ELECTRONIC SUPPLEMENTARY INFORMATION

Pyrolysis-GCMS of plastic and paper waste as alternative blast furnace reductants

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Table S1: Subcoal Peak Match Database matches, using NIST GCMS database.

Name	Probability	Area	R.T. (s)
1,3-Butadiene	64.3	8.52E+09	362.225
Naphthalene	62.7	8.16E+09	1367.01
Toluene	66.0	8.15E+09	836.377
1,3-Cyclopentadiene	56.2	7.82E+09	507.151
2-Propenal	79.5	6.92E+09	348.142
Benzene	79.1	6.67E+09	687.324
2-Propenal	77.1	6.66E+09	352.505
Acenaphthylene	66.9	4.83E+09	1622.35
Benzonitrile	64.2	4.18E+09	1166.41
Benzene	72.1	4.03E+09	686.406
Phenylethyne	98.2	3.41E+09	989.277
Benzene	76.0	3.06E+09	691.326
Propanedioic acid	95.4	2.72E+09	656.094
Phenol	88.7	2.52E+09	1176.92
Naphthalene	57.1	2.41E+09	1333.94
Aniline	68.8	2.24E+09	1150.36
Ethylbenzene	60.9	2.18E+09	959.614
Naphthalene, 2-methyl-	41.9	2.11E+09	1485.29
2-Propenenitrile	82.4	2.09E+09	539.301
Acetophenone	61.6	1.95E+09	1241.38
Acetone	38.1	1.88E+09	482.342
1-Buten-3-yne	92.5	1.87E+09	374.993
Biphenyl	52.5	1.85E+09	1530.06
Cyclopentene, 3-methyl-	53.6	1.61E+09	595.54
Pyridine	85.7	1.6E+09	828.136
Aminoacetonitrile	76.8	1.52E+09	354.328
a-Methylstyrene	59.3	1.51E+09	1105.24
Naphthalene, 2-ethenyl-	59.2	1.5E+09	1587.15
Benzene, propyl-	74.9	1.48E+09	1071.52
Chloromethane	98.7	1.43E+09	339.998
Benzoic acid	74.6	1.27E+09	1353.15
1,5-Hexadiene	71.5	1.21E+09	548.849
Cyclopentanone	54.4	1.21E+09	576.074
p-Cresol	56.1	1.2E+09	1269.44
Pyrrole	93.8	1.17E+09	876.879
Propargyl alcohol	77.7	1.14E+09	471.026
Furfural	93.3	1.11E+09	966.878
Acenaphthene	73.6	1.02E+09	1568.99

Table S2: HMB Blast furnace balance replacement ratio (RR) model data used

Fuel Type	C	H	C+H	Heat Dissociation (kJ/kg)	Rep ratio (HMB)
Sub coal high C	63.2	8.4	71.6	2000	0.68
Sub coal SRF	46.8	6.6	53.4	3000	0.42
Polythene	83.1	13.9	97	2100	0.99
Coal	81.5	4.46	85.96	256	0.9
Nat Gas	76	24	100	4445	0.985

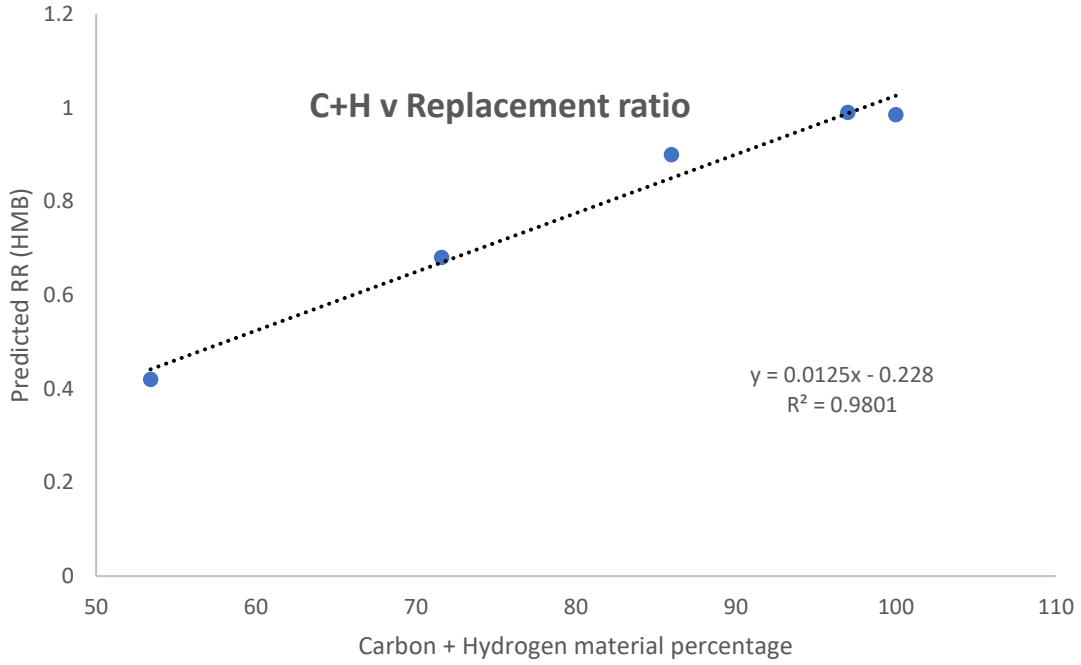


Figure S1: Graph of HMB model of predicted RR vs C + H content of various material set.

