Table A4. Proximate and Ultimate analysis of biochar and feedstock

Feed Stock	Pyrolysis Condition		Proximate Analysis (wt%)				Ultimate Analysis							
	Temperature (°C)	Heating rate (°C/min)	Moisture	Ash	VM	FC	C	O*	H	N	–	O/C	H/C	Ref.
Cellulose	–	–	4.37	0.51	93	3.7	39.99	54.2	5.8	0.01	–	1.02	1.74	[1]
			–	–	–	–	41.36	52.11	6.49	0.02	0.01	0.94	1.88	[2]
			–	–	–	–	43.09	50.67	5.96	0.13	0.14	0.88	1.66	[3]
			–	–	–	–	43.36	49.97	6.67	–	–	0.86	1.85	[4]
			0.06	95.84	4.1	41.74	49.04	6.79	0.13	0.3	0.16	0.10	0.03	[5]
			5.5	–	89.2	5.3	42.06	46.38	6.06	–	–	0.83	1.73	[6]
			7.03	0.85	87.45	4.67	41.53	51.04	6.68	0.75	0	0.92	1.93	[7]
			4.94	0.04	90.37	4.65	41.85	45.75	6.35	1.06	0.004	0.82	1.82	[8]
			5.9	–	89.1	5	44.4	49.3	6.3	0	0	0.83	1.70	[9]
			–	95.5	4.5	42.7	51.02	6.2	0.03	0.05	0.15	0.09	0.01	[10]
			4.67	0.07	93.37	1.89	51.47	43.93	2.87	1.69	0.03	0.64	0.67	[11]
			–	–	–	–	42.96	50.74	6.3	–	–	0.89	1.76	[12]
			4.72	–	89.91	5.37	39.32	49.78	6.02	0.16	–	0.95	1.84	[13]
			4.67	0.07	93.37	1.89	41.66	52.2	5.71	0.41	0.02	0.94	1.64	[14]
			6.9	0.3	92.9	–	44.6	49	6.4	–	–	0.82	1.72	[15]
			3.31	–	94.65	2.04	43.08	46.71	6.4	0.5	–	0.81	1.78	[16]
			1.99	–	91.97	6.04	43.65	49.93	6.33	–	–	0.86	1.74	[17]
Hemicellulose	–	–	–	–	–	–	39.26	54.95	5.76	0.02	0.01	1.05	1.76	[2]
			–	–	–	–	43.77	5.36	5.91	0.05	0.02	0.09	1.62	[3]
			6.9	3	71.5	18.6	41.7	51.9	6.3	0.1	–	0.93	1.81	[9]
			1.8	76.8	21.4	41.6	52.65	5.7	0.02	0.03	0.14	0.08	0.00	[10]
			3.96	5.59	79.42	11.03	42.14	41.4	6.22	0.69	–	0.74	1.77	[16]
Xylan	–	–	–	–	–	–	67.85	56.59	5.4	0.16	–	0.63	0.96	[4]
			1.8	89.18	9.02	41.76	48.88	6.72	–	0.4	0.16	0.10	0.00	[5]
			14.23	3.14	66.62	16.01	37.21	39.49	5.86	0.02	0.009	0.80	1.89	[8]
			–	–	–	–	43.25	49.9	6.3	–	–	0.87	1.75	[12]
			0.91	x	91.02	8.07	39.03	53.19	6.35	0.06	0.46	1.02	1.95	[13]
			5.83	3.61	77.79	12.78	40.26	51.55	5.49	2.7	–	0.96	1.64	[14]
Lignin	–	–	10.86	1.71	98.7	0.8	49.53	46.07	4.39	0.01	–	0.70	1.06	[1]

			–	–	–	–	56.82	5.21	33.62	0.11	1.32	0.07	7.10	[2]
			–	–	–	–	43.71	41.12	4.53	0.04	4.24	0.71	1.24	[3]
			–	–	–	–	50.85	43.92	5.17	0.06	–	0.65	1.22	[4]
			6.41	56.35	37.24	52.11	40.04	4.84	0.05	2.96	0.09	0.09	0.01	[5]
