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SUPPORTING INFORMATION

Transforming biomass conversion with ionic liquids: process intensification and the development of a high-gravity, one-pot process for the production of cellulosic ethanol

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Table S1. Process and economic data for the three scenarios studied in the TEA

	Water-wash[a]	One-pot HG (current)[b]	One-pot HG (projected)[c]
Biomass processed (dry MT/day)	2000	2000	2000
Biomass price ($/dry ton, delivered at plant-gate)	80	80	80
Pretreatment			
IL used	$[C_2C_1Im][OAc]$	[Ch][Lys]	[Ch][Lys]
IL purity (wt% of IL in aqueous IL solution [IL:H_2O])	90	10	10
IL/Biomass ratio (mass ratio on dry basis)	3.6	0.29	0.29
IL recovery (%)	99.9	99.9	99.9
IL price ($/kg)	5	5	2
Water loading (mass ratio between water and biomass in water-wash step in WW route)	20	N/A	N/A
Loss of glucan in water-wash step (wt% of initial glucan)	5	NONE	NONE
Loss of xylan in water-wash step (wt% of initial xylan)	24	NONE	NONE
Hydrolysis			
Enzyme loading (mg/g glucan present in initial biomass)	20	20	10
Enzyme price ($/kg protein)	4.29	4.29	4.29
Glucan-to-glucose conversion (%)	98	84	90
Xylan-to-xylose conversion (%)	79	80	90
Fermentation			
Co-fermentation of glucose and xylose	YES	NO (only Glucose)	YES
Glucose-to-ethanol conversion (%)	95	90	90
Xylose-to-ethanol conversion (%)	60	0	90

[a]based on (Cruz et al. 2013, Li et al. 2013, Li et al. 2015, Shi et al. 2014, Uppugundla et al. 2014)
[b]constructed to represent the 'current' one-pot HG process in this study
[c]constructed to represent 'projected' one-pot HG process with perceived advances (esp. with yield and enzyme loading)

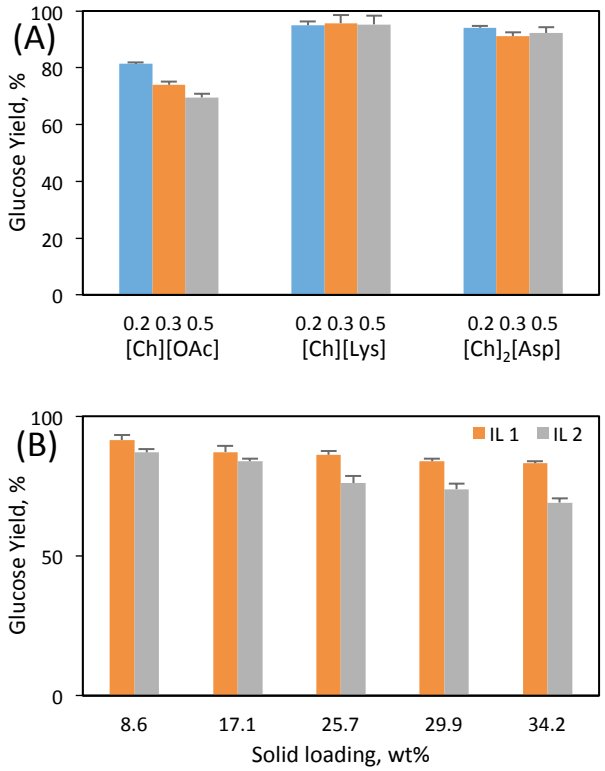

Figure S1. Glucose yields from saccharification of choline-based ionic liquid (IL1: [Ch][Lys]; IL 2: $[Ch]_2[Asp]$) pretreated corn stover. (A) Glucose yields with different ratios (R: 0.2, 0.3, and 0.5) of biomass to ionic liquid loading in pretreatment; (B) Glucose yield after pretreatment with solid loading from 8.6 to 34.2 wt%.

