

Hydrothermal carbonisation of organic waste for thermal energy generation

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Table 2: Full results of the HTC lab pilot tests at Laborelec

					Compost20-80			CompostRefusal			Digestate_ManureStraw			Eucalyptus			FoodWastes			GreenWaste_autumn			GreenWaste_summer			JellyResidues			
	Parameters	Units	typical	limit	raw	htc	htc-ind	raw	htc	htc-ind	raw	htc	htc-ind	raw	htc	htc-ind	raw	htc	htc-ind	raw	htc	htc-ind	raw	htc	htc-ind	raw	htc	htc-ind	
actual value of index	ash_content_815	% DM	30.00%		12.7%	19.5%	8.5%	12.0%	16.6%	8.7%	24.9%	28.9%	13.6%	4.7%	21.1%	15.4%	10.3%	13.1%	11.0%	15.4%	25.7%	11.4%	6.8%	8.4%	5.6%	52.5%	56.2%	52.6%	
	volatile_matter	% DM	50.00%		68.6%	54.5%	61.9%	65.0%	54.5%	59.6%	57.2%	51.6%	62.7%	77.7%	64.2%	68.8%	75.3%	60.0%	61.4%	67.9%	56.0%	66.8%	72.4%	59.9%	61.7%	44.8%	41.4%	44.8%	
	LHV	MJ/kg			17.87	19.39	22.02902	18.18	19.95	21.8324	15.58	17.94	21.7954	18.43	18.53	19.86248	16.75	24.54	25.12613	16.75	18.05	21.5191	18.37	23.53	24.24247	9.36	11.15	12.0688	
	C	% DM			47.6%	50.4%	57.3%	45.3%	51.9%	56.8%	40.6%	44.8%	54.4%	50.4%	43.0%	46.1%	51.0%	58.2%	59.6%	44.1%	46.7%	55.7%	48.1%	59.4%	61.2%	23.6%	25.8%	27.9%	
	H	% DM			5.9%	4.7%	5.3%	5.3%	5.0%	5.5%	5.3%	4.8%	5.8%	5.9%	5.2%	5.6%	5.7%	5.6%	5.7%	5.7%	5.3%	6.3%	5.7%	5.3%	5.5%	3.1%	3.4%	3.7%	
	N	% DM	1.00%	3.00%	1.0%	1.2%	1.4%	1.6%	1.1%	1.2%	2.3%	1.9%	2.3%	0.5%	0.5%	0.5%	3.0%	3.0%	3.1%	0.9%	1.4%	1.7%	1.8%	1.5%	1.5%	1.6%	1.6%	1.7%	
	S	% DM	0.20%	0.50%	0.3%	0.3%	0.3%	0.4%	0.2%	0.3%	0.4%	0.3%	0.4%	0.0%	0.0%	0.0%	0.2%	0.2%	0.2%	0.1%	0.2%	0.2%	0.1%	0.1%	0.1%	0.1%	0.1%	0.1%	
	Cl_ppm	ppm in DM	1500	8000	2890	679	771.4132	4189	163	178.38	10646	169	169	2335	140	150.0673	4666	383	392.1478	1446	133	158.562	2251	139	143.2088	8260	131	141.795	
	alkali (K+Na)	ppm in DM	2500	6000	11541	4603	5229.477	9992	3074	3364.04	38506	3588	3588	5255	1199	1285.22	15642	1055	1080.198	7997	4112	4902.31	13655	1223	1260.0314	1732	513	555.273	
	P_fuel	% DM			0.2%	0.3%	0.1%	0.4%	0.3%	0.2%	0.6%	0.9%	0.4%	0.1%	0.1%	0.1%	0.4%	1.3%	1.1%	0.2%	0.4%	0.2%	0.2%	0.3%	0.2%	5.0%	5.8%	5.5%	
	H/C_atom	no unit			1.42987	1.0724	1.11117	1.42987	1.19156	1.14794	1.54902	1.31071	1.27667	1.39488	1.44095	1.44095	1.31071	1.19156	1.14652	1.54902	1.31071	1.3523	1.42987	1.0724	1.06317	1.54902	1.54902	1.57027	