			13.1	12.35	35.74	38.81	47.65	19.6	4.3	2.92	0.08	0.31	1.08	[6]
			7.03	0.85	87.45	4.67	41.53	51.04	6.68	0.75	0	0.92	1.93	[7]
			6.05	11.76	64.56	17.63	41.44	31.44	4.9	0.16	4.25	0.57	1.42	[8]
			15.7	14.8	46.4	23.1	63.8	29.3	5.3	0.1	1.4	0.34	1.00	[9]
			4.2	58.9	36.9	48.3	43.6	4.9	0.1	3.1	0.10	0.08	0.03	[10]
			3.38	3.62	60.35	32.65	61.35	31.78	5.05	1.13	0.69	0.39	0.99	[11]
			–	–	–	–	57.7	34	4.38	0.11	–	0.44	0.91	[12]
			5.9	0.27	60.07	33.77	58.7	27.6	5.6	0.13	1.73	0.35	1.14	[13]
			3.41	3.62	60.37	32.6	61.33	31.71	5.14	1.13	0.69	0.39	1.01	[14]
			3.42	3.85	67.23	25.5	61.81	23.57	5.63	1.72	0	0.29	1.09	[16]
			4.19	1.35	48.83	45.63	65.03	27.6	5.03	0.04	2.3	0.32	0.93	[17]
Wheat straw	–	–	8.51	5.28	66.33	19.88	44.31	48.57	6.76	0.37	–	0.82	1.83	This Study
	–	–	3.37	10.08	70.37	16.18	43.44	50.55	5.05	0.96	–	0.87	1.40	
	200	10	–	–	–	–	44.79	47.9	6.93	0.39	–	0.80	1.86	
	300	1	–	–	–	–	57.67	35.27	5.41	1.65	–	0.46	1.13	
	300	10	–	–	–	–	54.08	39.75	5.08	1.03	–	0.55	1.13	
	300	10	–	–	–	–	58.09	34.357	5.863	1.69	–	0.44	1.21	
	400	10	–	–	–	–	61.9	32.6	4.11	1.39	–	0.39	0.80	
	500	5	–	–	–	–	61.24	32.547	4.743	1.47	–	0.40	0.93	
	500	10	–	–	–	–	67.19	28.75	2.87	1.19	–	0.32	0.51	
	500	10	–	–	–	–	61.57	33.074	3.846	1.51	–	0.40	0.75	
	600	10	–	–	–	–	67.92	29.06	1.82	1.2	–	0.32	0.32	
	700	1	–	–	–	–	67.55	27.583	3.607	1.26	–	0.31	0.64	
	700	10	–	–	–	–	64.04	33.36	1.36	1.25	–	0.39	0.25	
	700	10	–	–	–	–	64.47	32.153	2.237	1.14	–	0.37	0.42	
	–	–	5.8	5.1	70.8	18.3	47.9	45.5	6.1	0.3	0.2	0.71	1.53	[9]
	–	–	–	–	–	–	43.2	39.4	5	0.61	0.11	0.68	1.39	[12]
	–	–	44.1	45	6	0.4	0.01	0.14	1.02	44.1	45			[18]
	450	–	64.8	23	3.1	0.8	0.1	0.05	0.35	64.8	23	0.38	42.00	
	–	–	43.9	49.3	5.92	0.73	0.11	0.13	1.12	43.9	49.3			[19]
	900	–	5.3	4.69	75.88	14.12	43.64	44.09	5.82	0.68	–	0.76	1.60	[20]

	–	–	3.67	12.13	26.65	57.55	67.87	13.46	2.97	3.02	–	0.15	0.53	
	–	–	5.1	10.9	69.4	30.6	44.9	37.6	5.9	0.69	0.15	0.63	1.58	[21]
	307	–	–	–	–	–	–	–	–	–	–	0.13	0.84	
	392	–	–	–	–	–	–	–	–	–	–	0.12	0.63	
	310	–	–	–	–	–	–	–	–	–	–	0.12	0.56	
	352	–	–	–	–	–	–	–	–	–	–	0.1	0.49	
	133	–	–	–	–	–	–	–	–	–	–	0.12	0.71	
