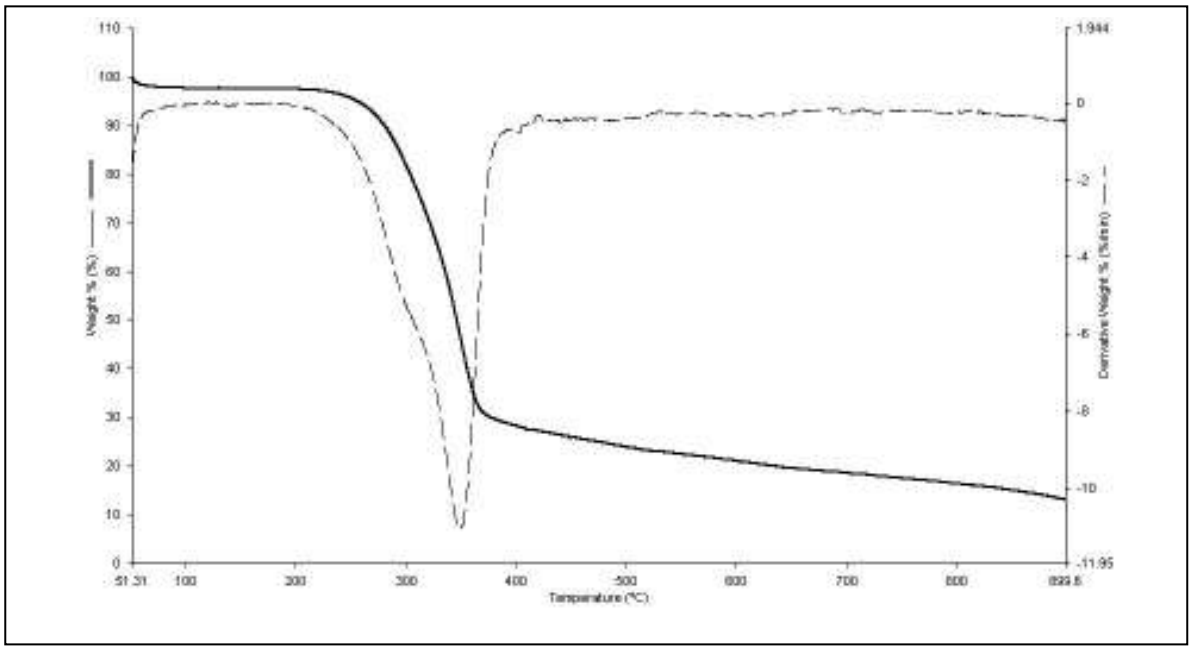
APPENDICES

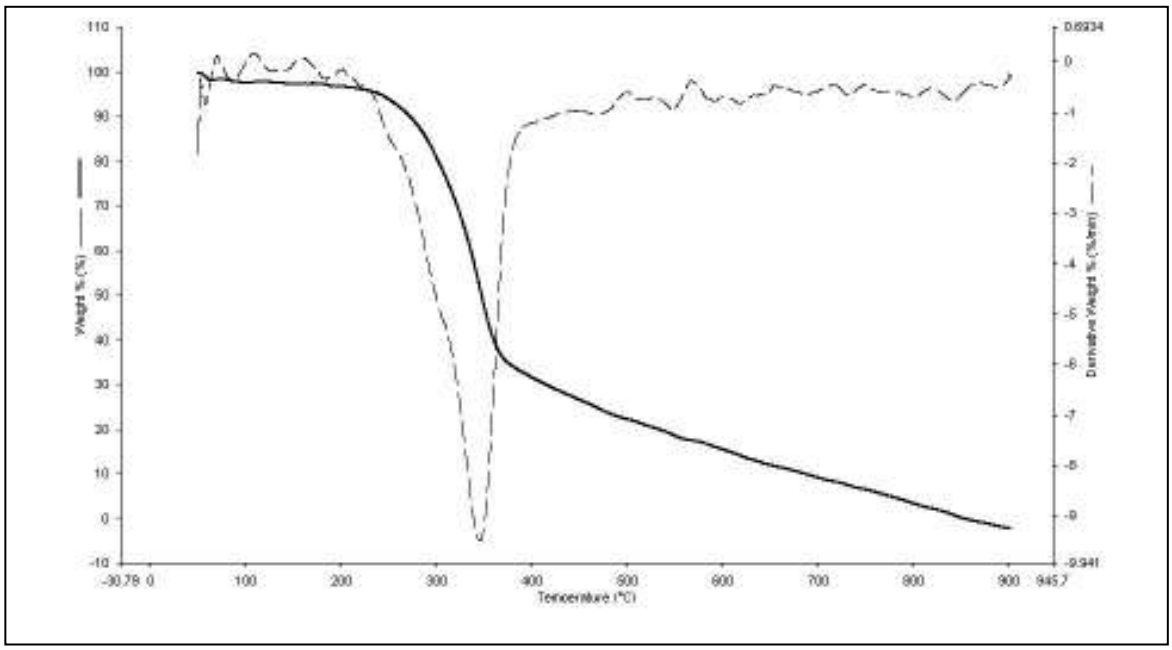
A. Water content of SMSS and GS (section 4.1.1)

Type of Substrate	Percentage of Water %					Mean	SD
