

<Supplementary Information>

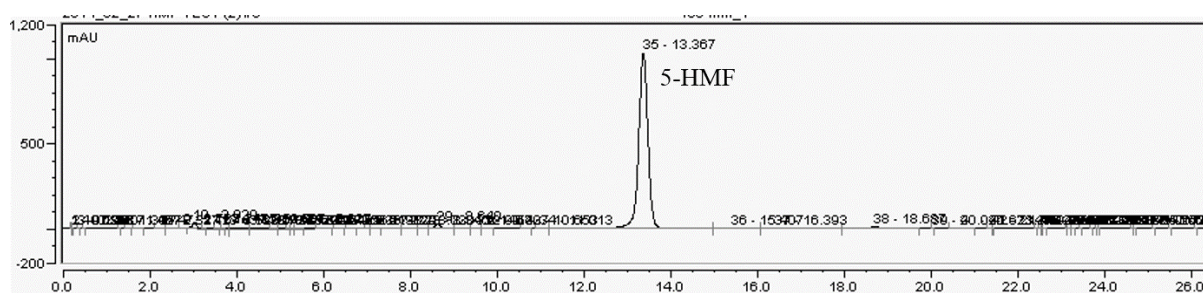
## **Production of 5-hydroxymethylfurfural from agarose by using solid acid catalyst in dimethyl sulfoxide**

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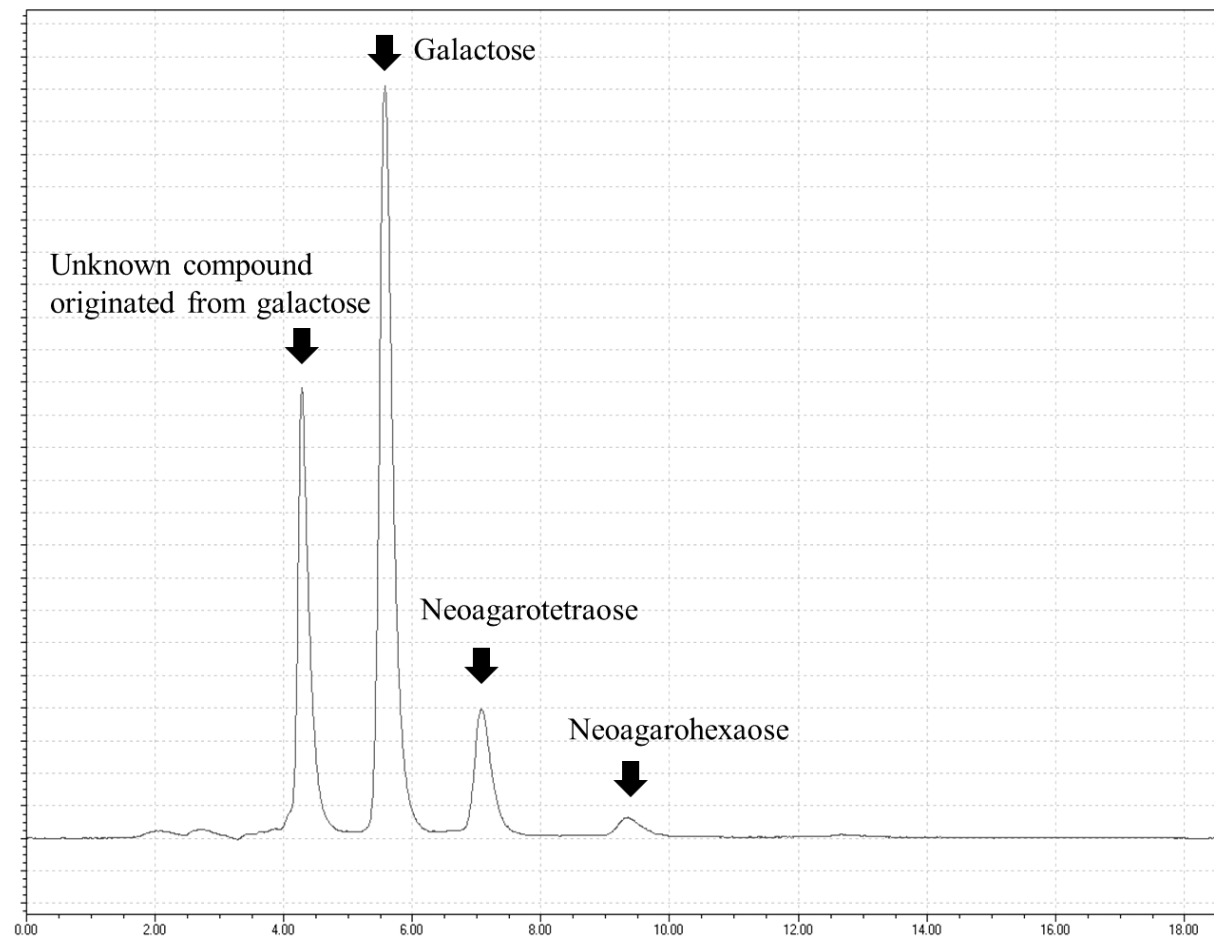
1. Representative HPLC chromatograms used for quantification of agarose hydrolysis

