Supporting Information

1. Pretreatment

For pretreatment 10.00±0.05 g of the ionic liquid mixture and 2.67±0.05 g of water were introduced into a 100 mL glass pressure tube (Ace Glass) to have overall 20% moisture content. To this 2.01±0.01g (oven dry basis) of biomass was also added in a pressure tube and heated in a pre-heated oven at a certain temperature (100-140 ^{o}C) for certain time (0.5, 1, 2, 4 hour). After this time the tubes were removed from the oven and allowed to cool at ambient temperature. To each tube, 30 mL of absolute EtOH was added and stirred for homogenization. Contents of each tube were transferred into a 50 mL Falcon tube and centrifuged at 4000 rpm for 40 minutes. The supernatant of the centrifuge tube containing dissolved lignin in EtOH was carefully collected in a round bottom flask. The contents of centrifuge tubes were again washed with EtOH for three more times as stated above. The cellulosic material at bottom of the centrifuge tube was carefully transferred into pre-weighed cotton thimble and was subjected to soxhlet extraction for at least 20 hours to remove any loosely bound lignin with biomass. After extraction, thimbles were allowed to dry in the air and weighed. All the ethanolic extracts with dissolved lignin and IL were rotavaped to remove ethanol. The remaining IL-lignin mixture was diluted by adding 20 mL of water as anti-solvent and allowed to stand for a day to allow maximum lignin precipitation. The precipitated lignin mixture was centrifuged at 2000 rpm for 30 minutes. The supernatant was collected separately (containing water and recycled IL), and lignin was centrifuged again 3-4 times by adding distilled water. The %cellulosic material recovery, %delignification, and %hemicellulose removal have been calculated using the following equations (Eq.1, 2, 3).

$$\%Hemi\ removal = \frac{Hemi\ untreated - (pulp\ yield \times \text{h}emipulp}{Hemiuntreated} \times 100$$

Eq. 1

$$\%Deligninfication = \frac{Lig.untreated - (Pulp\ yield \times Lig.pulp)}{Lig.untreated} \times 100$$

Eq. 2

$$yield\ of\ regenerated\ biomass\ (wt\ \%) = \frac{mass\ of\ regenerated\ biomass}{mass\ of\ initial\ biomass} \times 100$$

Eq. 3

Table S1: Pretreatment indices of biomass treated at various temperatures for different times. The values presented here are averages (avg) of the triplicate runs.

Temperature	Time (hr)	CRM	Avg. Ln removed	Avg. Ln recovered	Avg Hemi. removed
100 °C	0.5	62.33	11.33	2.33	5.67
	1.0	60.67	20.33	12.33	22.33
	2.0	59.00	33.67	18.67	34.00
	4.0	58.67	42.67	24.33	46.00
120 °C	0.5	54.00	11.33	3.33	12.67
	1.0	48.67	24.00	12.67	32.33
	2.0	45.67	42.00	22.67	39.33
	4.0	41.67	55.00	32.67	60.67
140 °C	0.5	49.67	25.67	11.67	23.33
	1.0	46.00	39.67	24.00	44.33
	2.0	42.67	70.67	41.67	71.67
	4.0	41.67	81.67	64.67	92.67

Compositional analysis

Known weight (0.3 g) of air-dried each sample (treated and untreated biomass) was put in a 100 mL pressure tube and 3 mL of 72% sulfuric acid was added to this. The mixture was gently stirred by a PTFE rod ensuring thorough mixing. The pressure tube was transferred into a preheated water bath at 30 °C for one hour with periodic stirring (every 15 min) using a PTFE rod. The pressure tube was removed and 84.00±0.012 mL of deionized water was added to the contents of the tube. The tube was autoclaved at 120 °C for 1 hour and allowed to cool down to ambient temperature. The content of the tube was filtered off using a dried, pre-weighed filter crucible. The filtrate obtained in the Buchner flask was taken in two different tubes for sugars and acid soluble lignin measurement. To one of the tube contents calcium carbonate was added (not quantitatively) to bring the pH between 6-6.5. This mixture was filtered using a syringe filter of 0.22 μm pore size. The filtered sample was transferred into an HPLC vial for analysis of sugars. The standard solutions for sugars were prepared as (10 mL stock solutions of concentrations 0.1 mg, 1 mg, 2 mg, 4 mg, and 8 mg per mL in series) and analyzed along with

biomass compositional samples. The formulas used for the quantification of sugars and ASL are given as follows.