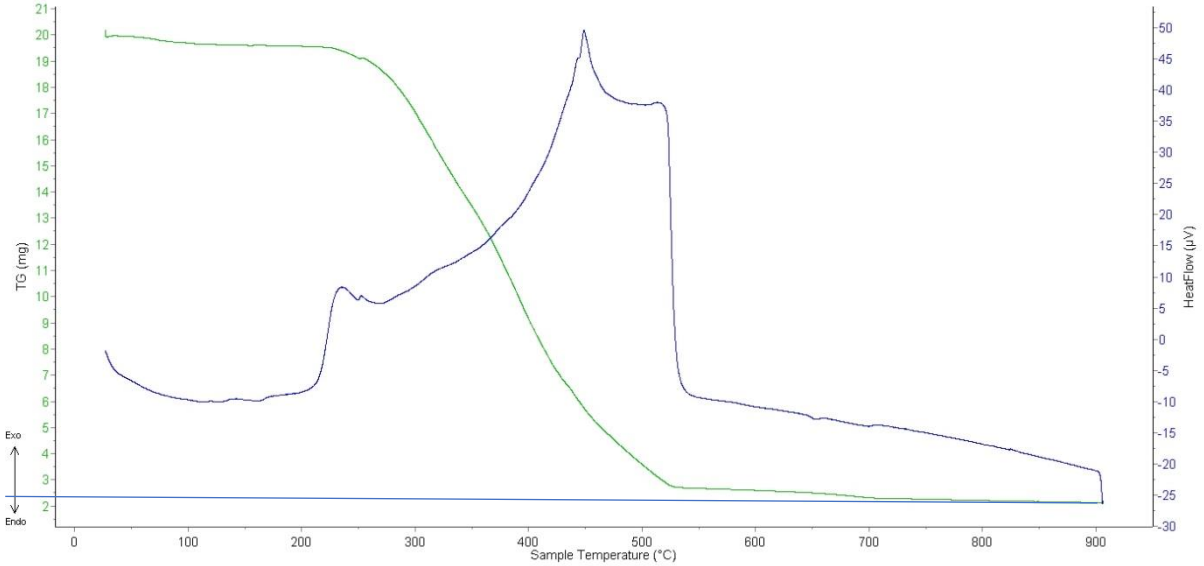


Figure S2: TGA data for Subcoal® showing 88% mass loss to 2.4mg

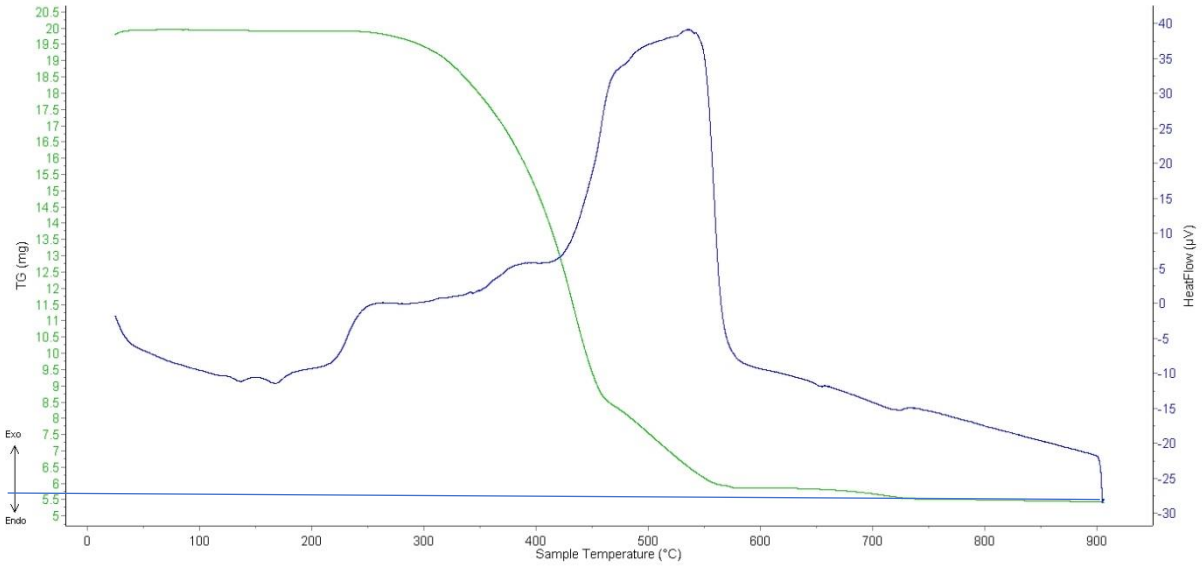


Figure S3: TGA graph of Subcoal® which has been torrefied at 300°C for 1h under N_2 showing 71.2% mass loss to 5.7 mg

Table S3: Volatile matter identified during pyrolysis of torrefied Subcoal® at 800 °C

Sample	Compounds identified	Retention time (s)	Peak area ($x10^8$ Ion Count)
Subcoal torrefied for 1 h at 250°C	1-Pentene,2-methyl	560	10.8
	1,3-cyclopentadiene,5-methyl	647	13.0
	Benzene	691	15.1
	Toluene	832	20.5
	1,4-cyclohexadiene,1-methyl	815	2.06
	Ethyl Benzene	959	8.37
	Styrene	1001	4.16
Subcoal torrefied for 1 h at 300°C	Benzene	690	8.00
	Methyl acrylate	751	14.3
	Toluene	835	22.4
	2,4 dimethyl-1-heptene	899	6.20
	Ethyl benzene	956	14.3
	Styrene	1007	11.2
	Propyl-benzene	1072	5.82
	Propanoic acid-ethenyl ester	1103	0.82
	Phenol	1172	5.22
	1,2-propanedione,1,-phenyl	1285	19.2
	Naphthalene	1364	6.15
	Benzoic acid	1368	57.3