Electronic Supplementary Material

Ball milling promoted direct liquefaction of lignocellulosic biomass in supercritical ethanol

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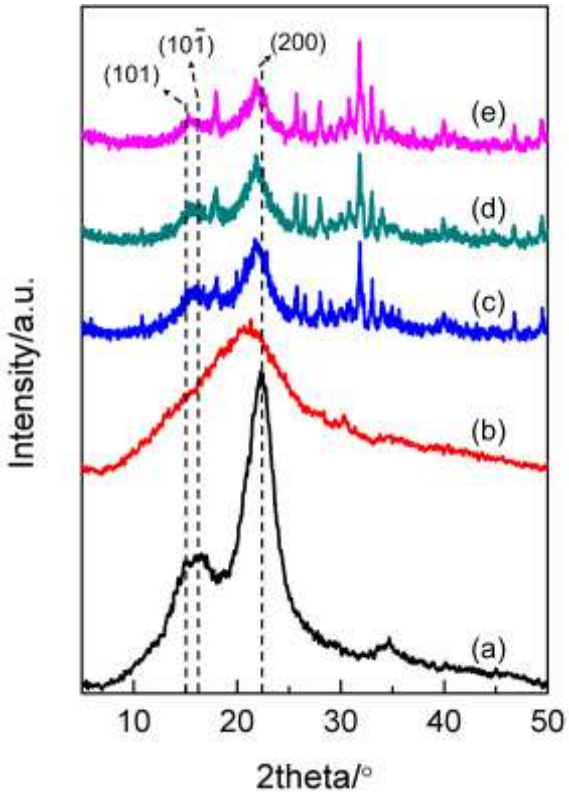

Figure S1. XRD patterns of original CS (a), BM-CS (b), and the residual of BM-CS after reaction at 260 ℃ for 60 min (c), 280 ℃ for 30 min (d), and 300 ℃ for 15 min (e).

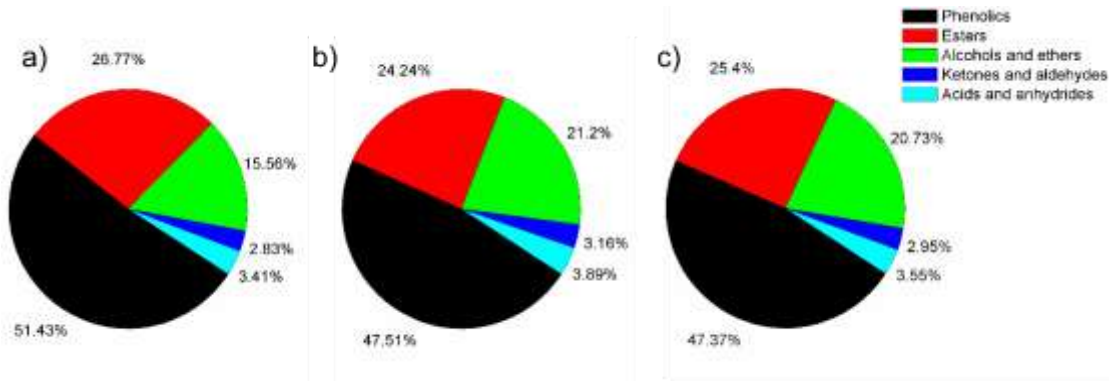

Figure S2. The classification of components in bio-oil from BM-CS produced at 250 ℃ for 60 min (a), 280 ℃ for 30 min (b), and 300 ℃ for 15 min (c).

Table S1. The components of CS feedstock.

Chemical components /wt%			Moisture and ash[a] /wt%	Elemental content /wt% [b]		
Cellulose	Hemicellulose	Lignin		C	H	O
36.3	30.1	23.7	9.9	47.1	6.1	36.9

[a] Moisture and ash are calculated by difference of chemical components

[b] Elemental content are calculated according to chemical components of cellulose $(C_6H_{10}O_5)_n$, hemicellulose $(C_5H_8O_4)_n$, and lignin (average of three monomers).

Table S2. The alcoholysis performance of BM-CS under different reaction time and temperature.

Temperature / ℃	Time /min	X_i /%			$Y_{bio\text{-}oil}$ /%
		Cellulose	Hemicellulose	Lignin	
280	30	85.9	90.8	72.6	44.8
250	60	71.1	80.5	68.6	37.5

Table S3. First-order alcoholysis rate constant at 300 ℃ obtained by single point calculation for original biomass without ball milling.

Biomass	Rate constant k_i /min^{-1} [a]		
	Cellulose	Hemicellulose	Lignin
CS	0.062	0.139	0.102

[a] The fisr-order alcoholysis conversion was estimated by equation $X_i = 1-\exp(-k_i t)$, where t was the reaction time