	R1	R2	R3	R4	R5		
SMSS	66.4	65.5	64.1	66.4	65.5	65.6	0.9
GS	55.7	55.6	55.7	55.7	55.5	55.64	0.09

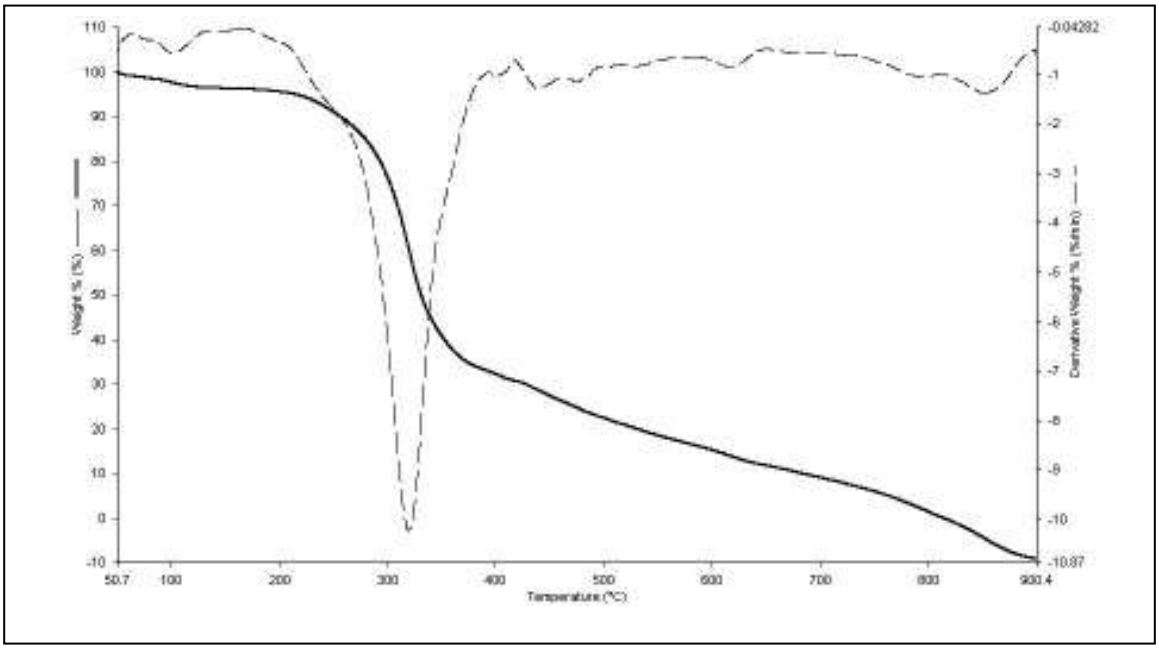
B. Thermogravimetric analysis (TGA) (section 4.1.2)



