

Fig. 1

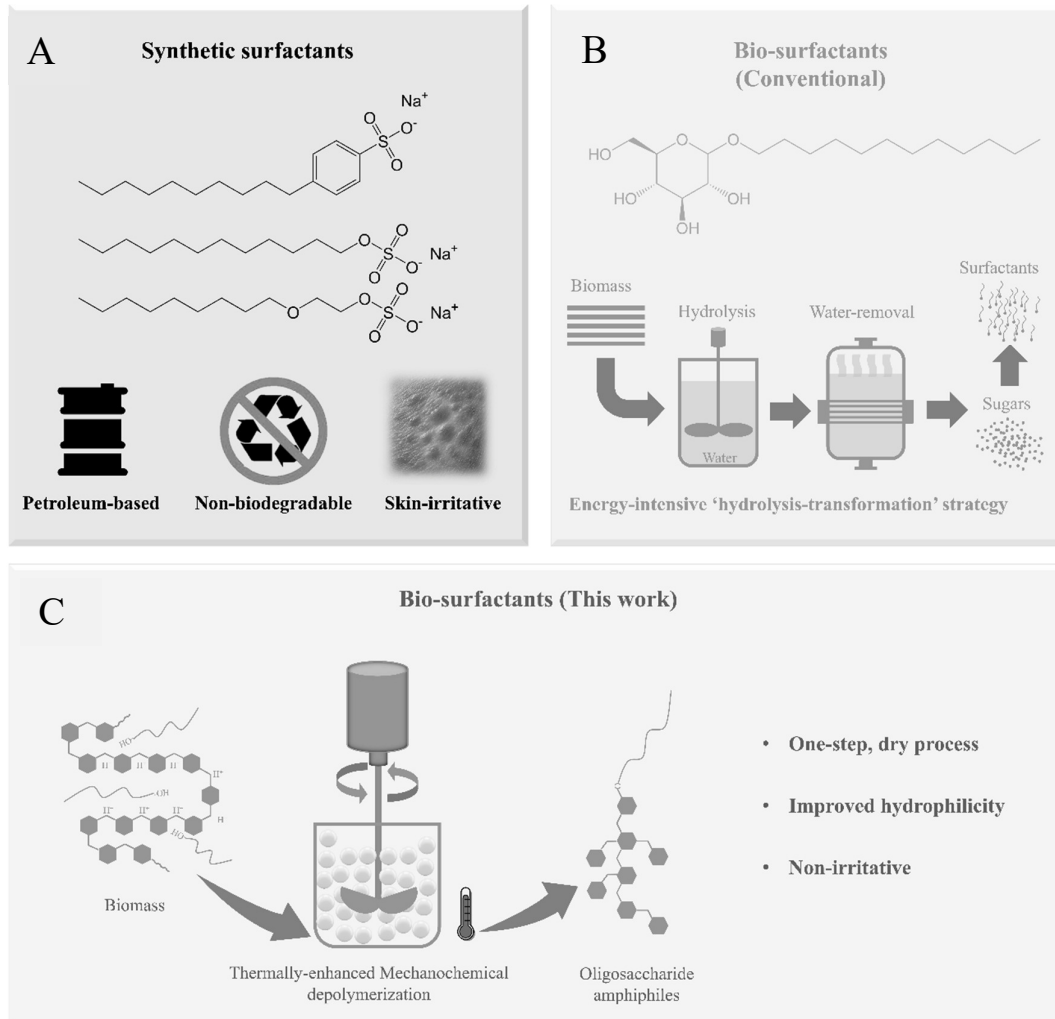
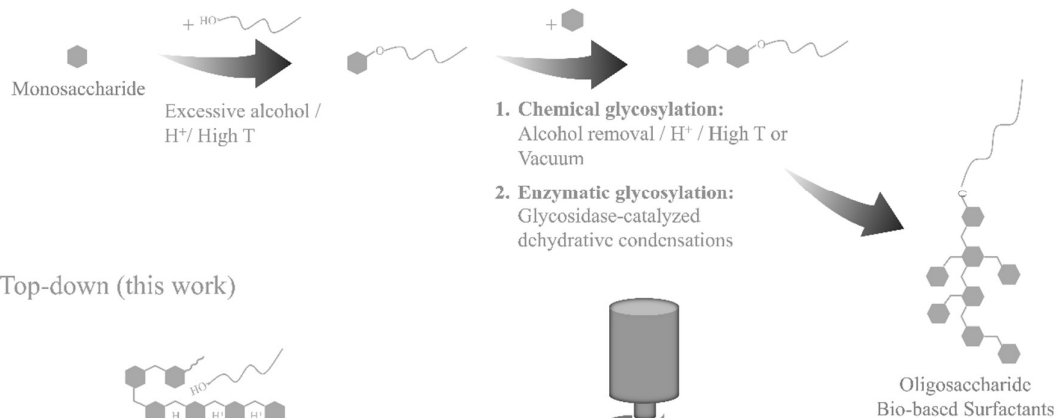


Fig. 1 (cont.)**D**

Bottom-up (previous works)



Top-down (this work)

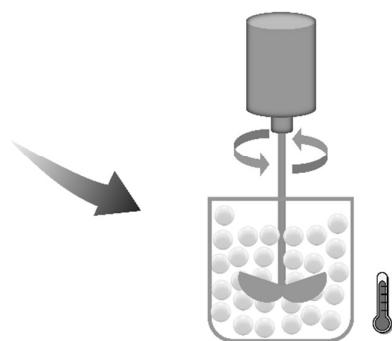
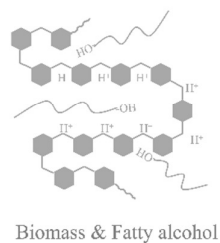
**Thermally-enhanced Mechanochemical Transglycosylation****Oligosaccharide Bio-based Surfactants**

Fig. 2

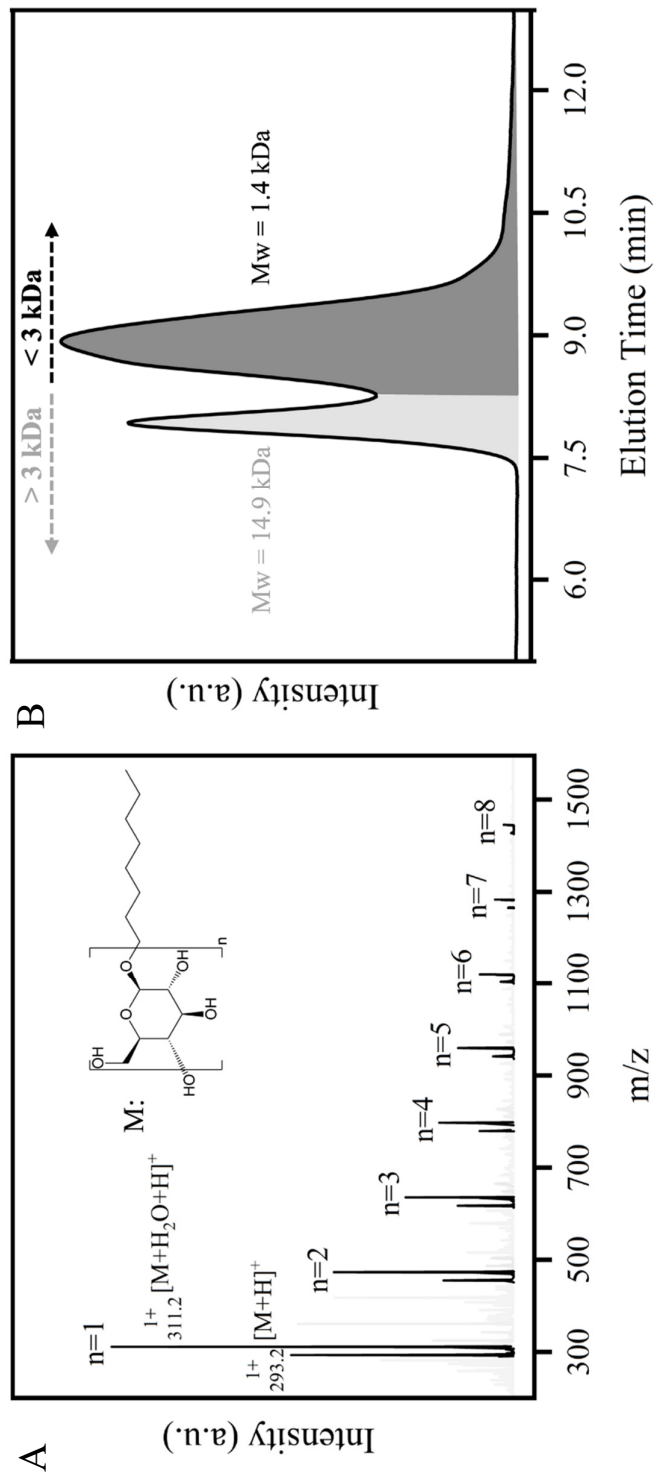


Fig. 2 (cont.)