	156	–	–	–	–	–	–	–	–	–	–	0.11	0.57	
	242	–	–	–	–	–	–	–	–	–	–	0.1	0.55	
	–	–	–	–	–	–	48.4	6.5	43.9	1	0.2	0.10	10.88	[22]
	400	–	–	–	–	–	–	–	–	–	–	0.82	0.24	[23]
	475	–	–	–	–	–	–	–	–	–	–	0.63	0.21	
	550	–	–	–	–	–	–	–	–	–	–	0.46	0.12	
	–	–	4.53	8.12	68.7	18.65	39.65	44.86	5.63	1.41	0.37	0.85	1.70	[24]
	450	2	–	–	–	–	41.7	48.4	8.2	1.5	0.2	0.87	2.36	[25]
	450	450	–	–	–	–	52.3	35.8	9.4	1.9	0.6	0.51	2.16	
	–	–	9.66	6.8	68.34	15.2	45.79	47.53	5.71	0.73	0.24	0.78	1.50	[26]
	–	–	–	0.89	–	–	58.57	34.96	5.76	0.34	0.37	0.45	1.18	[27]
	–	–	6.3	1.3	78.4	14	45.4	48.3	6.2	0.12	0.02	0.80	1.64	[28]
	400	5	1.97	5.2	36.27	56.56	71.28	22.73	4.85	0.59	0.55	0.24	0.82	
	475	5	6.18	7.35	22.5	63.97	74.86	20.54	3.92	0.55	0.13	0.21	0.63	
	550	5	6.31	8.25	18.62	69.03	83.1	12.9	3.22	0.61	0.17	0.12	0.46	
	-		12	–	–	40.48	53.18	5.94	0.4	–	0.15	0.08	0.09	[29]
	400	5	35	–	–	40.66	54.27	4.19	0.88	–	0.10	0.06	0.19	
	500	5	12	–	–	73.4	24.41	1.49	0.7	–	0.02	0.05	0.34	
	600	5	15	–	–	76.58	20.38	2.23	0.81	–	0.03	0.08	0.48	
	700	5	14	–	–	75.16	22.59	1.47	0.78	–	0.02	0.05	0.41	
	Gasification		–	–	–	–	48.2	6.3	–	–	–	–	–	
Wheat husk	–	–	4.37	6.98	69.12	19.53	40.78	43.55	6.29	2.09	0.31	0.80	1.85	[24]
Corn stover	–	–	8.12	5.17	67.63	19.09	41.42	52.07	6.16	1.21	–	0.94	1.78	This Study
	200	10	–	–	–	–	42.64	49.08	6.89	1.1	–	0.86	1.94	
	300	10	–	–	–	–	59.09	33.05	6.17	1.52	–	0.42	1.25	
	400	10	–	–	–	–	68.64	25.14	4.62	1.49	–	0.27	0.81	
	500	10	–	–	–	–	71.18	23.39	3.79	1.52	–	0.25	0.64	
	600	10	–	–	–	–	75.89	19.58	2.78	1.59	–	0.19	0.44	

	700	10	–	–	–	–	79.01	17.42	1.85	1.52	–	0.17	0.28	
	–	–	–	–	–	–	44.6	48.07	6	0.73	0.1	0.81	1.61	[31]
	–	–	4.47	7.75	75.55	12.23	28.85	66.14	8.27	0.4	0.06	1.72	3.44	
	600	–	–	–	–	–	45.14	12.96	1.86	0.44	–	0.22	0.49	[32]
	–	–	–	–	–	–	43.2	44.4	5.9	0.8	–	0.77	1.64	[33]
	–	–	7.27	2.5	80.3	9.93	44.4	49.12	5.6	0.43	0.45	0.83	1.51	[34]
	–	–	5.12	6.16	77.49	11.32	44.47	47.88	4.19	0.97	0.45	0.81	1.13	[35]
	–	–	5.2	5.16	73.83	20.22	48.09	40.59	5.48	0.63	–	0.63	1.37	[36]
	–	–	–	3.92	–	–	39.95	50.16	4.23	1.34	0.4	0.94	1.27	[37]
	–	–	3.75	5.62	79.64	10.99	40.49	52.09	5.25	1.04	1.13	0.96	1.56	[38]