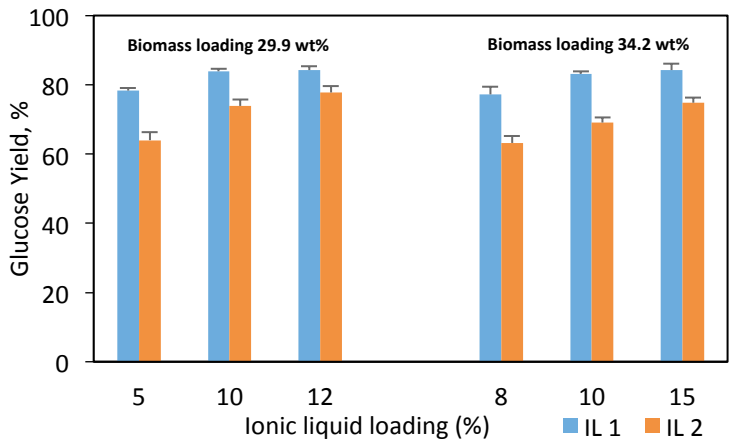

Figure S2. Glucose yields from saccharification of choline-based ionic liquids (IL1: [Ch][Lys]; IL 2: $[Ch]_2[Asp]$) pretreated corn stover (mass loading of 29.9 wt% and 34.2 wt%) with different ionic liquid loading.