TGA Spectrum of GS



TGA Spectrum of USMSS



TGA Spectrum of DSMSS

C. Pretreatment of SMSS and GS (section 4.2)

Type of Substrate	Dry Mass/ g			Mean	SD
	R1	R2	R3		
SMSS	51.0	50.6	52.1	51.2	0.8
GS	88.3	89.6	89.4	89.1	0.7

D. Hydrolysis of cellulose, SMSS and DSMSS (section 4.3.1)

Type of Substrate	Percent Yield of Glucose/ %			Mean	SD
	R1	R2	R3		
Cellulose	28.4	21.0	24.9	24.8	3.7
SMSS	14.5	14.7	12.5	13.9	1.2
DSMSS	8.7	7.9	7.3	8.0	0.7

Type of Substrate	Mass of Xylose/ g			Mean	SD
	R1	R2	R3		
Cellulose	-	-	-	-	-
SMSS	3.1	4.3	4.2	3.9	0.7
DSMSS	0.0	0.0	2.1	1	1

E Fehling's test (section 4.3.3)

i. Calibration curve for Fehling's test

% of Glucose	Titre Volume/ cm^3			Mean	SD
	R1	R2	R3		
0.5	27.00	26.15	27.00	26.70	0.5
1.0	16.80	18.60	19.80	18	2
1.5	9.75	7.80	8.75	9	1

ii. Determination of reducing sugar from calibration curve

Sawdust Substrate	Titre Volume/ cm^3			Mean	SD
	R1	R2	R3		
DSMSS 1	30.30	31.15	32.25	31	1
DSMSS 2	27.20	27.05	26.35	26.9	0.5
DSMSS 3	13.50	13.50	15.00	14.0	0.8

F. Methanol content after hydrolysis (section 4.3.4)

Substrates	Mass of Methanol/ g			Mean	SD
	R1	R2	R3		
DSMSS	0.41	0.38	0.43	0.41	0.03
SMSS	0.55	0.52	0.50	0.52	0.03
Cellulose	Not detected	Not detected	Not detected	-	-

G. Hydrolysis of SMSS by different concentrations of perchloric acid (section 4.3.5)

i. Percentage of Mass Reduction/ %

% of Perchloric Acid	Percentage of Mass Reduction/ %			Mean	SD
	R1	R2	R3		
70	77.1	77.0	77.3	77.1	0.2
60	59.2	59.6	59.8	59.5	0.3
50	19.4	19.8	19.2	19.5	0.3

ii. Percent Yield of Glucose/ %

% of Perchloric Acid	Percent Yield of Glucose / %			Mean	SD
	R1	R2	R3		
70	14.5	14.7	12.5	13.9	1.2
60	7.3	8.8	7.8	8.0	0.8
50	1.6	2.0	1.8	1.8	0.2

H. Yield of glucose of different hydrolysis time (section 4.3.6)

Hydrolysis Time/ min	Yield of Glucose/ g			Mean	SD
	R1	R2	R3		
60	3.75	2.61	2.51	2.6	0.7
30	5.01	4.61	4.72	4.7	0.2
10	7.11	8.33	7.95	8.1	0.6