	500	15	1.8	32.4	11.1	54.7	62.8	32.95	2.9	1.3	0.05	0.39	0.55	[39]
	500	Preheat	1	49.7	14.9	34.4	37.8	58.84	2.5	0.8	0.06	1.17	0.79	
	730	Preheat	1.9	54	5.5	38.5	38.5	59.41	1.3	0.7	0.09	1.16	0.41	
	-	–	–	28	–	–	33.25	62.43	3.91	0.41	–	1.41	1.41	[29]
	400	5	–	18	–	–	60.55	35.88	–	–	–	–	–	
	500	5	–	18	–	–	62.32	34.44	–	–	–	–	–	
	600	5	–	17	–	–	60.98	36.70	–	–	–	–	–	
	700	5	–	16	–	–	58.39	39.41	–	–	–	–	–	
	Gasification			21	–	–	–	57.57	1.77	–	–	–	–	
Corn stalk	–	–	7.4	2.1	88.8	9.1	40.1	52.55	5.2	2.1	0.05	0.98	1.56	[1]
Corncob	–	–	7.75	8.13	66.81	17.31	41.62	35.64	6.07	0.63	0.16	0.64	1.75	[6]
Pine wood	–	–	8.82	0.83	70.82	19.53	47.39	45.12	7.4	0.09	–	0.71	1.87	This Study
	–	–	3	0.76	80.25	16	49.34	44.36	6.213	0.09	–	0.67	1.51	
	200	–	–	–	–	–	48.14	44.01	7.77	0.08	–	0.69	1.94	
	300	1	–	–	–	–	63.89	27.48	8.332	0.3	–	0.32	1.56	
	300	10	–	–	–	–	62.09	31.89	5.94	0.08	–	0.39	1.15	
	300	10	–	–	–	–	63.06	28.21	8.507	0.22	–	0.34	1.62	
	400	10	–	–	–	–	76.32	19.02	4.51	0.15	–	0.19	0.71	
	500	5	–	–	–	–	82.82	8.78	8.151	0.25	–	0.08	1.18	
	500	10	–	–	–	–	81.02	15.39	3.39	0.21	–	0.14	0.50	
	500	10	–	–	–	–	82.41	11.64	5.642	0.31	–	0.11	0.82	
	600	10	–	–	–	–	72.83	24.59	2.42	0.16	–	0.25	0.40	
	700	1	–	–	–	–	89.62	4.96	4.946	0.47	–	0.04	0.66	
	700	10	–	–	–	–	77.79	20.75	1.3	0.16	–	0.20	0.20	
	700	10	–	–	–	–	87.85	9.01	2.65	0.49	–	0.08	0.36	

	–	–	7.9	2.68	71.39	18.03	45.73	36.76	6.5	0.23	0.2	0.60	1.71	[6]
	–	–	1.93	0.52	81.59	15.96	46.63	46.74	6.43	0.20	0	0.75	1.65	[7]
	–	–	9.43	2.85	72.64	15.08	44.4	38.29	4.91	0.2	0.1	0.65	1.33	[13]
	450	2	–	–	–	–	46.5	43	9.1	1.4	0.01	0.69	2.35	[25]
	450	450	–	–	–	–	54.4	34	9.6	1.3	0.4	0.47	2.12	
	–	–	–	–	–	–	50.1	46.6	6.5	0.1	0.1	0.70	1.56	[40]
	–	–	6.42	0.83	79.16	20	45.76	48.66	5.54	0.04	–	0.80	1.45	[41]
	–	–	5.62	0.38	81.4	12.6	46.9	47.3	5.49	0.31	–	0.76	1.40	[42]
	120	10	–	–	–	–	53.59	36.28	5.77	1.18	3.18	0.51	1.29	[43]
	190	10	–	–	–	–	53.91	38.01	4.03	1.6	2.45	0.53	0.90	
	250	10	–	–	–	–	62.28	30.08	3.69	1.85	2.1	0.36	0.71	
	380	10	–	–	–	–	69.72	22.39	3.71	1.98	2.2	0.24	0.64	
	–	–	–	0.34	–	–	47.14	45.46	6.52	0.44	0.1	0.72	1.66	[44]
	790	–	–	6.22	–	–	82.87	9.15	1.33	0.42	–	0.08	0.19	
