

Co-Hydrothermal Liquefaction of Food and Plastic Waste for Biocrude Production

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Supplementary Information

Table S1: Comparison of measured and calculated heating values.

Nr. -	HHV _{Biooil} MJ/kg	HHV _{Biooil} MJ/kg	Difference MJ/kg
Initial Experiments	T2	34,95	
	T7	34,94	35,40
	T8	35,71	36,47
	T9		22,86
	T10		41,92
	T11	35,52	36,06
	T12	32,33	36,12
	T13	35,74	36,57
Cube design	1	37,25	36,67
	2	35,2	34,60
	3	36,05	36,48
	4	35,96	35,63
	5	35,79	33,73
	6	36,52	36,22
	7	36,29	36,07
	8	36,56	36,00
	9	37,6	36,75
	10	36,8	36,25
Face centers	11	35,63	35,05
	12	36,84	36,14
	13	37,21	36,28
	14	36,63	36,28
	15	34,46	34,04
Sum			0,11
Std. dev			1,14

Table S2: Analysis of Variance for biooil yield model.

Call:

rsm(formula = yield ~ FO(x1, x2, x3), data = design.full_exp_design_coded)

	Estimate	Std. Error	t value	Pr(> t)	
(Intercept)	29.11000	0.94555	30.7862	1.559e-13	***
x1	1.31500	1.23285	1.0666	0.3055	
x2	1.72000	1.23285	1.3951	0.1864	
x3	17.22200	1.23285	13.9693	3.312e-09	***
Significant codes	0 '***'	0.001 '***'	0.01 '*'	0.05 '.'	0.1 ' ' 1

Multiple R-squared: 0.9385, Adjusted R-squared: 0.9243

F-statistic: 66.07 on 3 and 13 DF, p-value: 3.987e-08

Analysis of Variance Table

Response: yield	Df	Sum Sq	Mean Sq	F value	Pr(>F)
FO(x1,x2,x3)	3	3012.85	1004.28	66.0747	3.987e-08
Residuals	13	197.59	15.20		
Lack of fit	11	192.06	17.46	6.3198	0.1444
Pure error	2	5.53	2.76		

Table S3: GC results of experimental trials.

Nr. -	Hydrogen wt%	Oxygen wt%	Nitrogen wt%	CO ₂ wt%	Methane wt%	CO wt%	Ethylene wt%	Ethane wt%	Propene wt%	Propane wt%	isoButane wt%	Butene wt%	nButane wt%
T2	0	0	0	95,43	0,36	0	0,38	0,00	0,54	1,63	0,32	0,88	0,47
T4	0	0	0	96,37	0,71	0	0,27	0,00	0,51	0,89	0,16	0,74	0,34
T6	0	0	0	94,27	1,12	0	0,33	0,00	0,60	1,73	0,43	0,97	0,55
T7	0	0	0	92,17	2,70	0	0,63	0,16	0,77	1,57	0,25	1,08	0,67
T8	0	0	0	94,69	1,59	0	0,43	0,11	0,58	1,12	0,20	0,81	0,49
T9	0	0	0	95,48	1,07	0	0,28	0,00	0,56	1,09	0,21	0,87	0,44
T10	0	0	0	85,58	2,13	0	0,71	0,74	1,85	3,68	0,48	1,94	2,87
T11	0	0	0	85,22	1,65	0	0,69	0,83	1,94	3,94	0,42	1,91	3,41
T12	0,04	0	0	94,99	1,86	0	0,30	0,34	0,61	0,63	0,08	0,69	0,46
T13	0	0	0	92,68	3,00	0	0,38	0,49	0,86	1,10	0,22	0,72	0,55
1	0	0	0	90,04	1,75	0	0,51	0,00	1,12	2,89	0,70	1,55	1,44
2	0	0	0	92,09	2,70	0	0,53	0,27	0,72	1,58	0,36	0,89	0,85
3	0	0	0	92,75	1,05	0	0,00	0,00	2,82	0,62	0,54	1,31	0,91
6	0	0	0	93,31	0,67	0	0,42	0,00	2,74	0,46	0,54	1,11	0,74
7	0	0	0	94,23	0,66	0	0,32	0,00	2,32	0,37	0,45	1,02	0,63
9	0	0	0	90,26	1,10	0	0,47	0,00	0,72	4,49	0,97	1,00	0,98
10	0	0	0	92,89	2,93	0	0,45	0,40	1,49	0,66	0,18	0,28	0,72
11	0	0	0	93,32	2,49	0	0,47	0,23	1,56	0,55	0,20	0,28	0,92
12	0	0	0	92,51	2,24	0	0,49	0,00	1,99	0,60	0,29	1,16	0,72
13	0	0	0	93,93	2,38	0	0,39	0,11	1,30	0,43	0,17	0,80	0,49
14	0,05	0	0	88,32	5,84	0	0,74	0,63	1,83	0,86	0,19	0,34	1,20
15	0	0	0	88,87	3,95	0	0,78	0,15	2,60	0,80	0,36	1,58	0,91