$$SRC = \frac{C_{HPLC}.\ V}{initial\ weight} \quad \text{(Eq.4)}$$

$$\%sugar = \frac{c_{HPLC}\ \cdot V\ \cdot c \cdot corr_{anhydro}}{SRC\ \cdot\ ODW_{sample}} \times 100 \quad \text{(Eq.5)}$$

In the above formulas, C_{HPLC} is the concentrations of different sugars measured using HPLC analysis, V denotes the volume of the solution initially taken in the pressure tube (10.00 mL for the sugar recovery standards and 86.73 mL for the samples), initial weight designates the weight of the sugars in the original biomass, $corr_{anhydro}$ is used as the adjustment of any variation in the mass of the sugars during hydrolysis of polysaccharides (0.90 for the C6 sugars like glucose and 0.88 for the C5 sugars xylose and arabinose) and ODW designates oven dried mass of the untreated biomass or pulp in mg.

The contents of the second tube were used to calculate the amount of acid soluble lignin (ASL) in the sample. It was done by performing UV-Vis analysis at the wavelength of 240 nm (Perkin Elmer Lambda 650 UV/Vis spectrophotometer). The amount of the acid soluble lignin was calculated using the formula given as follows.

$$\%ASL = \frac{A}{l \cdot \varepsilon \cdot c} \times 100\ = \frac{A \cdot V_{filtrate}}{l \cdot \varepsilon \cdot ODW_{weight}} \times 100 \quad \text{(Eq. 6)}$$

Where %ASL is the percent of acid soluble lignin in the original/treated biomass, A denotes absorbance at the required wavelength (240 nm), l designates the UV cell path length (1 cm in this case), ε denotes the coefficient of extinction (12 L/g cm), c is the concentration of the solution (mg/mL), ODW_{weight} represents the oven-dried weight of biomass sample in mg initially taken and $V_{filtrate}$ is the total filtrate volume (86.73 mL).

$$\%AIL = \frac{weight_{crucible\ plus\ air} - weight_{crucible\ plus\ ash}}{ODW_{ssample}} \quad \text{(Eq. 7)}$$

The solid residue left in the crucible was washed well using purified water and placed in a convection oven at 105 ^{0}C for 24 hours (drying off the water). After removing, the crucible was immediately cooled in a desiccator at room temperature. When the crucible was cooled down it was weighed and recorded; finally, it was subjected to ashing in a muffle oven at 575 °C for 3 hours. After that, the weight of the crucible was measured again for ashes contents.