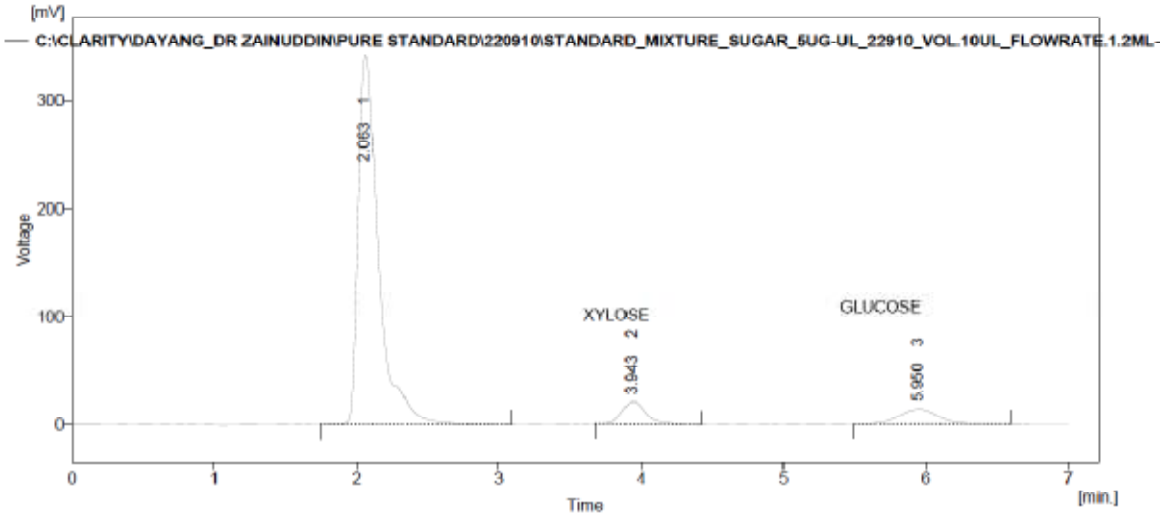
I. Fermentation of hydrolysates (section 4.4.1)

i. Percent yield of ethanol

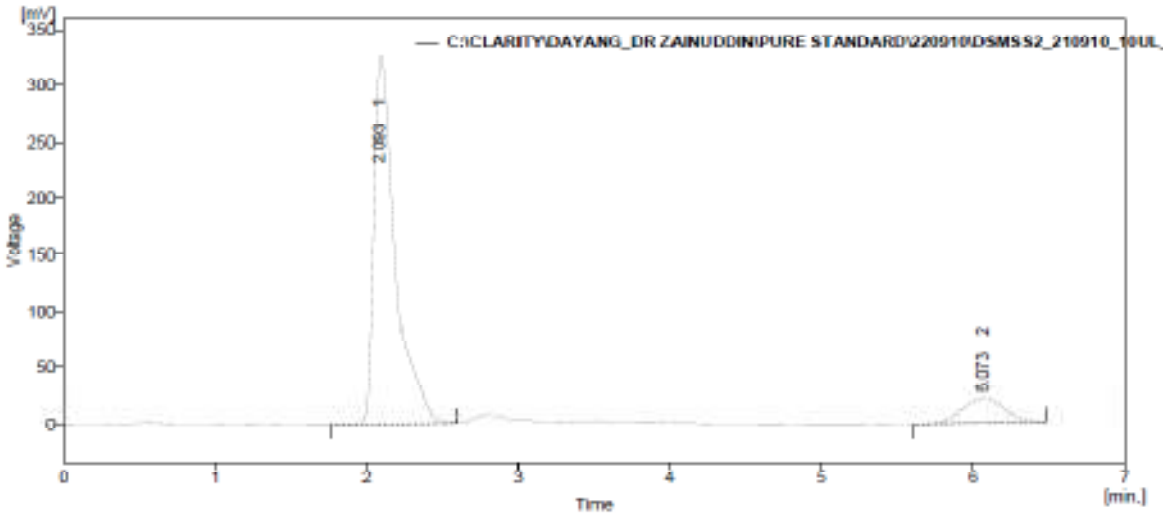
Type of Substrate	Percent Yield of Ethanol			Mean	SD
	R1	R2	R3		
Cellulose	12.5	11.9	16.2	13.5	2.3
SMSS	12.9	15.7	11.2	13.3	2.3
DSMSS	5.2	8.9	13.4	9.2	4.1