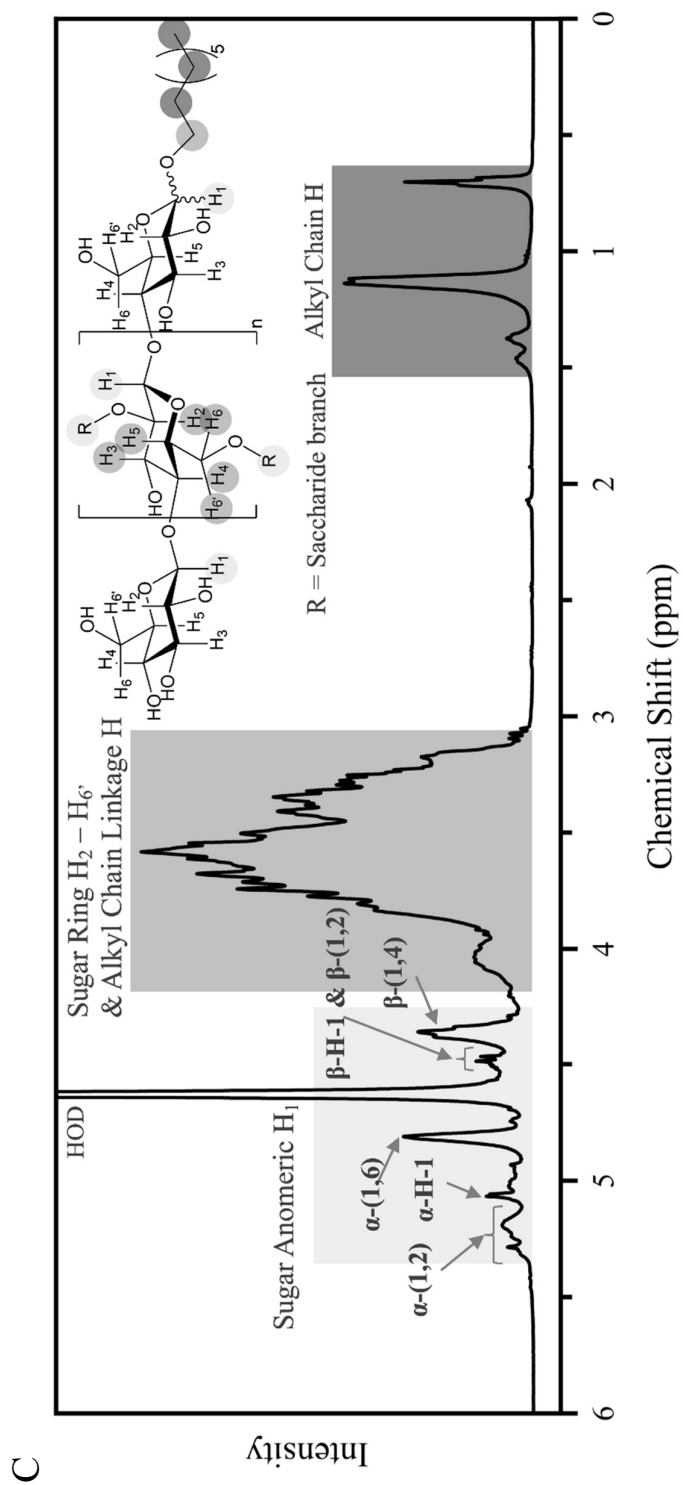


Fig. 3

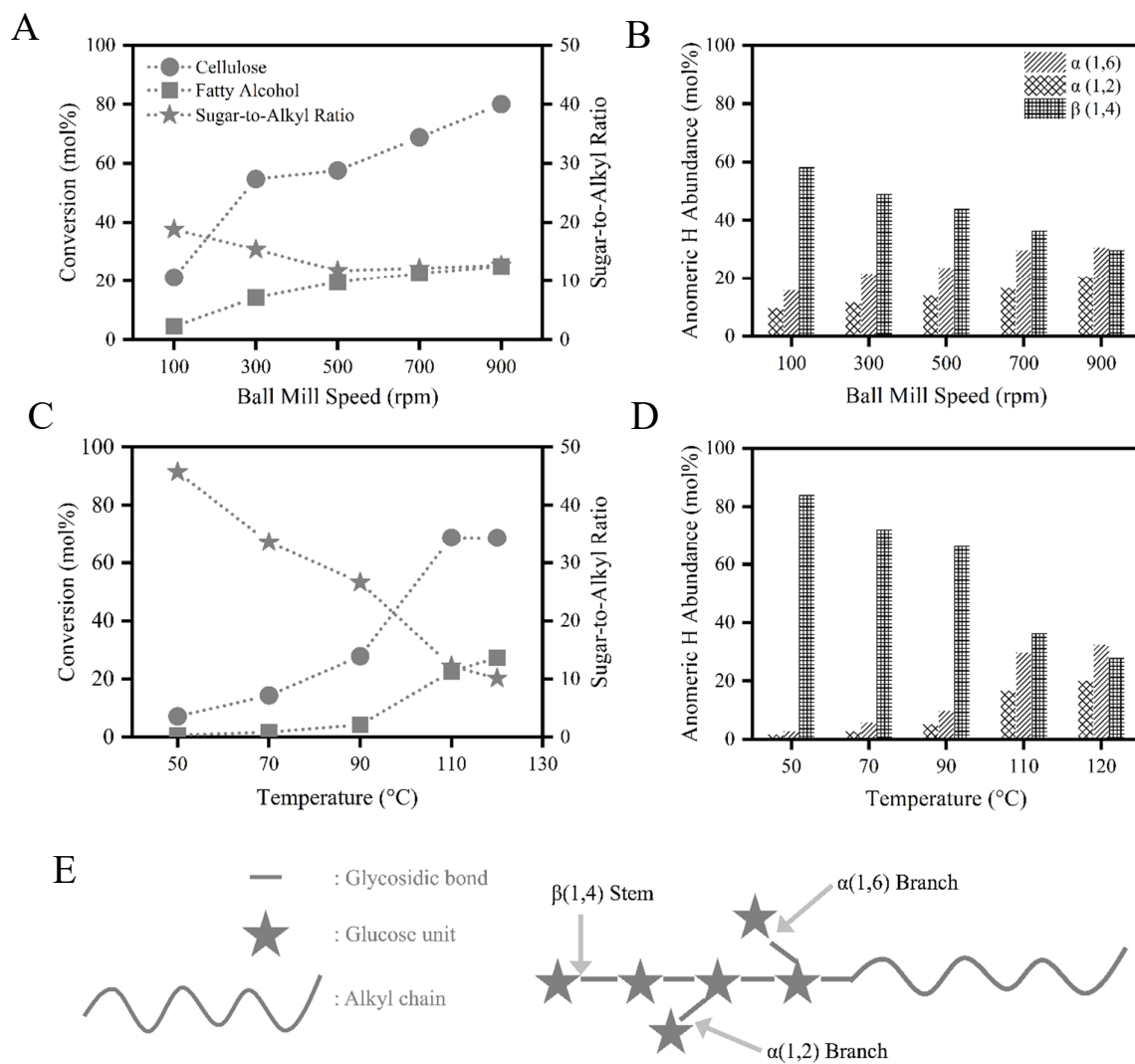


Fig. 4

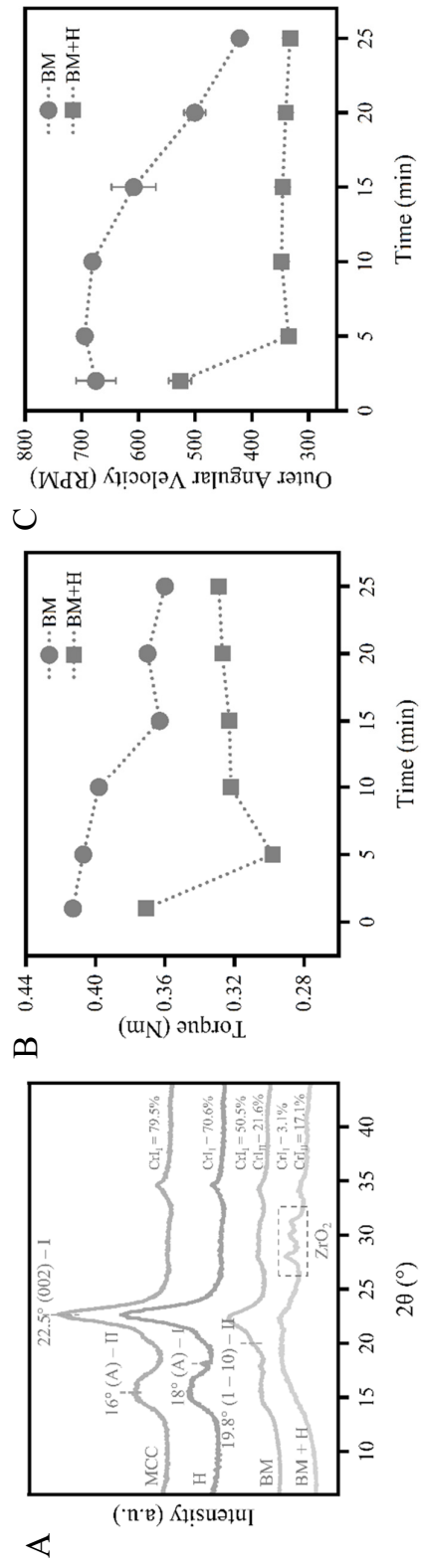


Fig. 4 (cont.)

