Supplementary Materials

Densification pretreatment with limited deep eutectic solvent triggers high-efficiency fractionation and valorization of lignocellulose

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Table S1 Strategies for FBE SSCF at 30% solid loading with different enzyme dosages

Enzyme loading	Pre-hydrolysis	FBE SSCF time		
	24 h	0 h	12 h	24 h
10 mg/g glucan	23% dw [a] 90%[b]	4% dw 10%	3% dw 0%	0% dw 0%
15 mg/g glucan	23% dw 90%	4% dw 10%	3% dw 0 %	0% dw 0%
20 mg/g glucan	20% dw 90%	6% dw 10%	2% dw 0 %	2% dw 0 %

[a]: biomass solid loading

[b]: enzyme loading

Table S2 Performances of traditional DES pretreatment and DLCA(DES) pretreatment on lignin fractionation and saccharification.

DESs (HBA:HBD)	Biomass	Pretreatment Conditions			delignification (%)	Enzyme & Enzymatic conditions	Saccharification performance	References
		Temperature (°C)	Time (min)	DES dosage				
ChCl:OA:EG (1:0.2:2)	Corn stover	130	60	2.06 g/g biomass	75.27	SL=3%, Cellic CTec3 HS, 10 mg protein/g glucan	glucan conversion of 96.4%	This study
ChCl:Gly (1:2)	Sorghum bagasse	180	40	1 g/g biomass	14.3	SL=1%, Cellic® CTec2, 20 mg protein/g glucan, Cellic® HTec2, 0.26 mg enzyme protein/g glucan	glucose yield of 85%	[1]
ChCl:BDO:$AlCl_3$ (25:50:1)	Moso bamboo	110	60	3.2 g/g biomass	63.1	SL=2.5%, 25 PFU/g glucan cellulase and 150 U/g xylan xylanase	glucose yield of 94.8%	[2]
BTMAC:LA (1:2)	Corncob	140	120	20 mL/g biomass	63.4	SL=2%, 15 FPU/g substrate of cellulase	glucose yield of 94.0%	[3]

ChCl:p-hydroxybenzoic acid (3:2)	Poplar	160	180	10 g/g biomass	69	SL=2%, Novozymes CTec2, 70 mg protein/g biomass	glucan conversion of 90.8%	[4]
ChCl:LA (1:2)	Poplar sawdust	130	90	10 g/g biomass	66.4	SL=5%, 30 FPU/g glucan	glucose yield of 75.8%	[5]
ChCl: monoethanolamine (1:6)	Wheat straw	70	540	20 g/g biomass	71.4	SL=1%	glucan conversion of 89.8%	[6]
ChCl:LA (1:2)	Poplar	140	180	20 g/g biomass	51.3	SL=2%, Cellic CTec3, 20 mg protein /g cellulose	sugar yield of 71.6%	[7]
ChCl:GA (2:1)	Poplar	140	180	20 g/g biomass	50		sugar yield of 69.1%	[7]

Table S3 The position of some common FTIR absorption bands and the relative changes of absorption intensity [a] in several samples.

Band position	Assignment	Samples		
		D-LCS	D-PCS	DLCA(DES)-CS
3340	O-H stretching	0.02	0.25	0.38
2915	C-H stretching	0.13	0.30	0.44
1595	Aromatic ring stretching	0.26	0.37	0.56
1513	Aromatic ring vibration	0.30	0.41	0.61
1245	C-O adsorption	0.28	0.33	0.59
1105	C-O vibrations of crystalline cellulose	0.09	0.42	0.37
890	β-glycosidic linkages in cellulose	-0.04	0.12	0.29

[a]: $\text{Relative change} = \frac{\text{intensity of untreated LCS} - \text{intensity of pretreated sample}}{\text{intensity of untreated LCS}} * 100\%$; where positive number indicates reduction.

References

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