K. Examples of HPLC chromatograms

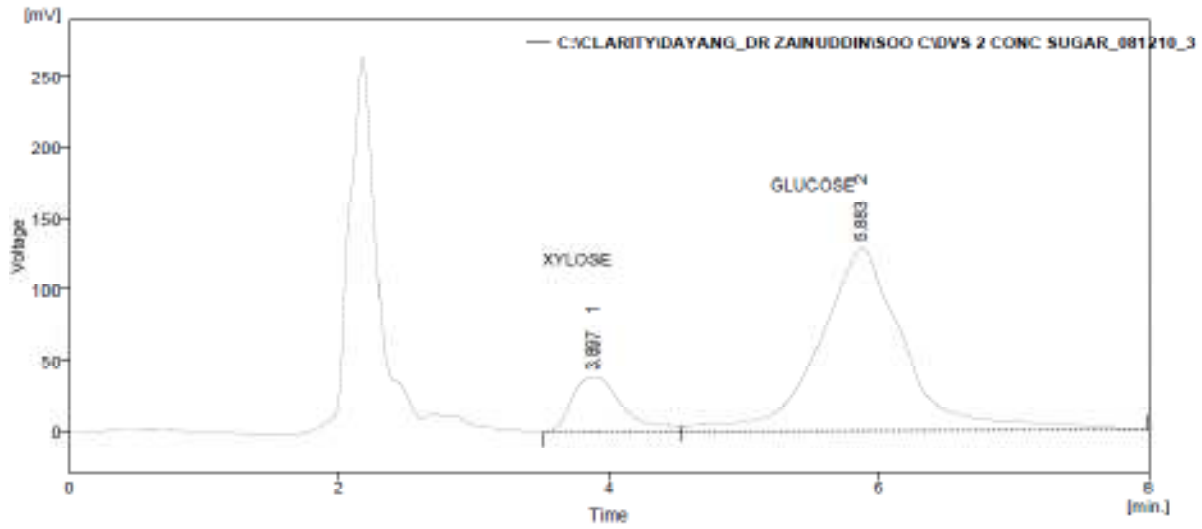
i. Standard of xylose + glucose



ii. DSMSS



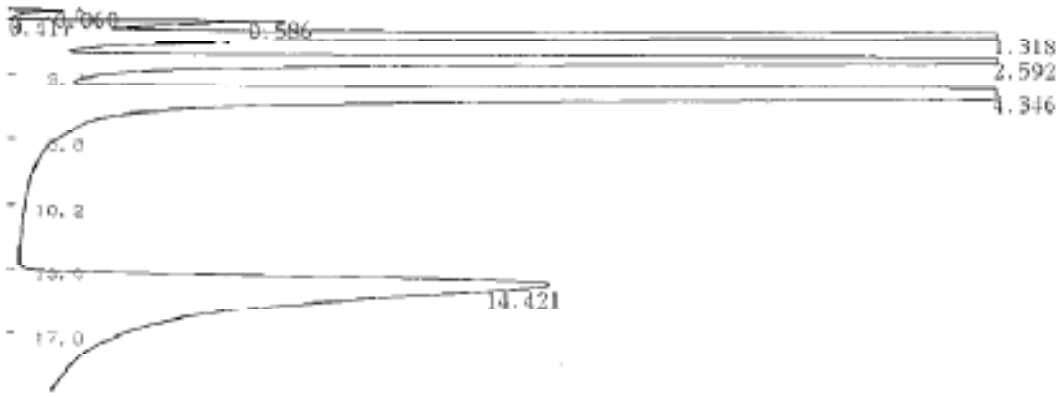
iii. SMSS


[mV]
C:\CLARITY\DAYANG_DR ZAINUDDIN\SOO C\DVS 2 CONC SUGAR_081210_3
250
200
150
100
50
0
Voltage
XYLOSE
3.897 1
GLUCOSE
5.883
0
2
4
6
8
Time
[min.]

