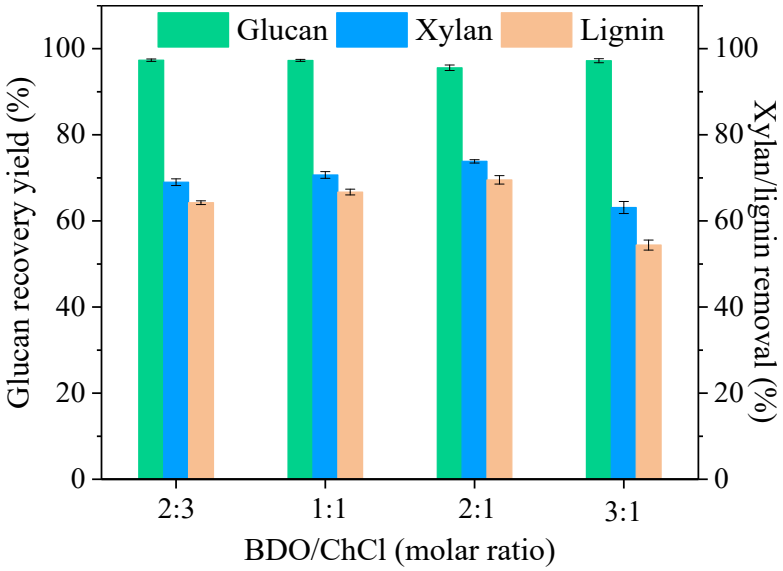

Fig. S1. Components variations under different BDO to ChCl molar ratios.

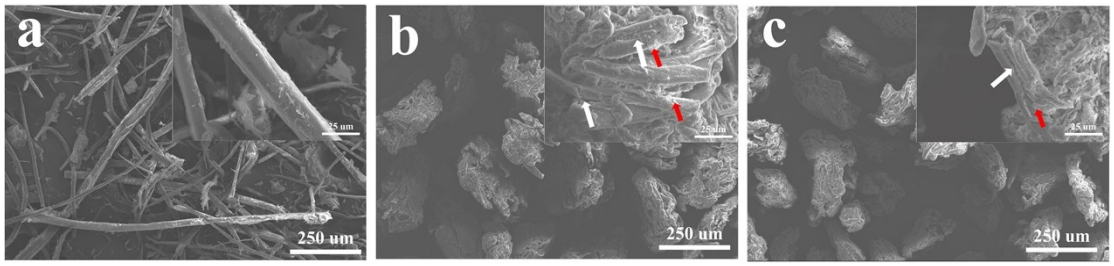

Fig. S2. The morphology analysis of the raw (a) and pretreated bamboo under different temperature of 120 (b) and 140 ℃ (c).

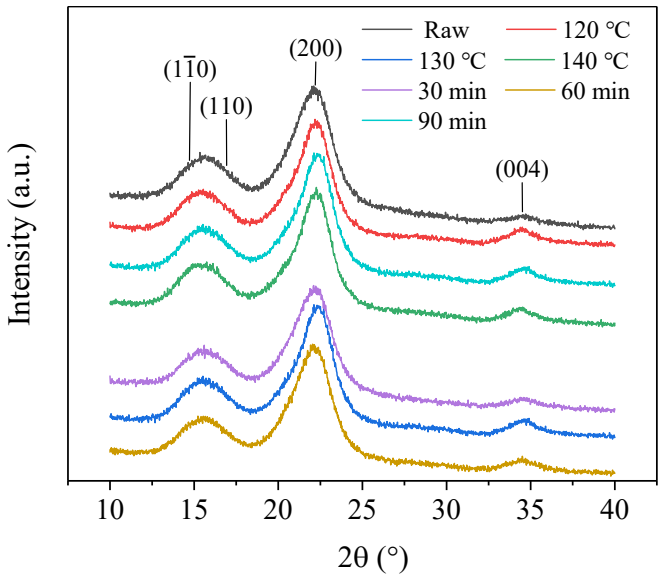

Fig. S3. XRD patterns of raw and pretreated samples.