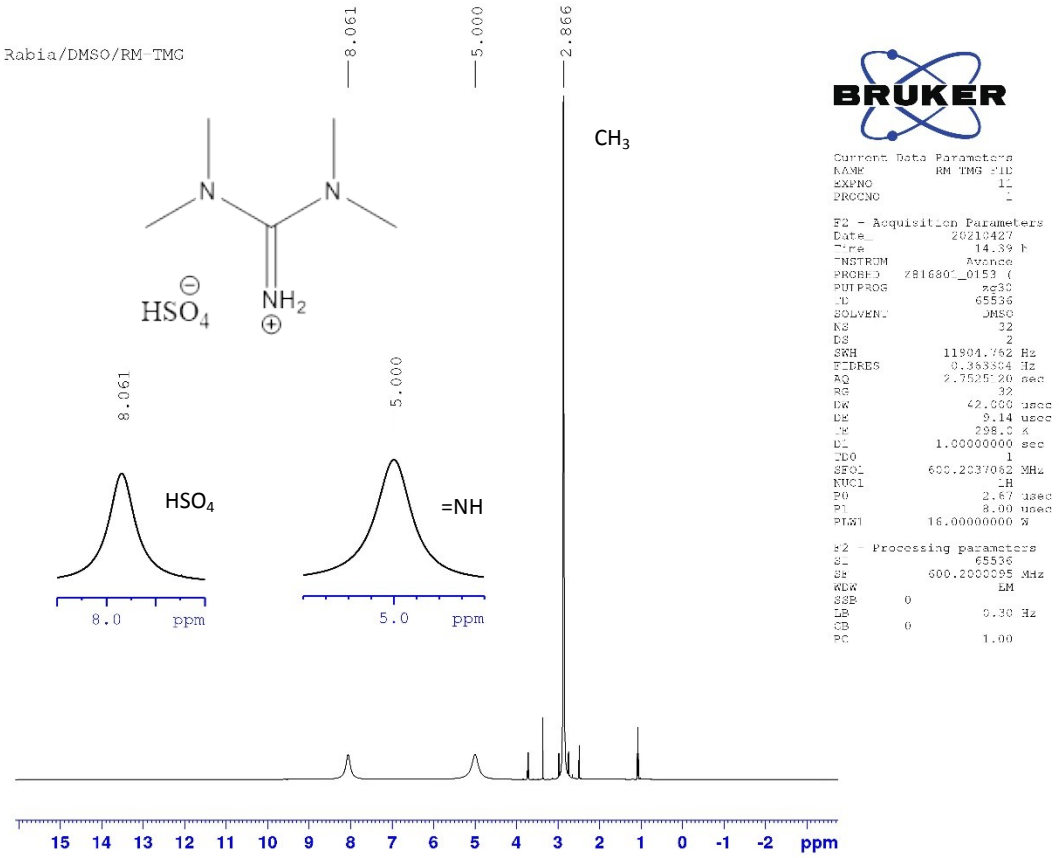
Saccharification assay

100 mg of each biomass sample was taken in a sterile tube and weighed. To this tube, 9.9 mL of the enzyme solution was added. The tubes were then sealed and put into an incubator (at 50 ^{o}C and speed of 250 rpm) for 7 days. Three blanks having only 100 µL of water were also incubated to correct any discrepancy occurring due to residue sugars in the enzyme mixture. 1 mL of the final enzymatic mixture was filtered using a syringe filter of 0.22 µm pore size and loaded into the HPLC vial. The samples were then subjected to HPLC for released sugars (Shimadzu HPLC system equipped with RI detector and Aminex HPX-87P, Biorad 300 x 7.8 mm column). Deionized water (milli-Q) was used as the mobile phase with (0.6 mL min^{-1}, column temperature 85 ^{0}C, acquisition time 40 min). The standard sugar solution mixtures (0.1, 1, 2, 4 mg/mL of glucose, xylose, arabinose) and 8 mg/mL of only glucose were run for calibration of the instrument. Saccharification yields of the samples were measured by taking the ratio between the total amount of sugars from treated biomass and the theoretically obtained monosaccharides from untreated biomass.