:Each (1) 5-HMF, (2) Galactose and (3) LA and FA analysis was performed by individual HPLC columns and detectors. More detail descriptions about analysis conditions were referred on “2.5. Analytical procedures” section in the article.

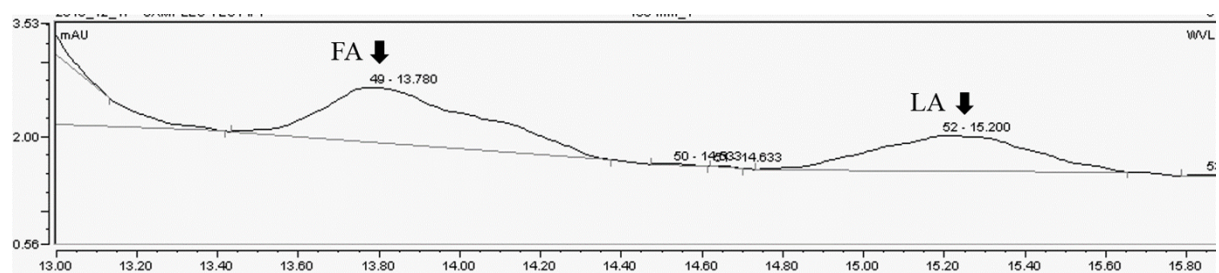
(1) 5-HMF



## (2) Galactose and other chemical compounds from hydrolysis



## (3) LA and FA



## 2. Data tables about graphical figures in the article

**Fig.3** Galactose, 5-HMF, levulinic acid and formic acid formation from agarose

(a) In aqueous solution

Time (min)	Yield (%)			
	Galactose	5-HMF	LA	FA
0	0	0	0	0
30	20	3	0	3
40	49	13	9	7
60	64	17	17	12
90	80	13	30	24
150	80	3	35	35
210	78	1	50	49

(b) In DMSO

Time (min)	Yield (%)			
	Galactose	5-HMF	LA	FA
0	0	0	0	0
30	21	9	1	5
60	29	27	2	5
120	31	44	6	7
180	29	49	8	10

**Fig.6** 5-HMF and levulinic acid yields at various levels of moisture content

Moisture content % (w/w)	Final yield (%)	
	5-HMF	LA
1.8	42	9
3.6	49	9
5.4	55	10
7.2	62	11
9.0	61	12
10.8	59	9
12.6	58	10
100	17	50

**Fig.8** Comparison of 5-HMF yields in beaker and packed-bed reactor

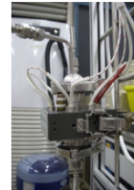
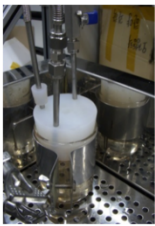
Moisture content % (w/w)	Final yield (%)	
	Packed-bed reactor	Beaker
3.6	45	49
5.4	49	55
7.2	53	62
9.0	51	61
10.8	48	59

**Fig.9** Results of reusability test in packed-bed reactor

	1 <sup>st</sup> run	2 <sup>nd</sup> run	3 <sup>rd</sup> run	4 <sup>th</sup> run	5 <sup>th</sup> run	6 <sup>th</sup> run
5-HMF yield (%)	54	41	37	34	34	33

3. The photo of actual packed bed differential recycle reactor

**Reservoir**



**Catalyst bed  
column**



**Pump**