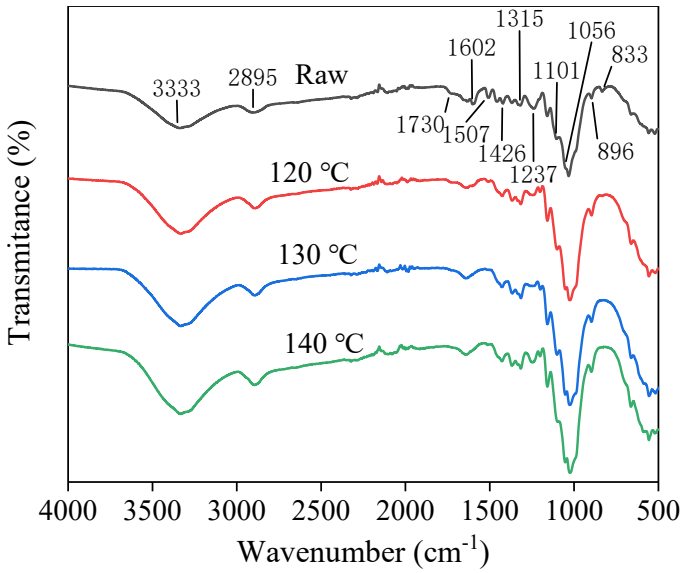

Fig. S4. The FTIR spectra of the raw and pretreated bamboo under different temperature.

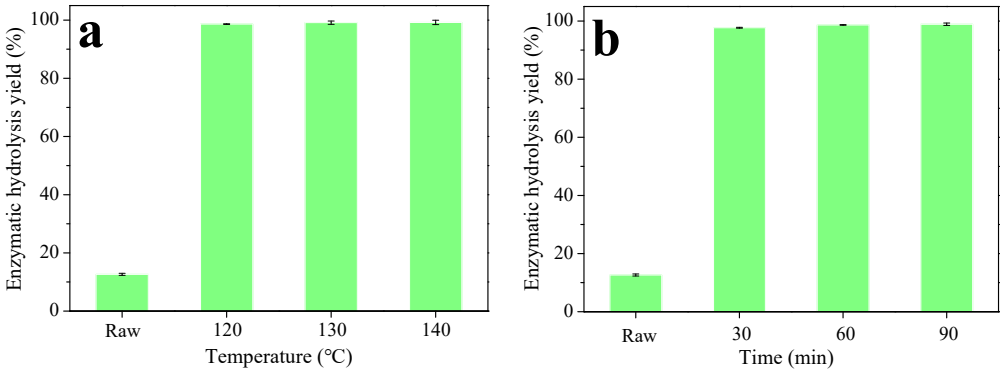

Fig. S5. Glucan enzymatic saccharification yield under different pretreatment temperature for 1 h (a), and different time at 120 ℃ (b) with the optimal additions of the $Al_2(SO_4)_3$ (0.15 M) and H_2SO_4 (0.075 M).

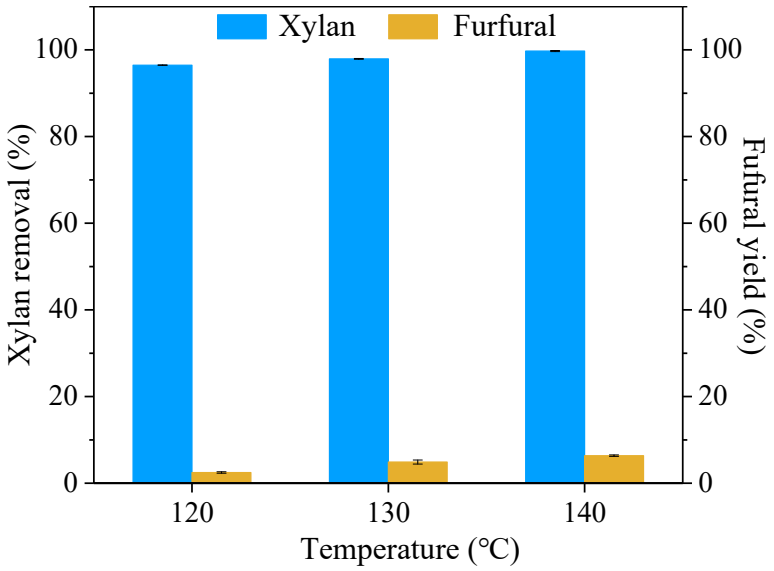

Fig. S6. The xylan recovery and furfural yield under different temperatures under monophasic DES pretreatment.