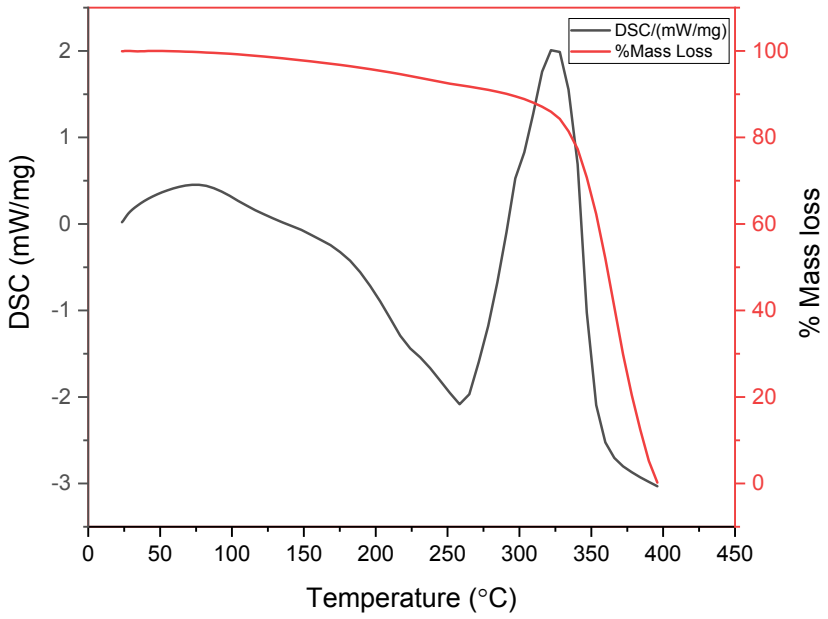
Table S2: Composition analysis of the biomass after pretreatment.

Temperature	Time (hr)	%Glucan	%Xylan	%Arabinan	%ASL	%AIL	%Ashes	%Mass Loss	%Extr
	Untreated	37.09	20.075	2.49	3.49	23.465	6.28	0	7.05
At 100 °C	0.5	46.64	19.33	2.32	3.33	21.65	5.83	0.90	0
	1	43.93	15.74	1.86	3.06	18.88	6.29	10.24	0
	2	43.32	12.73	1.52	2.48	15.36	6.00	18.58	0
	4	47.01	11.51	1.33	2.15	13.95	3.51	20.53	0
At 120 °C	0.5	37.40	18.19	2.11	3.11	19.46	5.90	7.61	0
	1	39.18	14.35	1.79	2.80	17.15	7.45	12.04	0
	2	40.54	11.94	1.36	2.14	12.61	9.62	17.11	0

	4	42.12	6.49	0.89	1.33	8.50	10.16	26.69	0
At 140 °C	0.5	35.41	15.37	1.92	2.67	17.41	5.80	16.22	0
	1	38.64	11.41	1.39	2.18	14.53	8.55	18.80	0
	2	41.54	6.04	0.97	1.29	6.72	10.39	29.30	0
	4	46.07	1.82	0.08	0.60	4.58	9.43	34.58	0



FigureS1: ^{1}H NMR spectrum of ionic liquid [TMG][HSO_4]



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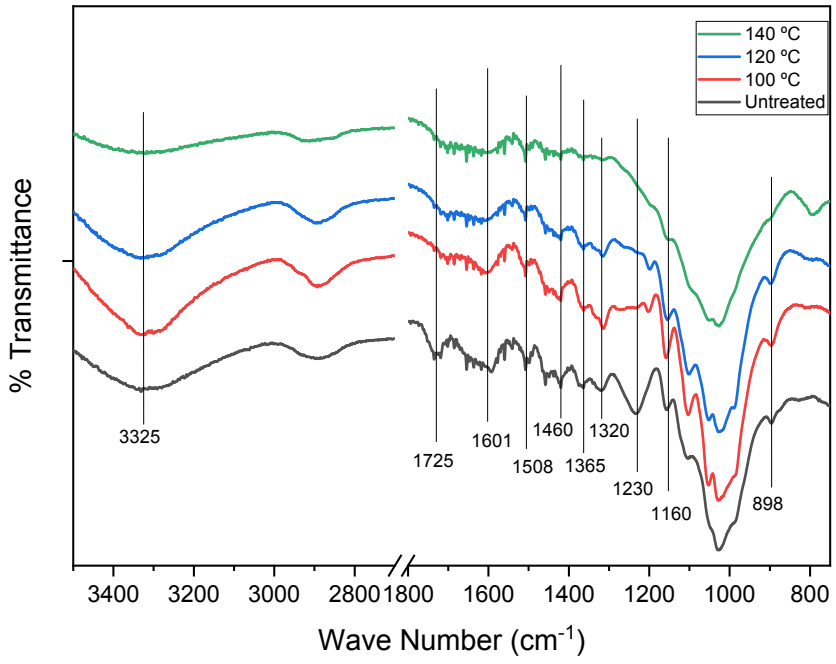
107 **Figure S2:** DSC and TGA plot of the Ionic liquid [TMG][HSO_4]