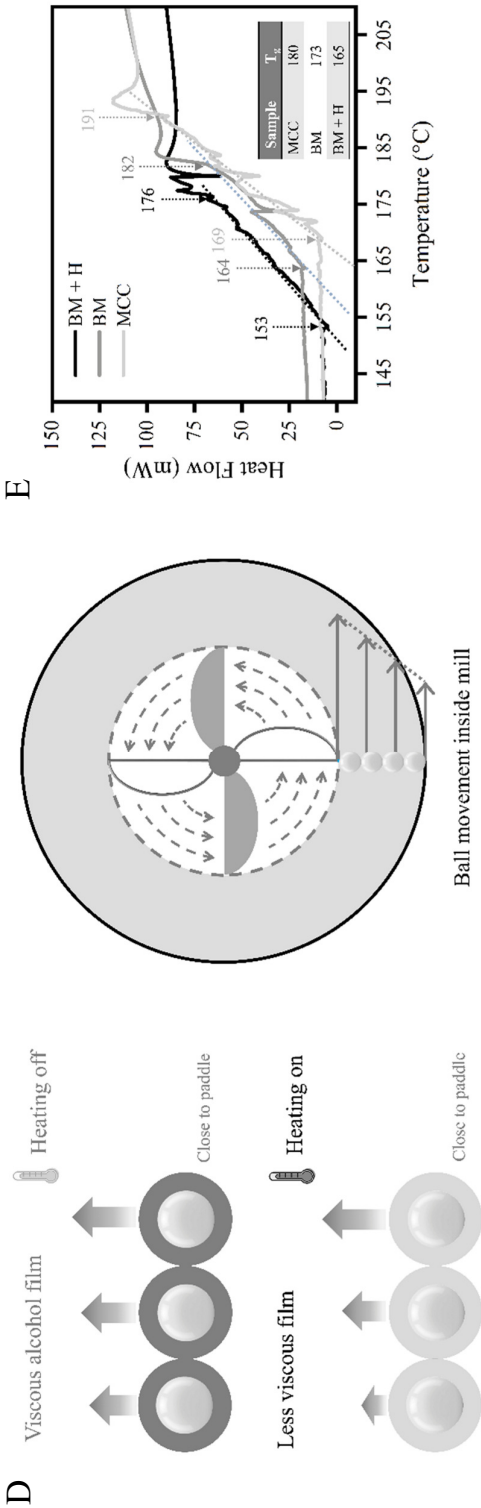


Fig. 5

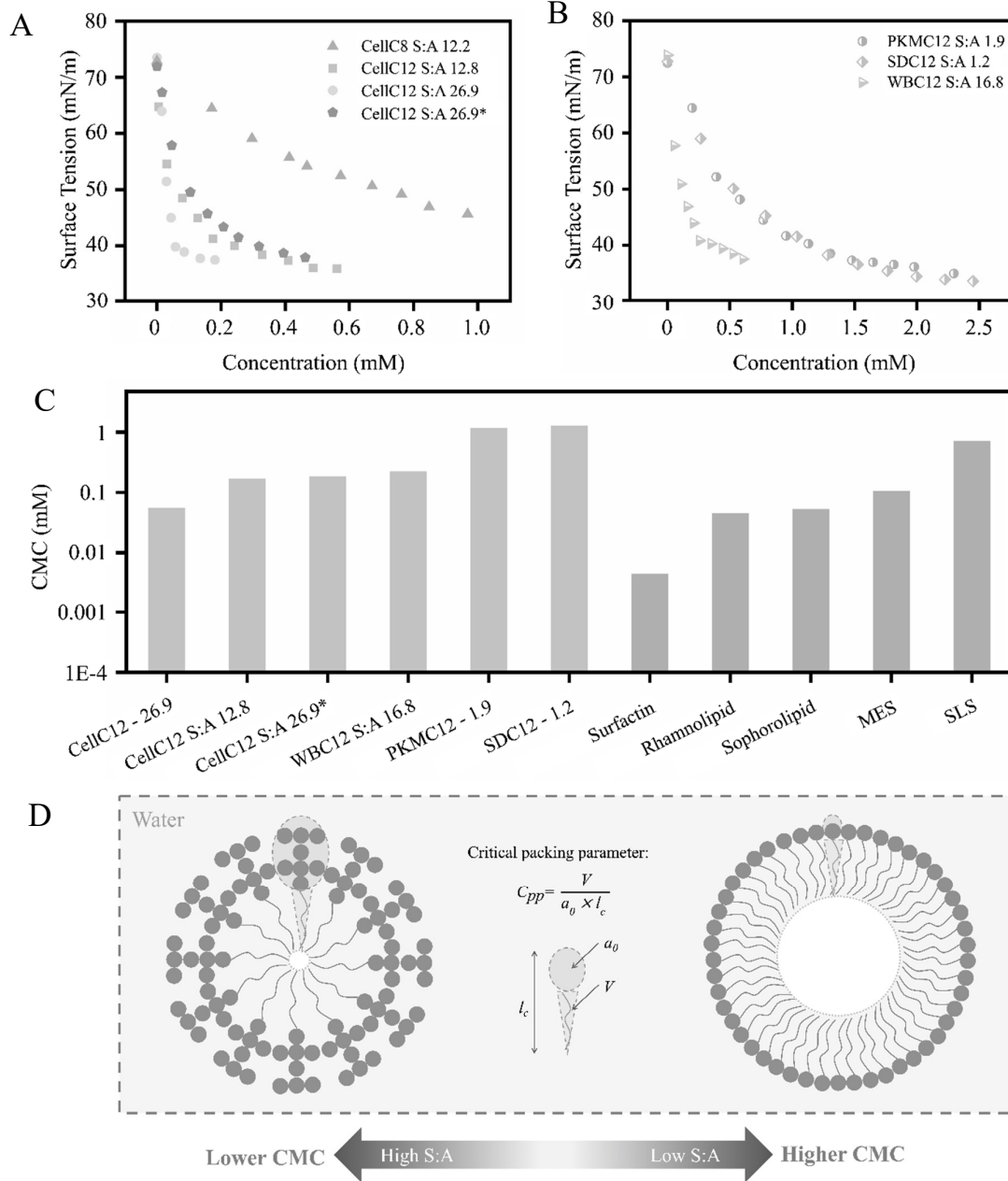


Fig. 6

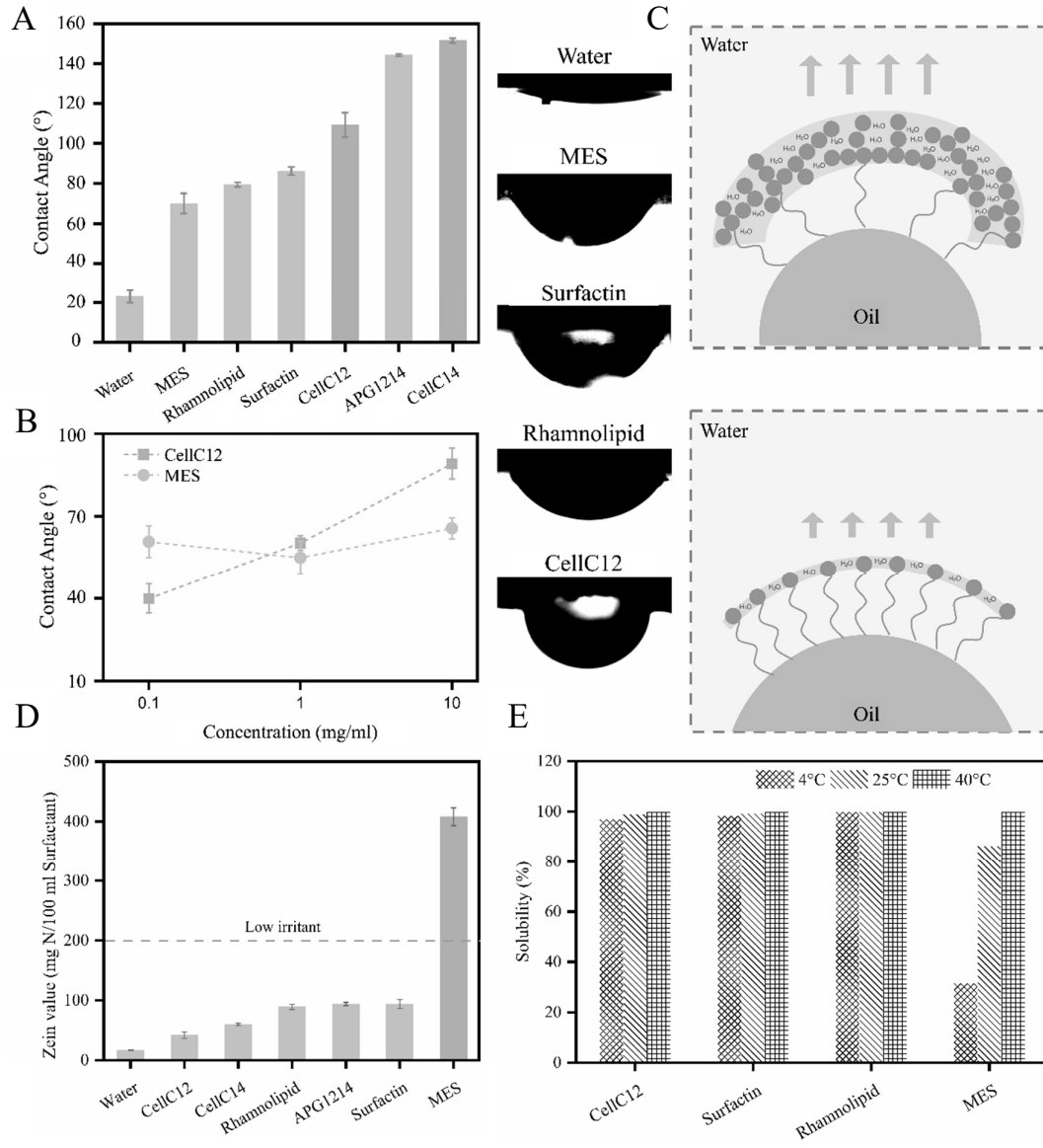