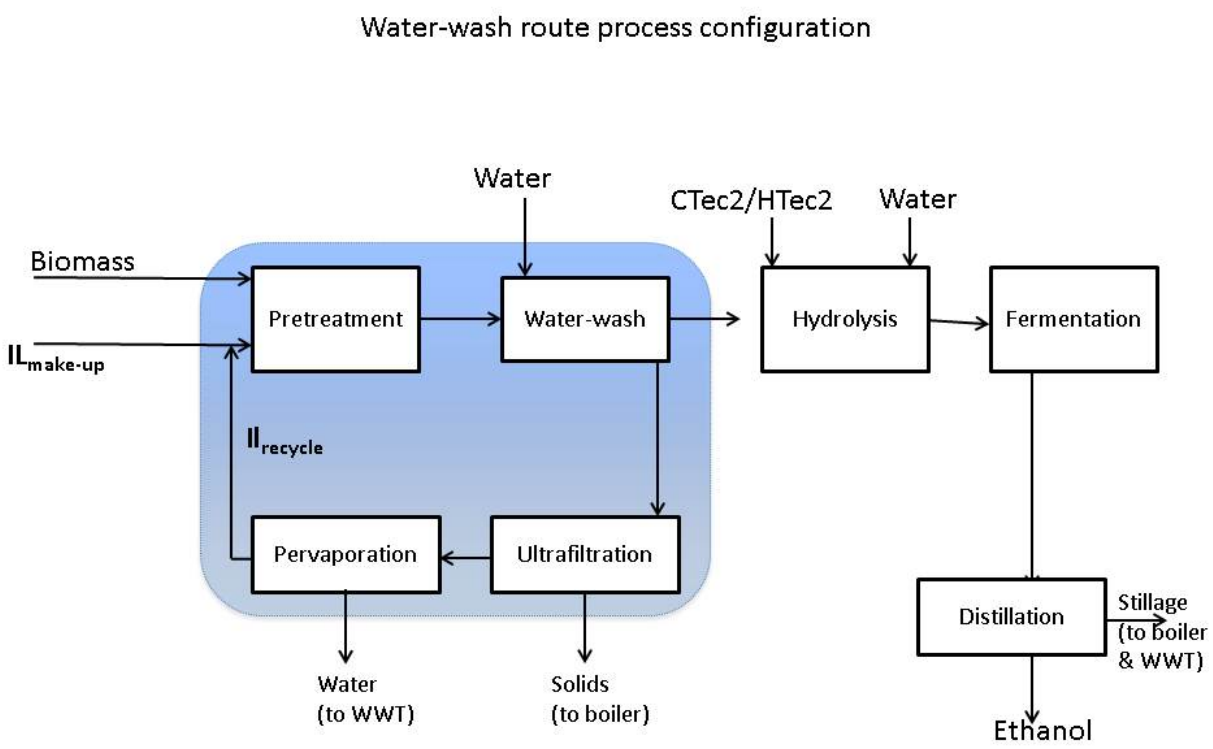

Figure S3. Simplified block flow diagram of water-wash process configuration

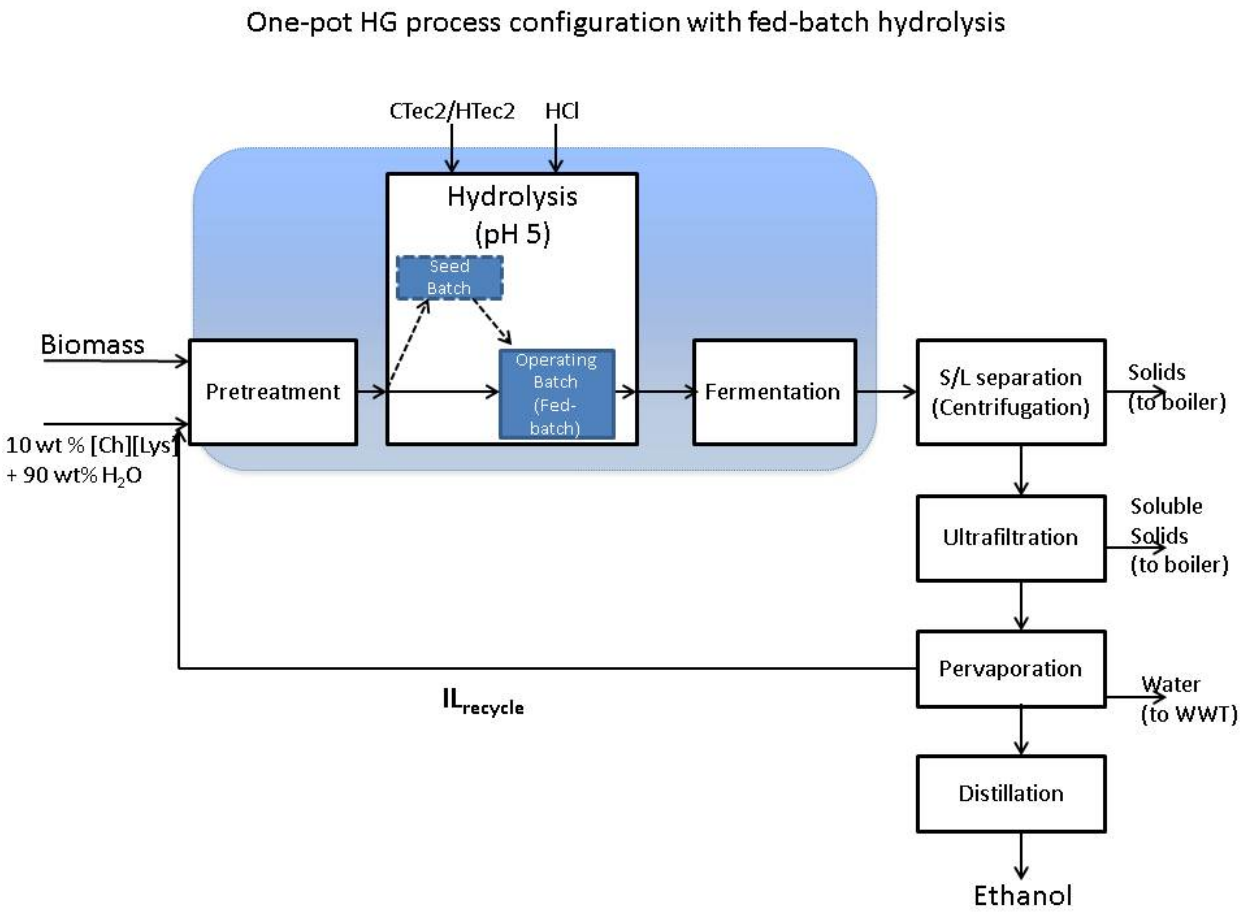

Figure S4. Simplified block flow diagram of one pot HG process configuration

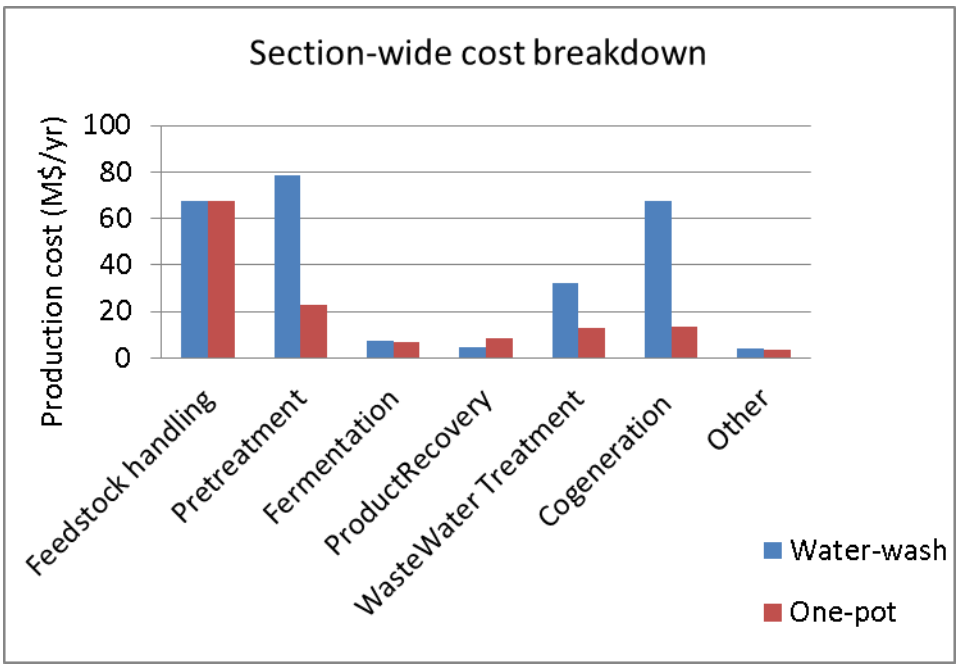