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109 **Figure S3:** FTIR of untreated and pretreated Acacia wood at different temperatures for 4 hours.

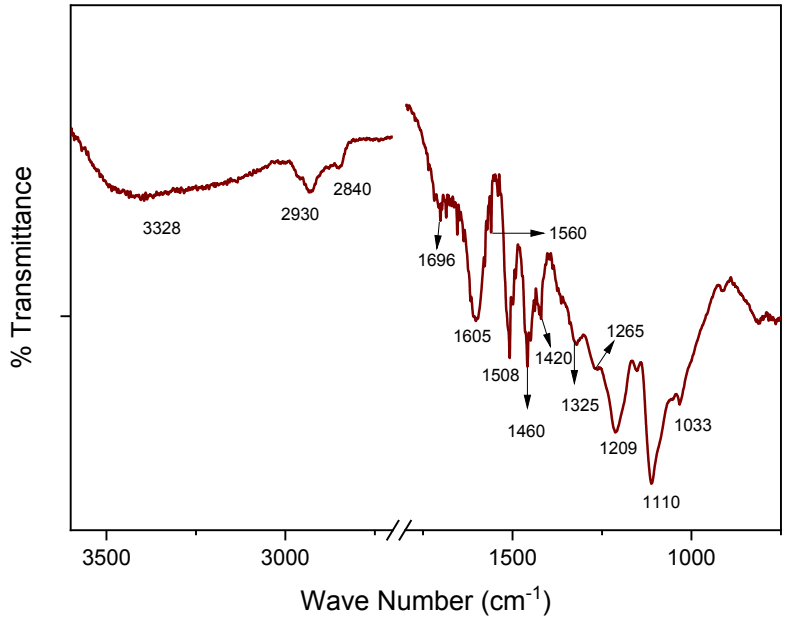

Figure S4: FTIR of lignin recovered at 140 °C and 4 hours of pretreatment.

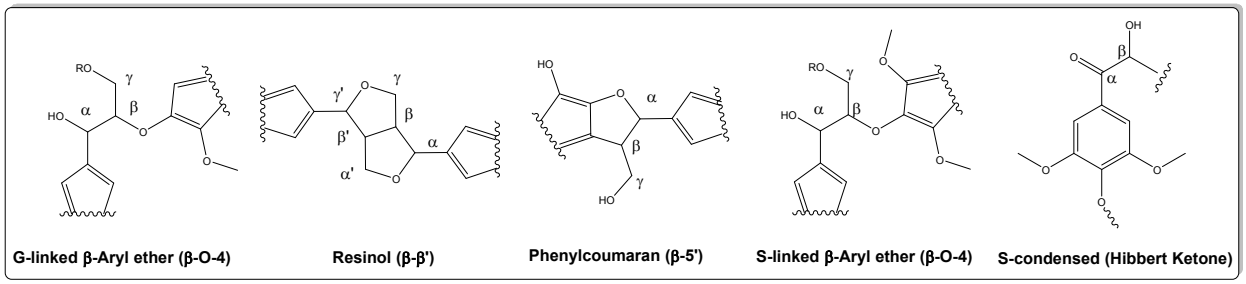

Figure S5: Some common linkages of Lignin mentioned in manuscript.