Fig. 7

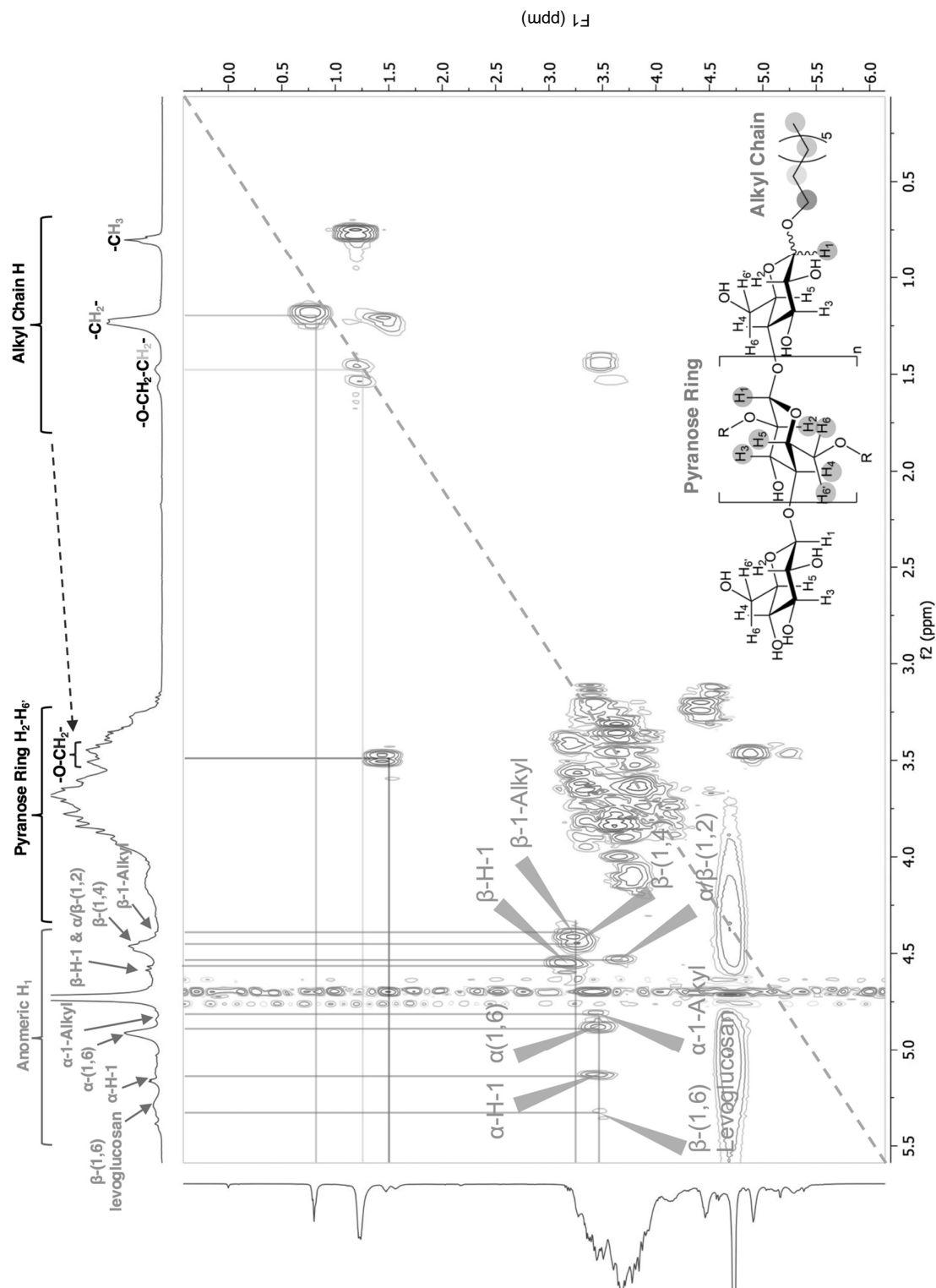


Fig. 8

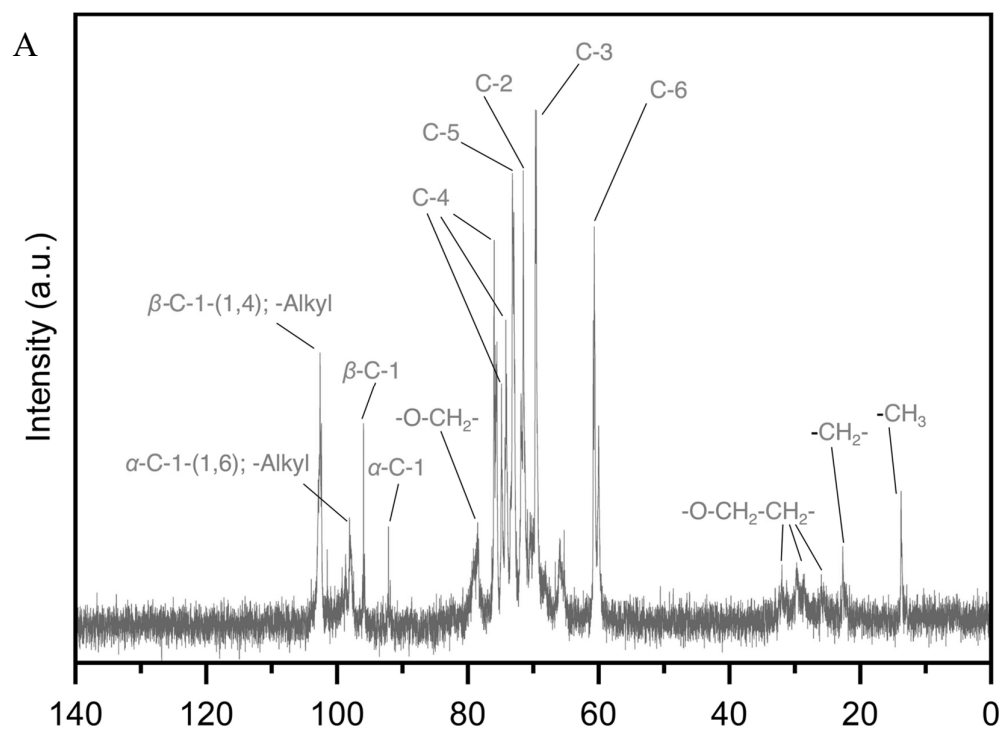


Fig. 8 (cont.)