	934	–	–	9.59	–	–	85.38	4.38	0.34	0.31	–	0.04	0.05	
	1078	–	–	15.75	–	–	81.56	1.37	0.96	0.35	–	0.01	0.14	
	–	–	6.5	0.83	79.16	20	45.76	48.66	5.54	0.04	–	0.80	1.45	[45]
	–	–	–	–	–	–	49.95	43.97	5.94	0.14	–	0.66	1.43	[46]
	–	–	–	–	–	–	45.17	48.11	5.7	1.02	–	0.80	1.51	[47]
	–	–	–	0.3	–	–	48.8	45	6	0.2	–	0.69	1.48	[48]
	300	–	–	4.5	–	–	63.9	30.4	5.4	0.3	–	0.36	1.01	
	400	–	–	7.9	–	–	70.7	25.5	3.4	0.4	–	0.27	0.58	
	500	–	–	7.7	–	–	90.5	6.4	2.5	0.6	–	0.05	0.33	
	700	–	–	2.2	–	–	79	15	3	0.2	0.6	0.14	0.46	[49]
	800	–	–	–	–	–	90	6.9	0.67	0.22	–	0.06	0.09	[50]
	–	–	–	–	–	–	48.9	42.5	6.2	0.1	0.1	0.65	1.52	[18]
	450	–	–	–	–	–	75.5	17	3.7	0.2	0.1	0.17	0.59	
Poplar Wood	–	–	3.81	0.86	80.91	14.43	46.27	51.542	2.118	0.07	–	0.84	0.55	This Study
	300	1	–	–	–	–	65.23	32.279	2.171	0.32	–	0.37	0.40	
	300	10	–	–	–	–	64.18	33.554	2.086	0.18	–	0.39	0.39	
	500	5	–	–	–	–	85.8	11.912	1.958	0.33	–	0.10	0.27	
	500	10	–	–	–	–	81.5	16.817	1.403	0.28	–	0.15	0.21	
	700	1	–	–	–	–	89.68	8.473	1.377	0.47	–	0.07	0.18	
	700	10	–	–	–	–	87.91	10.588	1.022	0.48	–	0.09	0.14	
	–	–	7.54	73.85	18.61	47.49	5.45	37.91	1.41	0.2	0.80	5.22	3.10	[51]

	–	–	–	0.69	–	–	58.73	34.7	6.04	0.1	0.43	0.44	1.23	[27]
	–	–	7.2	3.04	–	–	46	44.08	5.58	0.16	0.85	0.72	1.46	[52]
	–	–	12.59	4.3	79.2	16.5	45.47	47.58	6.45	0.48	–	0.78	1.70	[53]
	300	25	7.65	32.94	16.76	50.3	51.75	41.76	3.91	2.58	–	0.61	0.91	
	400	25	5.27	39.45	27.9	32.65	50.31	43.93	3.09	2.67	–	0.65	0.74	
	500	25	4.35	43.04	24.84	32.12	56.89	37.43	2.86	2.82	–	0.49	0.60	
	600	25	5.44	50.93	21.74	27.33	55.21	40.57	1.96	2.26	–	0.55	0.43	
	700	25	4.89	52.17	13.67	34.16	50.44	45.97	1.51	2.07	–	0.68	0.36	
	800	25	4.81	26.8	15.68	57.52	43.83	51.1	2.9	2.17	–	0.87	0.79	
	–	–	–	–	–	–	45	48.8	6.2	–	–	0.81	1.65	[30]
	–	–	–	–	–	–	49.8	44.7	6.3	0.5	0.4	0.67	1.52	[54]
	500	10	–	–	–	–	75.7	20.6	2.6	1	0.07	0.20	0.41	
	600	10	–	–	–	–	78.7	17.7	2.4	1.2	0.05	0.17	0.37	
	700	10	–	–	–	–	80.2	16.7	1.9	1.2	0.05	0.16	0.28	
	800	10	–	–	–	–	84.3	13	1.7	0.9	0.05	0.12	0.24	
	–	–	–	–	–	–	43.9	45.2	5.7	0.7	0.01	0.77	1.56	[55]
	–	–	–	1.92	77.52	20.56	43.61	47.68	5.91	0.91	–	0.82	1.63	[56]
	–	–	–	0.58	–	–	48.8	44.5	6.5	0.2	–	0.68	1.60	[57]