L. Examples of GC Chromatogram

i. Standard of ethanol

C-RSA CHROMATOPAC CH=1 DATA=1:@CHRM1.C48 ATTEN= 3 SPEED= 3.0

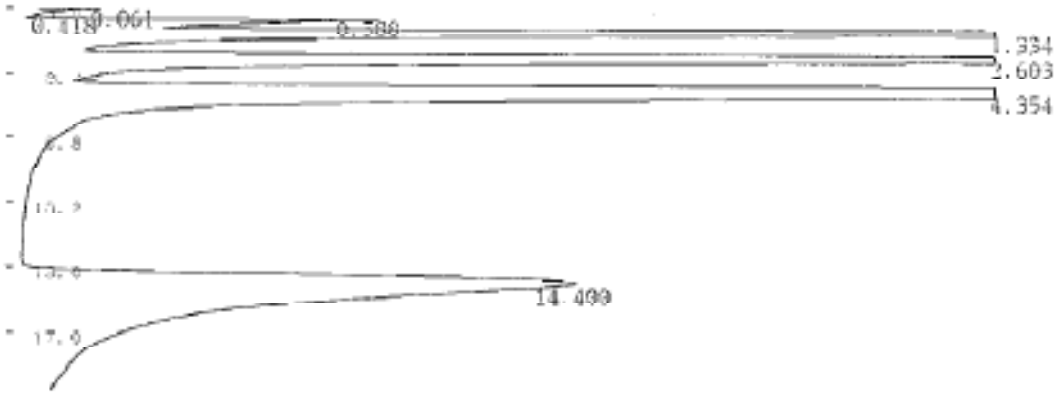


C-RSA CHROMATOPAC CH=1 Report No.=48 DATA-1:@CHRM1.C48 10/03/16 12:45:10

** CALCULATION REPORT **

CH	PKNO	TIME	AREA	HEIGHT	MK	IDNO	CONC	NAME
1	1	0.06	2942	396				
	2	0.417	176	46				
	3	0.586	39119	2457				
	4	1.318	466904	17912	M	V		
	5	2.592	419865	18004	E	V		
	6	4.346	939042	28441				
	7	14.421	518037	4651				
		TOTAL	2326085	71908			0	

C-RSA CHROMATOPAC CH=1 DATA=1:@CHRM1.C49 ATTEN= 3 SPEED= 3.0

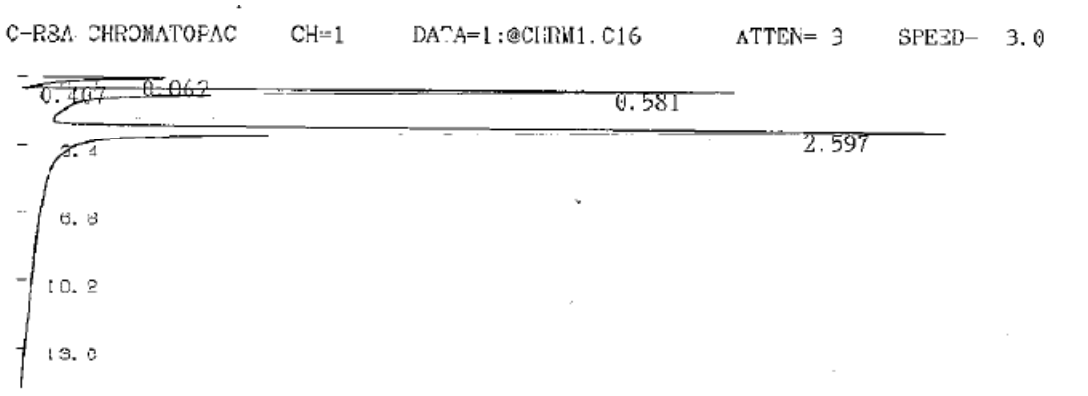


C-RSA CHROMATOPAC CH=1 Report No.=49 DATA-1:@CHRM1.C49 10/03/16 13:06:28

** CALCULATION REPORT **

CH	PKNO	TIME	AREA	HEIGHT	MK	IDNO	CONC	NAME
1	1	0.061	3739	512				
	2	0.418	186	51				
	3	0.588	31095	3129				
	4	1.334	416128	18765	M	V		
	5	2.603	418355	18633	E	V		
	6	4.354	909929	29894				
	7	14.4	530401	4874				
		TOTAL	2329832	75858			0	