Chemical Shift (ppm)

B

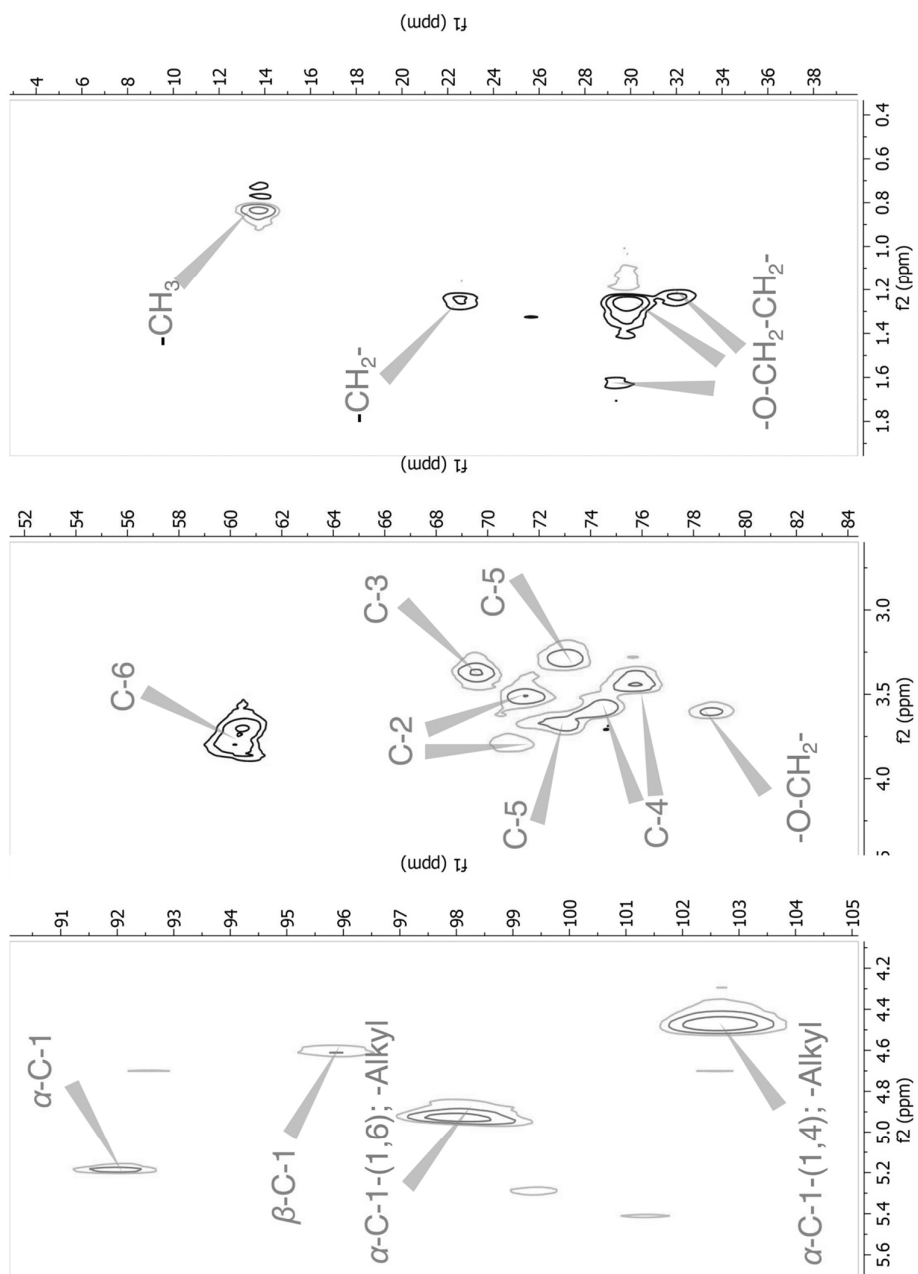


Fig. 9

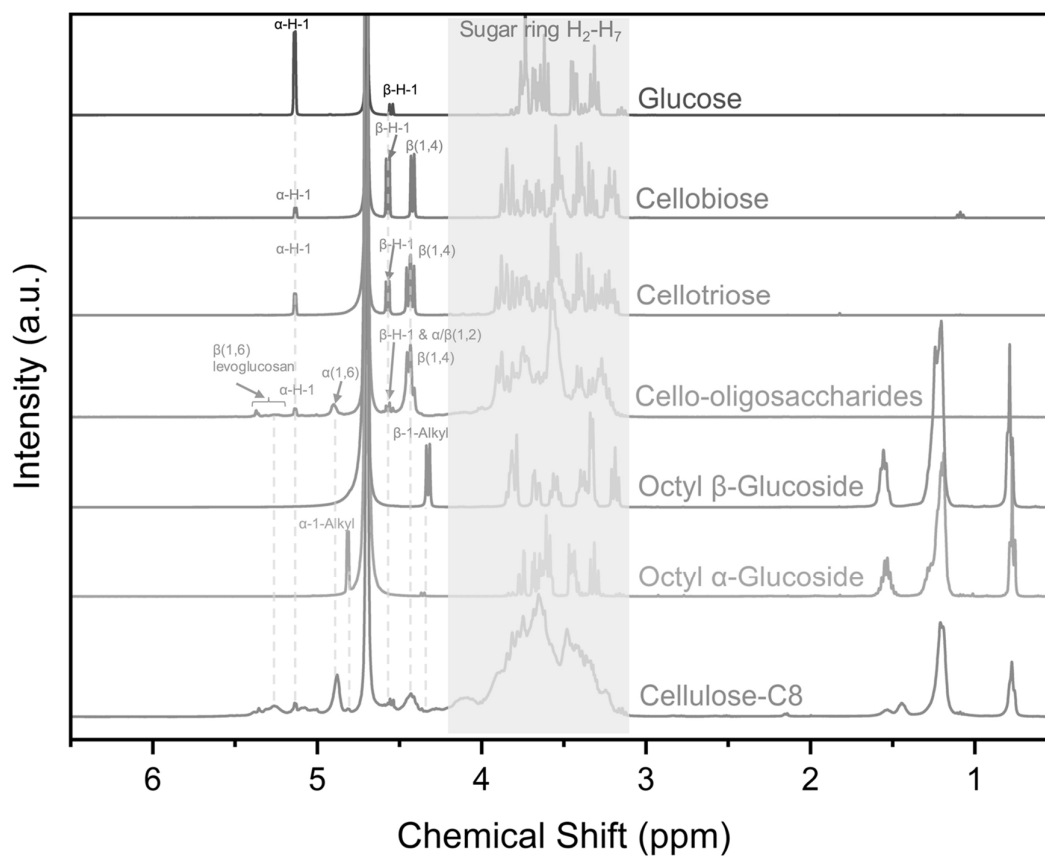


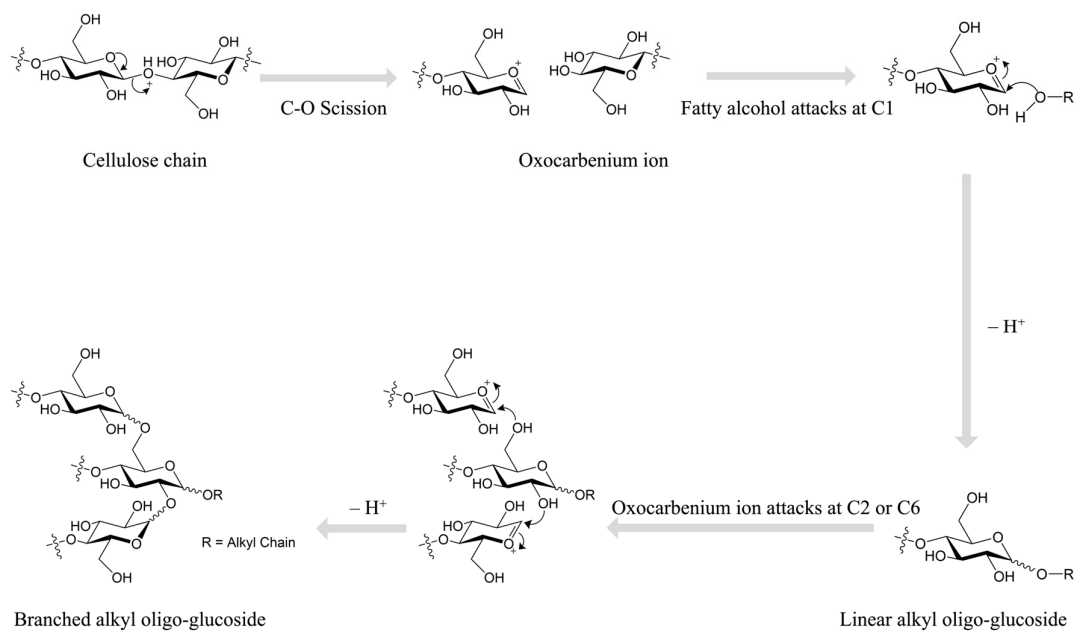
Fig. 10

Fig. 11

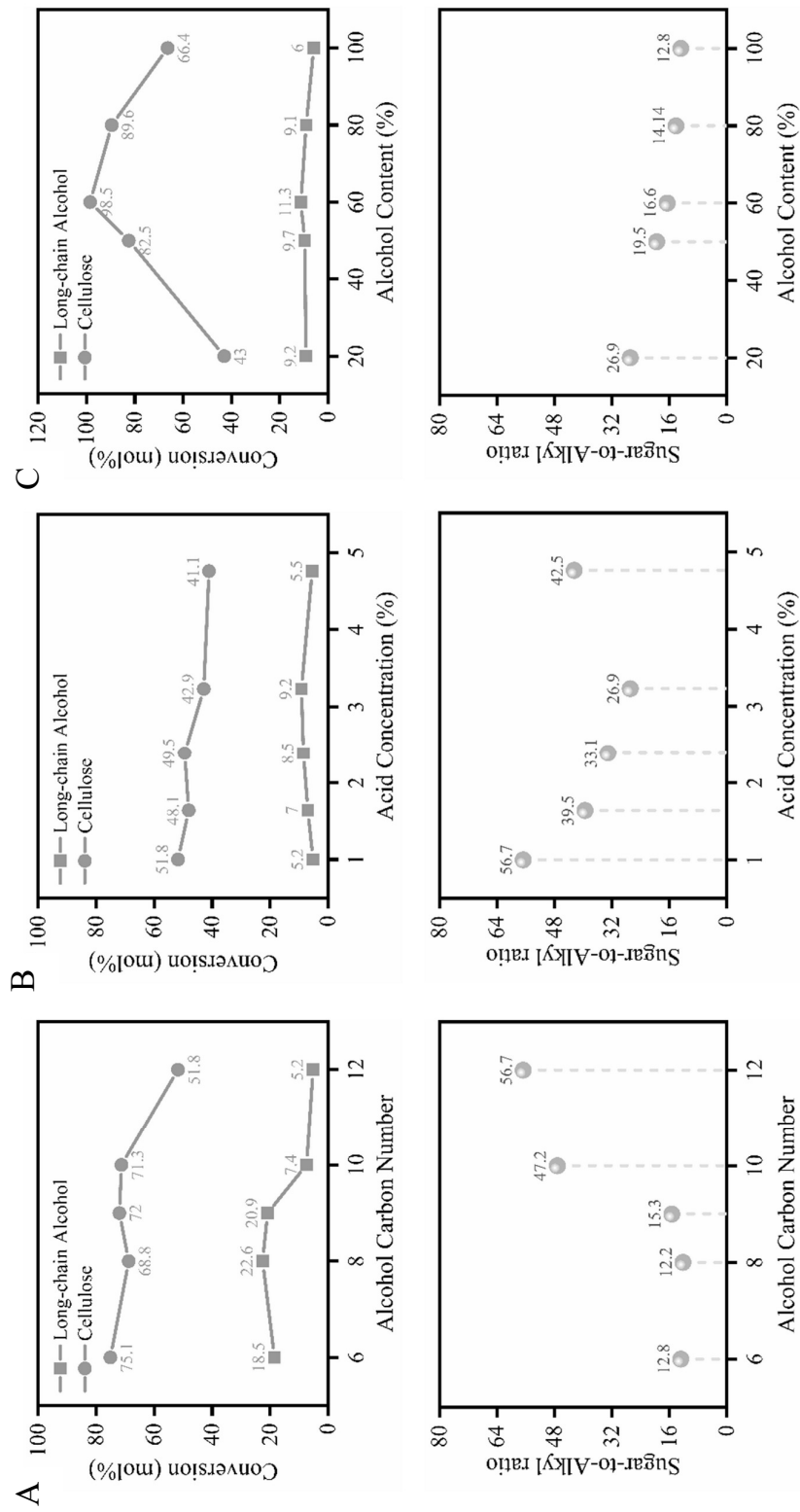


Fig. 11 (cont.)**D**

Entry ^a	alcohol carbon number	acid (mol%) ^b	alcohol (mol%) ^b	MCC conversion (mol%) ^b	alcohol conversion (mol%) ^c	$\overline{DP}_n$
1	6	1.7	17.4	80.9	32.6	13.9
2	8	1.7	17.4	68.5	17.3	22.4
3	9	1.7	17.4	66.0	19.2	19.5
4	10	1.7	17.4	59.2	8.6	39.2
5	12	1.7	17.4	51.8	5.2	56.7
