

Experimental study on properties of syngas, tar, and biochar derived from different gasification methods

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1. Results and discussion

1.1 Analysis of liquid-phase products

Common compounds of tar are further identified via GC-MS. Tables SM-1 and SM-2 present the names and relative contents of detailed tar components at various temperatures.

Table S1

GC-MS results of oak tar derived from MG and EG.

Compound name	Relative content (%) at different gasification heating temperatures (°C)									
	600 °C		700 °C		800 °C		900 °C		1000 °C	
	MH	EH	MH	EH	MH	EH	MH	EH	MH	EH
Ethylbenzene	2.24	3.03	2.53	2.55	-	1.21	-	1.33	1.72	-
1-Cyclohexene, 1-ethynyl-	3.46	8.43	3.74	3.24	2.46	1.34	-	2.64	1.5	1.20
Phenylethyne	-	2.25	1.22	2.15	-	3.7	0.85	1.79	-	-
Styrene	3.87	10.59	5.15	7.1	4.75	9.25	-	9.34	3.22	8.16
Benzene	-	2.09	-	1.02	1.46	3.24	2.46	1.11	-	2.85
Naphthalene-2-carbonitrile	-	3.43	-	3.66	-	4.95	-	4.42	-	2.55
3-Methylphenylacetylene	5.84	1.72	8.35	2.15	7.67	0.92	2.01	0.31	5.86	-
Benzocycloheptatriene	-	0.61	0.85	0.95	3.24	1.31	-	1.19	-	0.24
Biphenyl	-	2.15	1.65	3.70	1.96	-	-	3.86	-	-
Biphenylene	2.35	6.31	-	4.25	1.28	2.89	2.08	-	2.14	1.62
Phenanthrene	1.44	1.92	1.83	1.86	-	2.77	-	2.82	1.25	-
Hematoporphyrin	2.02	1.02	-	3.24	1.52	1.11	-	4.07	-	1.28
Tricarbonyl	-	-	-	4.07	-	-	2.32	4.66	-	-
Oxirane, ethenyl-	-	5.52	-	8.69	-	-	-	1.36	-	-
Rhodopin	-	5.19	-	1.38	1.67	3.76	1.92	5.44	-	3.20
2-Pentanone	3.06	4.14	-	2.56	4.97	-	7.15	1.48	-	1.50
Toluene	1.39	-	1.05	-	2.01-	1.47	-	1.79	5.21	1.08
1,2,4,5-Tetrazine	-	-	-	-	2.88	5.16	2.59	3.2	1.80	1.62
Benzofuran, 2,3-dihydro-	1.83	1.49	-	0.38	0.89	0.89	-	-	0.58	-
1H-Tetrazole, 1-methyl	3.17	-	-	-	2.11	4.07	-	-	1.68	-
Phenol, 2-methoxy-	-	-	2.59	1.44	-	-	3.56	1.56	8.11	2.08
methoxy-	0.58	3.89	-	0.85	-	-	0.25	1.09	4.66	-

Table S2

GC-MS results of corn stalk tar derived from MG and EG.

Compound name	Relative content (%) at different gasification heating temperatures (°C)									
	600 (°C)		700 (°C)		800 (°C)		900 (°C)		1000 (°C)	
	MH	EH	MH	EH	MH	EH	MH	EH	MH	EH
Ethylbenzene	1.46	1.02	-	-	4.66	0.85	-	0.26	-	-
1-Cyclohexene, 1-ethynyl-	1.65	2.32	4.05	2.50	-	-	-	-	2.74	3.52
Phenylethyne	-	-	0.85	1.25	-	1.82	3.73	3.73	-	-
Benzene	-	3.46	-	5.44	-	-	-	3.52	-	2.58
3-Methylphenylacetylene	3.87	-	4.79	-	14.2	-	4.01	-	8.68	-
Naphthalene	-	-	5.2	-	3.2	-	5.58	-	2.62	-
Benzocycloheptatriene	-	3.2	3.2	3.2	1.36	1.36	-	-	-	-
Biphenyl	1.73	-	1.36	-	1.68	1.58	2.52	2.01	-	2.58
Biphenylene	-	-	1.68	-	8.11	2.11	4.34	4.34	5.23	5.23
Phenanthrene	-	-	4.21	-	4.36	1.85	-	-	2.50	-
Hematoporphyrin	0.52	3.03	-	3.03	0.25	2.55	-	1.21	2.33	1.33
Tricarbonyl	4.62	1.25	2.58	1.25	4.52	-	-	2.58	0.48	1.52
3'H-Cycloprop (1,2)-5-cholest-1-en-3-one	1.44	1.44	8.43	8.43	3.24	3.24	1.34	1.34	2.64	2.64
Hexadecanamide	2.02	2.02	2.25	2.25	2.15	2.15	3.7	3.7	1.79	1.79
Rhodopin	-	-	2.36	-	3.58	-	9.25	-	9.34	-
2-Pentanone	5.19	5.19	-	-	1.92	1.92	1.86	1.86	1.98	1.98
Toluene	4.21	4.21	2.09	2.09	1.02	1.02	3.24	3.24	1.11	1.32
Furfural	-	-	3.43	3.43	3.66	3.66	4.95	4.95	4.42	4.42
1,2,4,5-Tetrazine	3.17	3.17	1.72	1.72	2.10	2.15	0.9	1.20	0.32	2.38
methoxy	-	-	-	4.25	-	3.25	-	1.22	-	1.04
Methoxystyrene	1.01	-	-	1.85	0.54	0.54	2.40	-	-	1.66
Phenol, 2-methyl-	5.01	1.58	0.38	2.28	-	-	-	2.66	3.62	-
Benzofuran, 2,3-dihydro-	-	1.52	1.56	-	-	3.52	-	4.55	1.78	2.31
2,2'-Bifuran	4.25	-	3.62	-	-	-	2.95	-	2.83	-