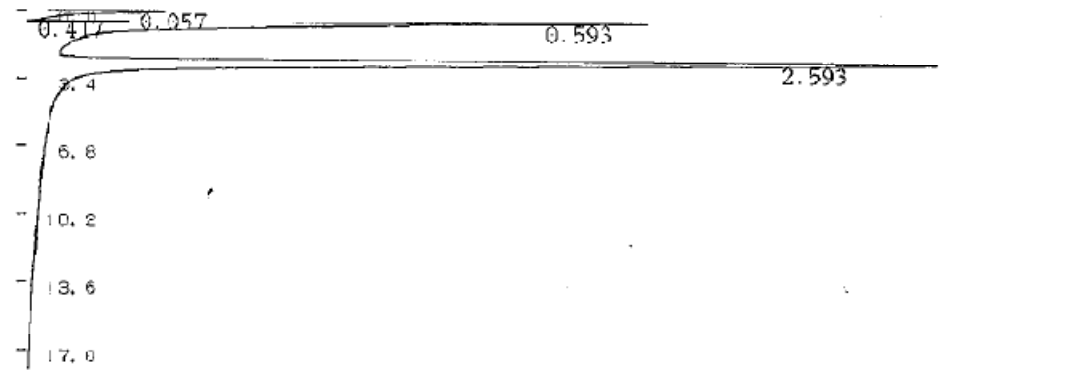
ii. Ethanol produced from cellulose



C-R8A CHROMATOPAC CH=1 Report No.=16 DATA=1:@CHRM1.C16 10/04/21 11:25:58

** CALCULATION REPORT **

CH	PKNO	TIME	AREA	HEIGHT	MK	IDNO	CONC	NAME
1	1	0.062	7128	982				
	2	0.407	281	73				
	3	0.581	99793	6036				
	4	2.597	190275	7745	V			
	TOTAL		297477	14835			0	



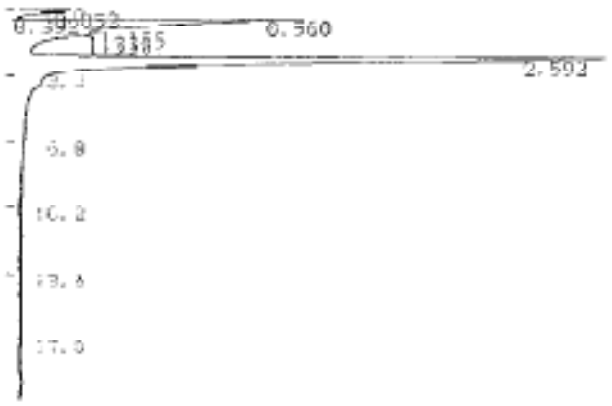
C-R8A CHROMATOPAC CH=1 Report No.=17 DATA=1:@CHRM1.C17 10/04/21 11:42:50

** CALCULATION REPORT **

CH	PKNO	TIME	AREA	HEIGHT	MK	IDNO	CONC	NAME
1	1	0.057	6203	881				
	2	0.417	253	70				
	3	0.593	94787	5258				
	4	2.593	181819	7634	V			
	TOTAL		283061	13843			0	

iii. Ethanol and methanol from DSMSS

C-R8A CHROMATOPAC CH=1 DATA=1:@CHRM1.C08 ATTEN= 3 SPEED= 3.0



C-R8A CHROMATOPAC CH=1 Report No.=8 DATA=1:@CHRM1.C08 10/03/26 10:40:04

** CALCULATION REPORT **

CH	PKNO	TIME	AREA	HEIGHT	MK	IDNO	CONC	NAME
1	1	0.052	2522	387				
	2	0.392	145	38				
	3	0.56	45885	2509				
	4	1.155	8301	735	V			
	5	1.33	15131	658	V			
	6	2.592	133152	5092	V			
	TOTAL		205136	9419			0	