6	12	2.7	17.4	48.1	7.0	39.5
7	12	4.0	17.4	49.5	8.5	33.1
8	12	5.3	17.4	42.9	9.2	26.9
9	12	8.0	17.4	41.1	5.5	42.5
10	12	5.3	43.5	82.5	9.7	19.5
11	12	5.3	52.2	98.5	11.3	16.6
12	12	5.3	69.6	89.6	9.1	14.1
13	12	5.3	87.0	66.4	6.0	12.8

^a Reaction conditions: reaction temperature of 110 °C, ball milling speed of 700 rpm, milling time of 30 min. ^b The mol% is relative to the moles of MCC substrate. ^c The mol% is relative to the moles of alcohol added.

Fig. 12

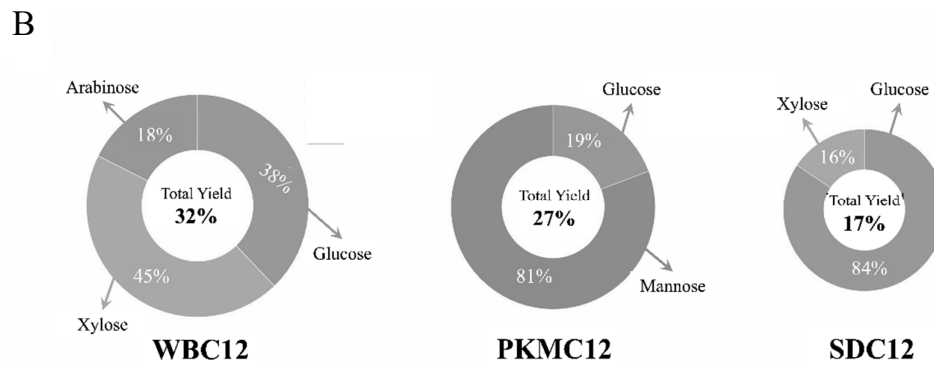
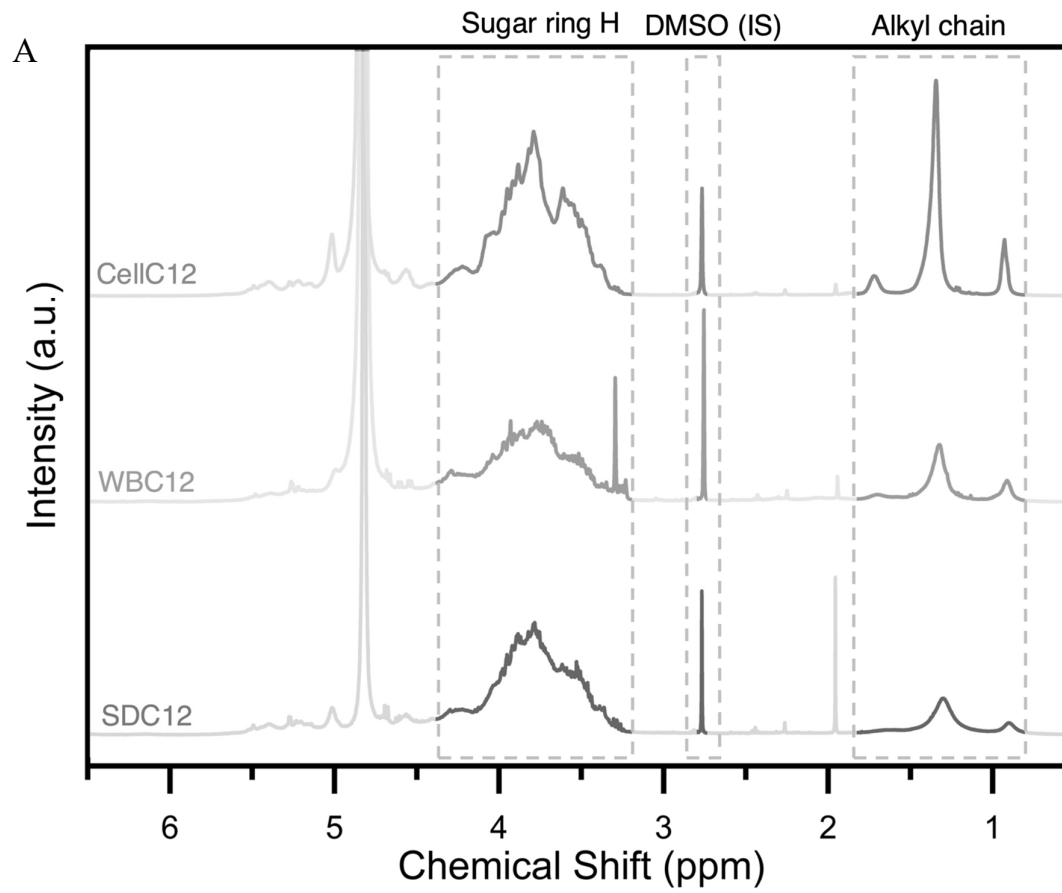