Table S4: HPLC results of experimental trials.

Nr. -	Temp. °C	Time min	x _B wt.-frac	Cellobiose g/l	Glucose g/l	Xylose g/l	Arabinose g/l	Succinic Acid g/l	Lactic Acid g/l	Glycerol g/l	Formic Acid g/l	Acetic Acid g/l	Propionic Acid g/l	Isobutyric Acid g/l	Butyric Acid g/l	Total g/l
T9	330	30	0								5.25	0.07				5.32
T10	370	30	0		0.13						7.18	0.77				8.09
T12	370	30	1			0.12	0.12	0.38	0.86	6.77	0.33	5.52	1.32			15.44
1	370	60	0.5			0.30		0.14	0.11		5.93	2.41	0.58	0.14		9.62
2	290	60	0.5	0.35	0.29	0.21	0.77	0.48	4.16	3.87	1.83	0.98	2.79	1.05		16.78
3	370	0	0.5	0.20	0.19		0.32	0.24	0.98	3.34	1.66	1.24	0.39	0.13		8.69
4	330	30	0.75		0.28	0.13	0.42	0.32	1.58	5.49	1.51	2.60	2.58	0.15	0.21	15.28
5	290	0	0.5	0.37	0.39	0.25	1.35	0.54	5.33	1.03	2.32	0.90	4.31	1.04	0.19	18.01
6	290	60	1		0.37	0.26	1.13	0.69	8.00	8.18	0.33	8.65	7.50	0.58	0.67	36.38
7	290	0	1	0.14	0.40	0.71	1.83	0.83	9.04	2.03	2.65	2.33	1.22	1.98	0.55	23.69
8	370	0	1		0.35	0.15	0.67	0.43	2.07	6.83	0.33	3.32	3.69	0.51	0.46	18.79
9	370	60	1		0.14			0.23		4.63	0.33	4.49	1.02	0.35	0.26	11.45
10	330	30	0.75	0.11	0.36	0.31	0.63	0.56	1.92	5.32	3.66	3.39	3.12	0.61	0.60	20.59
11	290	30	0.75	0.45	0.45	0.29	1.18	0.61	6.39	5.77	0.66	1.42	5.20	0.46		22.89
12	330	60	0.75	0.02	0.24		0.26	0.32	0.45	4.80	0.33	2.37	1.71	0.21	0.17	10.87
13	370	30	0.75	0.30	0.27	0.10		0.23	0.28	4.13	0.33	2.72	0.70	0.15	0.10	9.32
14	330	30	0.75		0.46	0.24	0.65	0.46	1.70	5.72	0.47	2.90	2.63	0.18	2.35	17.75
15	330	0	0.75	0.32	0.30	0.19	0.93	0.46	8.49	3.62	0.59	1.31	4.34	0.52		21.08
16	330	30	0.5		0.16		0.34	0.30	1.40	3.88	2.08	1.53	0.40	0.15	0.15	10.40
17	330	30	1		0.45	0.35	0.76	0.55		7.55	0.48	3.66	0.29			14.08