	400	–	–	–	–	–	36	57.2	6.5	0.3	–	1.19	2.17	
	450	–	–	–	–	–	39.9	54.2	5.6	0.3	–	1.02	1.68	
	500	–	–	–	–	–	40.2	52.8	6.8	0.3	–	0.99	2.03	
	550	–	–	–	–	–	40.5	53	6.1	0.4	–	0.98	1.81	
Poplar Leaf	–	–	15.69	68.74	15.57	41.77	4.42	36.75	1.11	0.26	0.88	6.24	3.01	[51]
Hinoki Saw Dust	–	–	11	1.3	97.4	1.3	55.94	36.74	7.07	0.24	0.01	0.49	1.52	[1]
Rice Sraw	–	–	5.8	20.4	79.6	0	48.25	43.91	6.59	1.23	0.05	0.68	1.64	
Rice husk	–	–	5.6	20.2	78.4	1.4	51.29	41.3	6.81	0.29	0.02	0.60	1.59	
Larch Bark	–	–	8.7	2.6	97.1	0.2	47.07	47.2	5.5	0.23	0.02	0.75	1.40	
Bagasse	–	–	3.78	2.69	86.37	10.94	48.9	44.71	5.79	0.6	0	0.69	1.42	
Palm Oil fiber	–	–	6.6	3.4	93	3.7	46.73	46.59	6.12	0.56	0.02	0.75	1.57	
Chinar Leaf	–	–	9.91	67.6	22.49	42.78	5.3	37.76	3.7	0.55	0.88	5.34	8.38	[51]
Chinese cabbage	–	–	2.91	76.49	20.6	47.32	5.75	42.45	1.39	0.18	0.90	5.54	2.90	
Orange peel	–	–	9.23	69.74	21.03	48.06	4.43	37.06	0.92	0.3	0.77	6.27	2.49	
Castor	–	–	0	100	0	71.88	9.97	11.67	0.18	0.3	0.16	0.88	0.22	[5]

Corn Starch	–	–	0.41	90.92	8.67	43.74	48.83	7.09	0	0.34	0.16	0.11	0.00	
Soy Protein	–	–	3.91	81.11	14.98	50.17	26.97	7.33	14.68	0.85	0.15	0.20	6.53	
Bagasse	–	–	5.48	2.84	77.83	13.85	46.28	38.87	6.32	0.21	x	0.63	1.64	[6]
Cotton-stalk	–	–	8.87	5.46	68.7	16.97	42.7	35.52	6.25	0.94	0.26	0.62	1.76	
Rice-straw	–	–	8.54	10.5	65.77	15.19	39.28	33.44	6.17	1.41	0.66	0.64	1.88	
Rice HusK	–	–	7.67	14.96	60.69	16.68	38.45	32.37	5.68	0.56	0.31	0.63	1.77	
Japanese cedar	–	–	5.8	0.3	78.1	15.8	51.3	42.3	6.1	0.2	0	0.62	1.43	[9]
Japanese cypress	–	–	7.9	0.2	78.7	13.2	51.5	42.2	6.2	0.1	0	0.61	1.44	
Japanese oak	–	–	8.1	0.4	77.3	14.2	49.5	44	6.2	0.4	0	0.67	1.50	
Wood Bark	–	–	8.3	1	66	24.7	54.7	39.2	5.7	0.5	0	0.54	1.25	
Rice straw	–	–	6.8	11.1	65.5	16.6	47.6	45.7	6.2	0.5	0.1	0.72	1.56	
Rice husk	–	–	8.7	18.4	58.4	14.5	48.9	44.5	6.2	0.3	0.1	0.68	1.52	
Switchgrass	–	–	–	–	–	–	46.62	42.27	5.74	0.18	0.3	0.68	1.48	[12]
Easter redcedar	–	–	–	–	–	–	51.07	40.95	5.97	0.37	0	0.60	1.40	
Rice Straw	–	–	12.42	14.1	61.05	12.43	30.26	36.85	5.53	0.62	0.22	0.91	2.19	[13]
Anthracite coal	–	–	0.97	8.81	4.24	85.98	94.23	1.04	2.93	1.36	0.44	0.01	0.37	[17]