Fig. 13

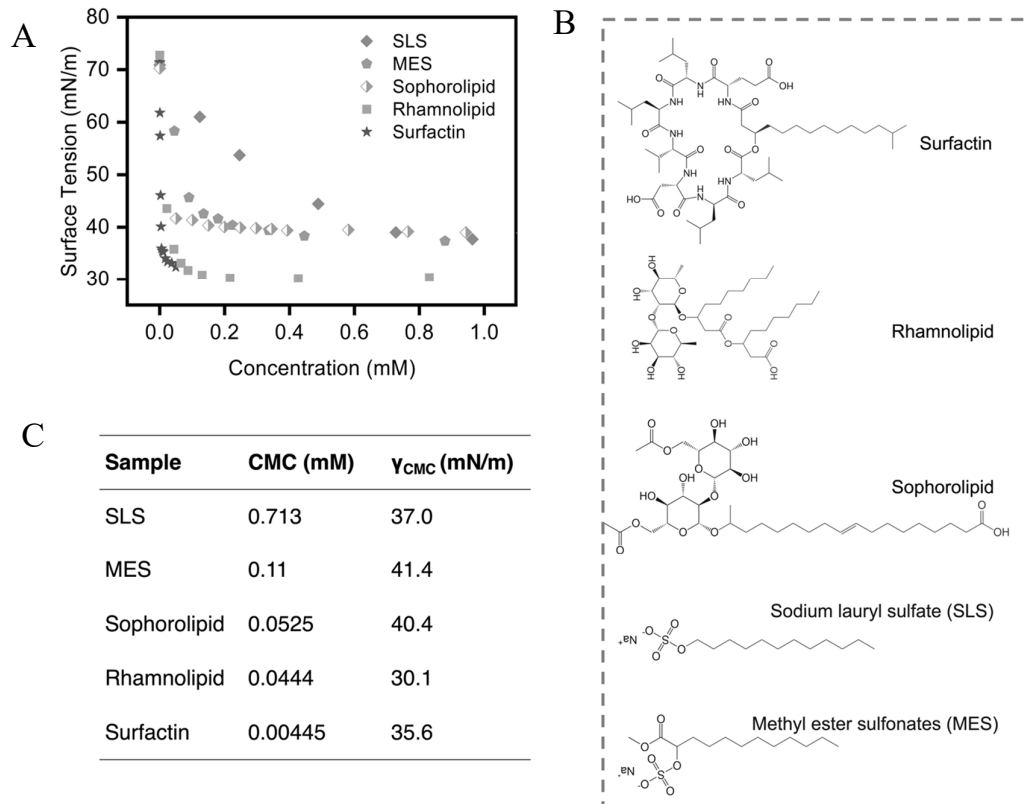


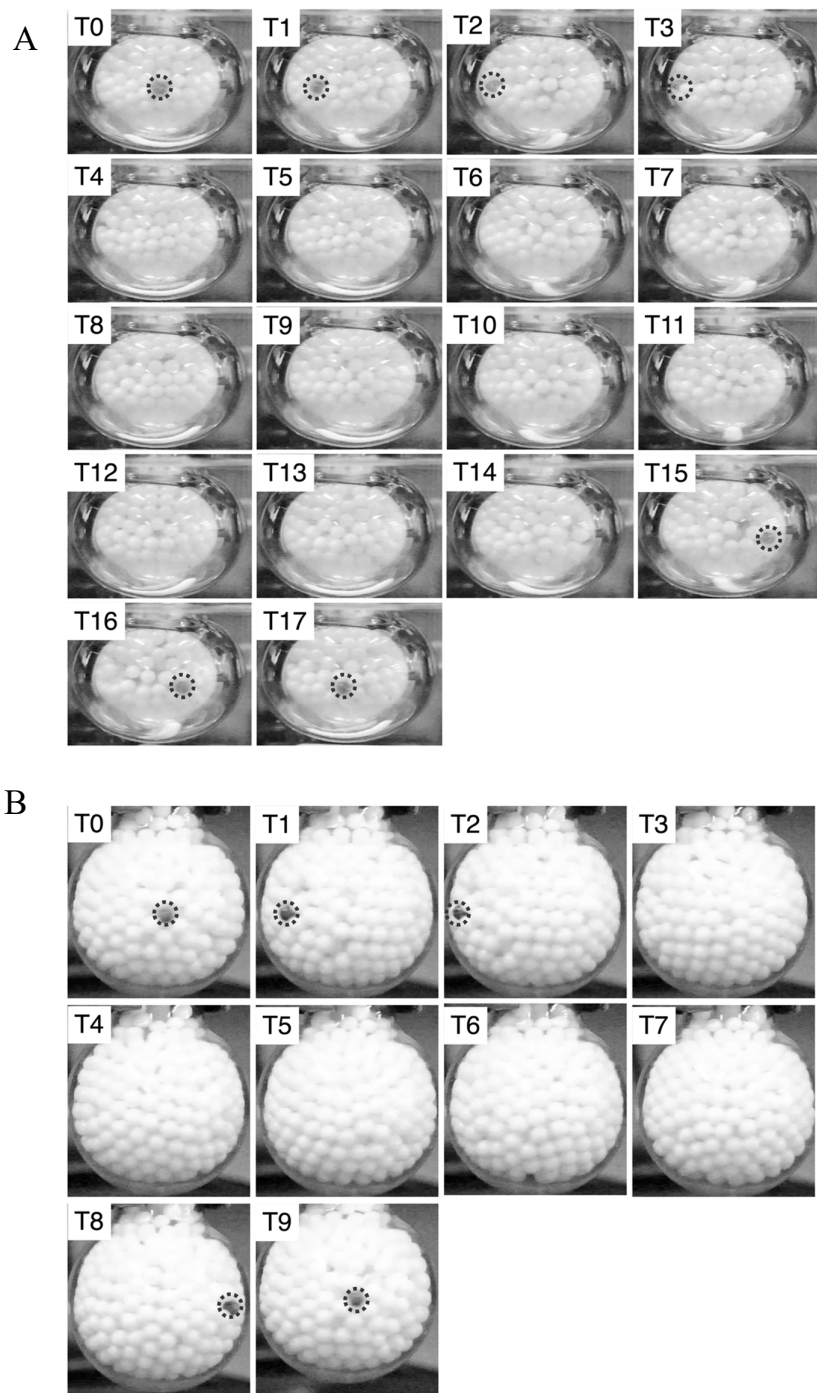
Fig. 14

Fig. 15

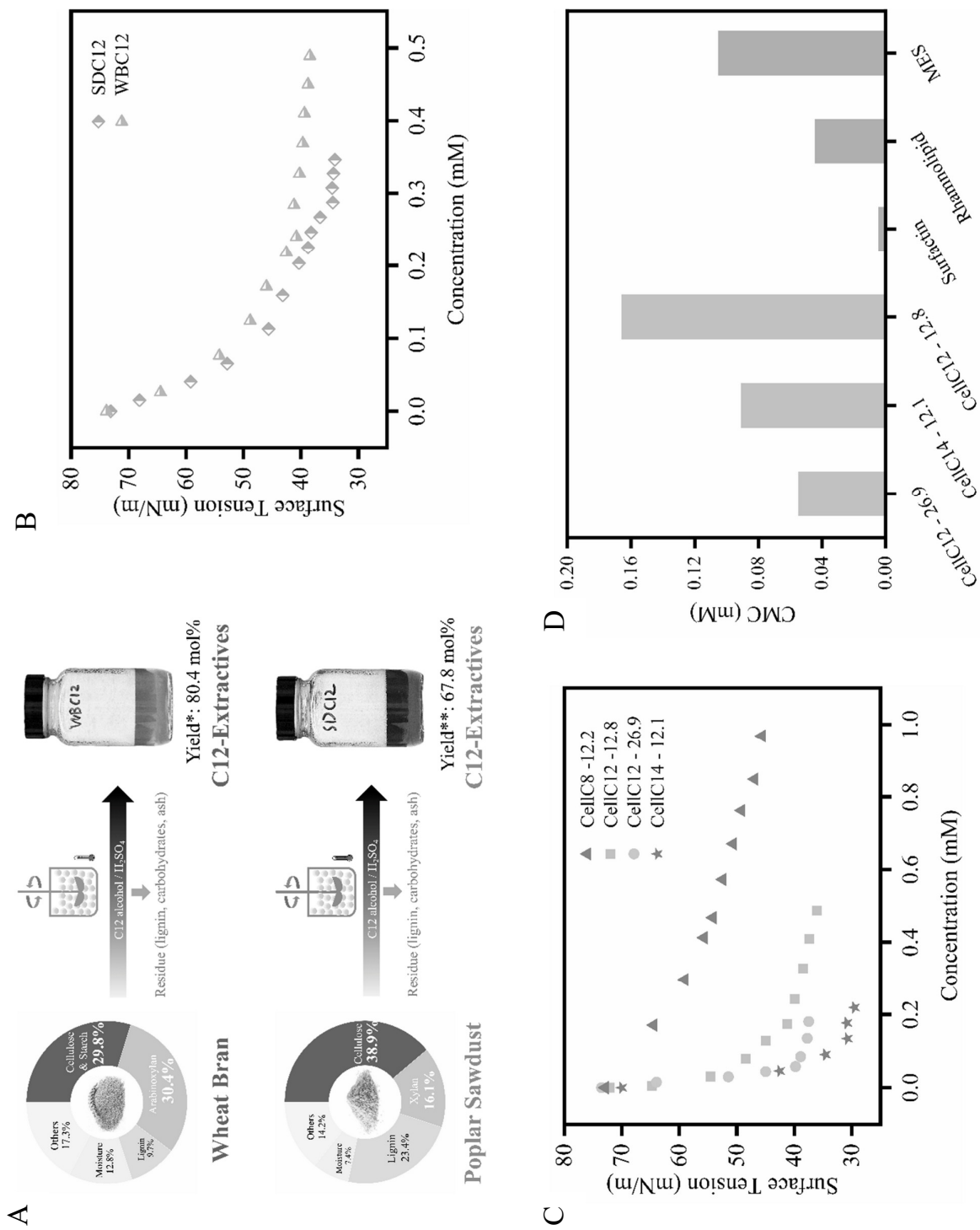
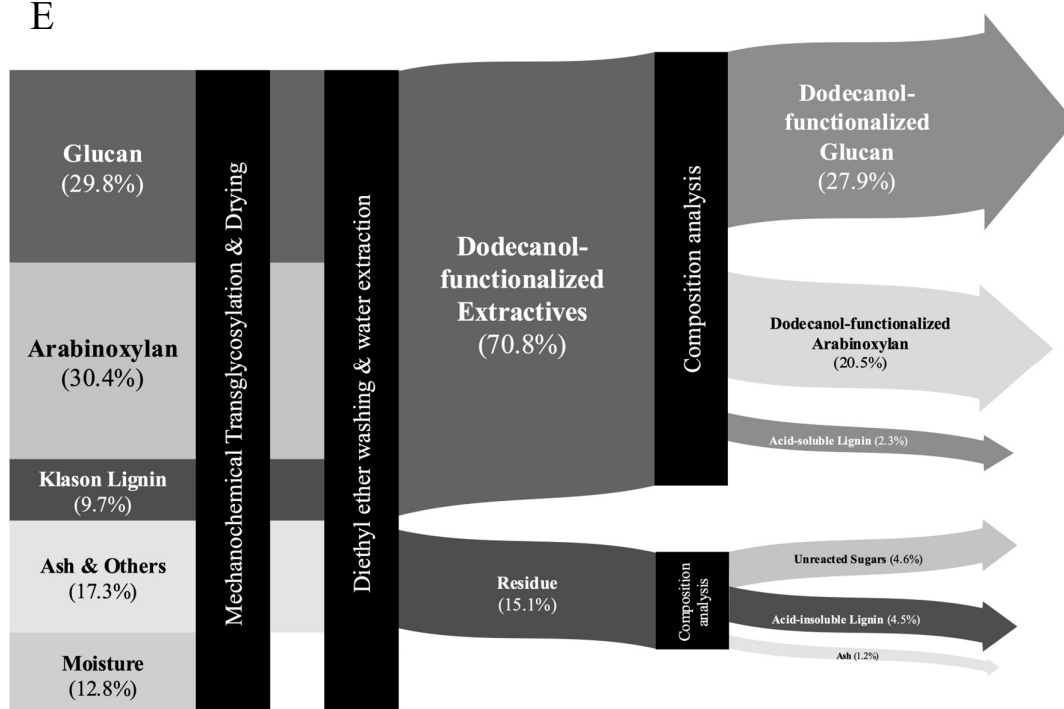


Fig. 15 (cont.)

E



F

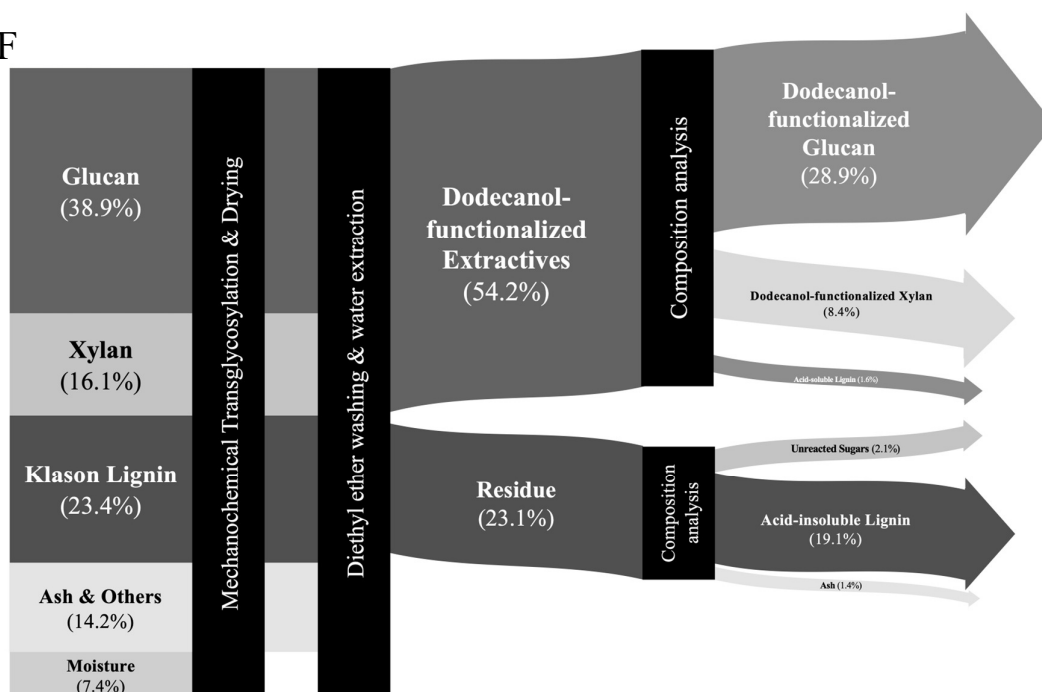


Fig. 16

entry ^a	biomass substrate	acid used (mol%) ^b	alcohol input (mol%) ^b	milling time (min)	yield (mol%) ^c	S:A ^d
1	MCC	5.3	52.2	30	98.5	16.6
2	MCC	5.3	43.5	30	82.5	19.5
3	MCC	5.3	17.4	30	43	26.9
4	wheat bran	8.5	69.6	60	80.4 ^e	17.2
5	poplar sawdust	8.0	69.6	40	67.8 ^e	23.9

^a Reaction conditions: reaction temperature of 110 °C, ball milling speed of 700 rpm, dodecanol (C12) as the alcoholysis agent. ^b The mol% is relative to biomass substrate. ^c It is defined as the moles of monosaccharide units extracted in the products relative to the moles of monosaccharide units in the biomass substrate. ^d S:A is defined as the molar ratio between the monosaccharide units to alkyl groups in the alkyl-functionalized oligosaccharides products. ^e It is the molar yield of monosaccharide units (both pentose and hexose) extracted from raw biomasses.

Fig. 17