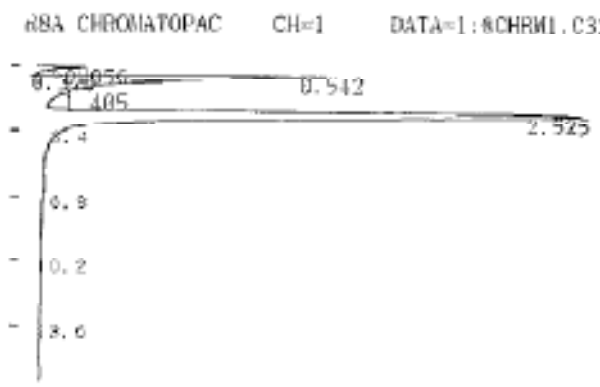
C-R8A CHROMATOPAC CH=1 DATA=1:@CHRM1.C09 ATTEN= 3 SPEED= 3.0

C R8A CHROMATOPAC CH=1 Report No.=9 DATA=1:@CHRM1.C09 10/03/26 11:02:12

** CALCULATION REPORT **

CH	PKNO	TIME	AREA	HEIGHT	MK	IDNO	CONC	NAME
1	1	0.053	2395	376				
	2	0.396	148	38				
	3	0.566	46625	2571				
	4	1.149	8077	746	V			
	5	1.345	17761	704	V			
	6	2.602	138376	5171	SV			
	7	3.831	924	50	T			
	TOTAL		214304	9657			0	

iv. Ethanol and methanol from SMSS



C-R&A CHROMATOPAC CH=1 Report No.=33 DATA=1:&CHRM1.C32 10/02/11 09:26:08

** CALCULATION REPORT **

CH	PKNO	TIME	AREA	HEIGHT	MK	IDNO	CONC	NAME
1	1	0.056	2488	405				
	2	0.376	155	38				
	3	0.542	53453	2598				
	4	1.405	9045	330				
	5	2.525	132331	4791				
	TOTAL		197472	8165			0	

C-R&A CHROMATOPAC CH=1 DATA=1:&CHRM1.C33 ATTEN= 3 SPEED= 3.0

C-R&A CHROMATOPAC CH=1 Report No.=34 DATA=1:&CHRM1.C33 10/02/11 09:43:24

** CALCULATION REPORT **

CH	PKNO	TIME	AREA	HEIGHT	MK	IDNO	CONC	NAME
1	1	0.851	2115	370				
	2	0.385	159	40				
	3	0.553	50414	2489				
	4	1.346	11782	416				
	5	2.563	134781	5689				
	TOTAL		199251	9003			0	

LIST OF CONFERENCES

Teoh T.C., Soo C.S. & Zainudin A., 2009. Production of Bioethanol as an Alternative Fuel. International Congress of Malaysian Society for Microbiology (ICMSM 2009). 1st to 4th Dec 2009

Soo, C.S., Teoh T.C., A. Zainudin (2009). Production of Bioethanol from Spent Mushroom Sawdust Substrate (SMSS). 5th Mathematics and Physical Sciences Graduate Congress (5th MPSGC), Chulalongkorn University, Bangkok. 7th to 9th Dec 2009.

LIST OF AWARD

Best Oral Presentation Award. Production of Bioethanol from Spent Mushroom Sawdust Substrate (SMSS). 5th Mathematics and Physical Sciences Graduate Congress (5th MPSGC), Chulalongkorn University, Bangkok. 7th to 9th Dec 2009.