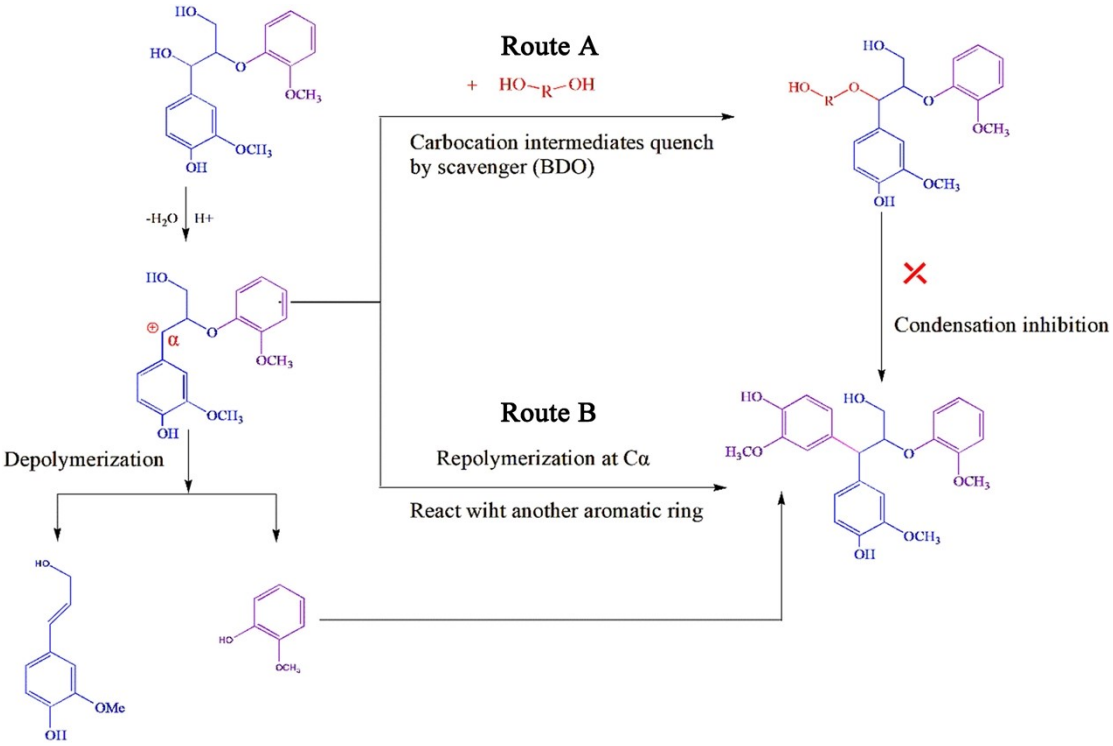

Fig. S7. Lignin extraction in normal case (Route B), and the lignin protection by our 1,4-BDO DES (Route A).

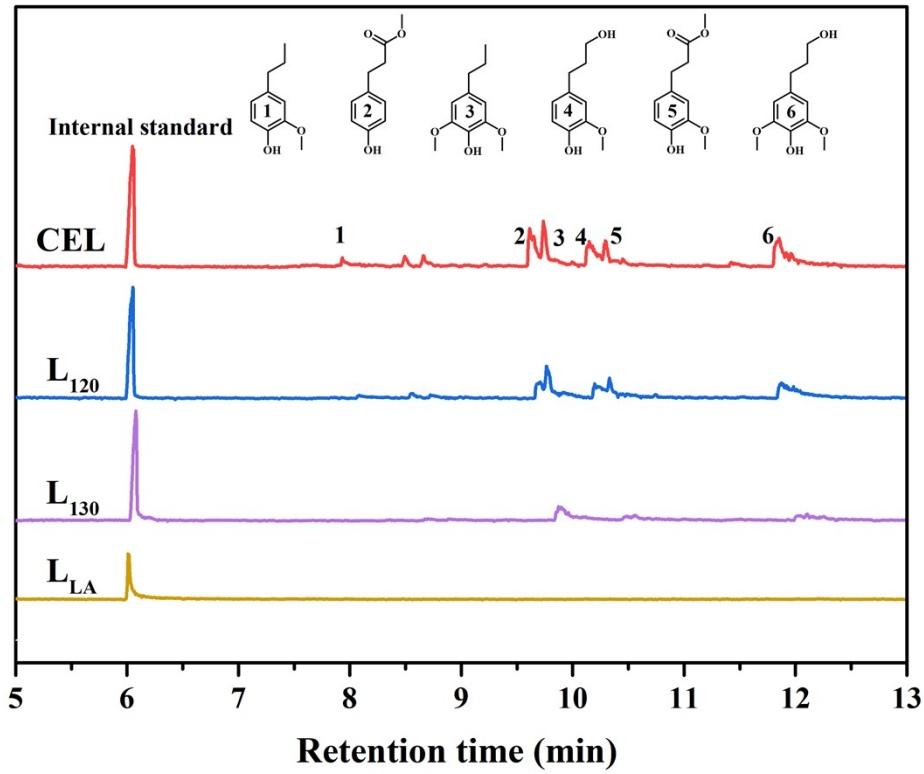

Fig. S8. GC-FID spectra of hydrogenolysis products from CEL and recovered lignins.