Figure S5. Section wide production costs (including CapEx and OpEx)

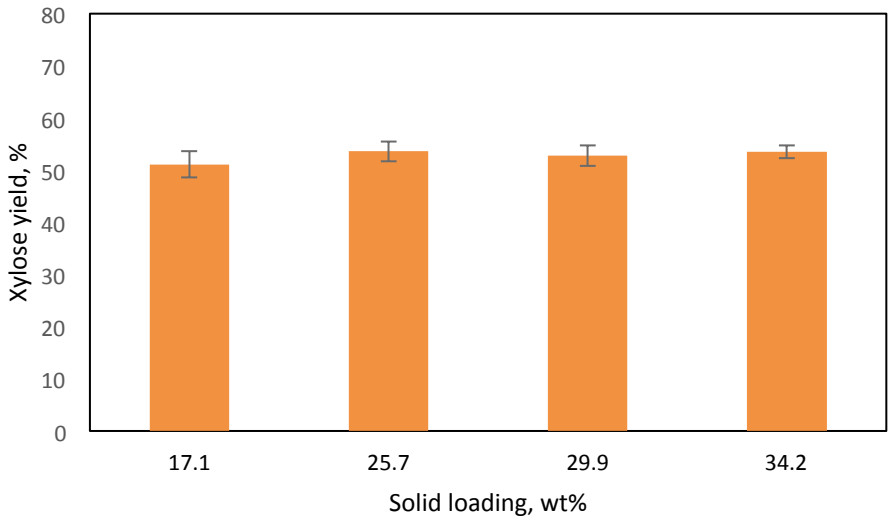

Figure S6. Xylose yields from [Ch][Lys] pretreated corn stover. The ionic liquid loading is 10%.

References

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