Oat Straw	–	–	4.38	3.21	74.04	18.37	43.23	45.39	6.12	0.88	–	0.79	1.70	[20]
	900	–	4.93	11.22	20.78	63.08	66.42	20.28	2.34	1.26	–	0.23	0.42	
Flax Straw		–	4.75	1.12	74.8	19.32	46.76	43.53	6.34	1.11	–	0.70	1.63	
	900	–	2.83	4.55	18.23	74.4	71.73	17.99	2.8	2.32	–	0.19	0.47	
Barley Straw		–	2.69	4.38	75.64	17.28	44.83	42.43	6.25	0.93	–	0.71	1.67	
	900	–	2.26	5.52	23.14	69.09	72.61	16.44	3.09	1.73	–	0.17	0.51	
		–	5.8	8.1	71.2	28.8	44.5	40.4	5.8	1.09	0.17	0.68	1.56	[21]
	400	–	–	–	–	–	–	–	–	–	–			[23]
	475	–	–	–	–	–	–	–	–	–	–			
	550	–	–	–	–	–	–	–	–	–	–			
Coal		–	3.56	57.99	18.71	19.74	26.11	12.03	2.26	1.03	0.58	0.35	1.04	[24]
Timothy Grass	450	2	–	–	–	–	44.9	44.4	8.4	1.8	0.5	0.74	2.24	[25]
	450	450	–	–	–	–	49.2	38.4	9.3	2.2	0.9	0.59	2.27	
Ginkgo	–	–	–	0.74	–	–	59.34	33.16	6.04	0.81	0.65	0.42	1.22	[27]
Flax Straw	–	–	8.1	3.1	79.9	8.9	47.8	45.7	6.4	0.07	0.01	0.72	1.61	[28]

	400	5	8.3	8.93	38.09	48.37	71.15	22.58	5.02	1.16	0.09	0.24	0.85	
	475	5	3.51	9.36	31.28	55.85	76.61	18	4.37	1.02	0	0.18	0.68	
	550	5	5.67	10.64	19.42	64.27	82.56	12.71	3.72	0.98	0.02	0.12	0.54	
Switch Grass	600	−	−	−	−	−	43.65	24.99	3.71	0.78		0.43	1.02	[32]
Switch Grass	500	−	0.9	52.5	7.1	39.5	39.4	58.60	1.3	0.7	0.002	1.12	0.40	[39]
	500	−	2.7	54.6	16.4	26.4	38.7	57.99	2.5	0.6	0.21	1.12	0.78	
	760	−	2.5	53	10.3	34.3	42.8	54.63	1.6	0.8	0.17	0.96	0.45	
Acacia	−	−	3.72	3.9	76.51	19.59	41.47	52.15	5.15	1.23		0.94	1.49	[41]
jarrah	700	−	−	3.3	−	−	85.3	8.7	1.6	0.2	0.8	0.08	0.23	[49]
Hazelnut	−	−	9.44	1.45	−	−	48.3	41.67	6.25	1.5	0.83	0.65	1.55	[52]
Rapeseed Straw	-	−	4.93	4.2	84.4	11.4	36.45	55.11	7.98	0.48	−	1.13	2.63	[53]
	300	25	8.51	27.78	78.2	37.66	55.42	35.49	5.59	3.5	−	0.48	1.21	
	400	25	7.83	28.3	34.56	40.6	59.88	31.56	4.66	3.9	−	0.40	0.93	
	500	25	12.98	43.25	31.1	39.89	60.37	31.81	4.15	3.67	−	0.40	0.82	
	600	25	9.15	36.1	16.89	36.09	64.98	30.07	1.62	3.33	−	0.35	0.30	
	700	25	9.34	45.06	27.81	37.54	59.22	36.25	1.28	3.26	−	0.46	0.26	
	800	25	4.44	39.74	17.29	41.03	60.77	34.41	1.33	3.49	−	0.42	0.26	
Rice Husk	−	−	−	19.41	65.43	15.16	47.05	44.12	6.3	0.94	−	0.11	0.26	[56]

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