	O/C_atom	no unit			0.50296	0.35282	0.35002	0.59305	0.35282	0.34714	0.47294	0.30778	0.30832	0.57344	0.42248	0.42248	0.33781	0.24022	0.24378	0.5405	0.30028	0.29899	0.57803	0.31529	0.31342	0.41288	0.17266	0.17458	
	DT	degree C			1135	1215	1215	1225	1165	1165	1130	1255	1255	1500	1420	1420	na	na	na	na	1240	1230	1230	1085	1255	1255	na	na	na
	DT_calc	degree C			1680.2	1682.71	1675.14	1677.7	1680.44	1673.18	1679.36	1681.9	1681.9	1668.68	1674.76	1669.901	1671.53	1671.82	1668.91	1679.78	1682.18	1674.72	1675.32	1676.89	1670.8377	1668.84	1669.83	1668.38	
	Ca	% ash_ox_norm			17.3%	13.7%	31.4%	26.2%	19.2%	36.7%	13.5%	17.0%	36.1%	57.8%	59.7%	81.6%	52.0%	58.8%	67.6%	27.8%	19.4%	43.6%	25.0%	37.9%	56.7%	77.7%	74.0%	79.1%	
	Si	% ash_ox_norm			51.6%	63.4%	29.1%	38.4%	52.3%	20.0%	52.1%	62.4%	26.5%	2.8%	19.5%	5.3%	15.1%	13.5%	3.1%	53.2%	65.3%	29.4%	31.9%	37.4%	11.2%	0.5%	4.4%	0.9%	
	K	% ash_ox_norm			8.8%	2.1%	4.8%	8.2%	1.7%	3.3%	17.2%	1.4%	3.0%	14.4%	0.9%	1.2%	14.3%	0.8%	0.9%	5.0%	1.5%	3.4%	24.0%	1.4%	2.1%	0.3%	0.1%	0.1%	
	Fe	% ash_ox_norm			4.7%	6.1%	14.0%	6.4%	11.9%	22.8%	3.7%	6.1%	12.9%	0.3%	2.2%	3.0%	0.7%	5.4%	6.2%	2.1%	4.0%	9.0%	1.2%	8.5%	12.7%	0.3%	0.9%	1.0%	
	Al	% ash_ox_norm			2.8%	1.0%	2.3%	2.7%	0.8%	1.5%	3.4%	0.3%	0.6%	5.0%	0.1%	0.1%	6.2%	0.5%	0.6%	1.5%	0.6%	1.3%	2.3%	0.6%	0.9%	0.3%	0.0%	0.0%	
	P_ash	% ash_ox_norm			5.6%	7.0%	3.2%	5.9%	7.0%	2.7%	2.2%	3.8%	1.6%	0.6%	14.0%	3.8%	1.7%	2.7%	0.6%	4.5%	4.1%	1.8%	2.1%	3.9%	1.2%	3.2%	3.6%	0.8%	
S_ash	% ash_ox_norm			1.4%	1.7%	3.9%	3.4%	2.3%	4.4%	2.7%	3.4%	7.2%	3.9%	0.8%	1.1%	3.7%	12.3%	14.1%	1.1%	1.6%	3.6%	3.6%	4.5%	6.7%	12.5%	13.5%	14.4%		
Na+K/1,7	index_1 units (% ash_ox_norm)			5.3%	3.0%	6.9%	5.3%	2.7%	5.2%	2.8%	2.3%	4.9%	1.7%	1.1%	1.5%	2.5%	3.7%	4.3%	1.2%	1.2%	2.7%	4.4%	3.2%	4.8%	1.6%	1.7%	1.8%		
Ca/P	index_2 units (no units)			8.0%	2.2%	5.1%	7.5%	1.8%	3.4%	13.5%	1.1%	2.4%	13.5%	0.6%	0.9%	14.6%	1.0%	1.1%	4.4%	1.5%	3.3%	16.4%	1.4%	2.1%	0.5%	0.1%	0.1%		
Ca/(Na+K)	index_3 units (no units)			12.3571	8.05882	8.058823	7.70588	8.34783	8.34783	5	5	5	14.8205	74.625	74.625	14.0541	4.78049	4.780488	25.2727	12.125	12.125	6.94444	8.42222	8.4222222	6.216	5.48148	5.48148		
Si/Al	index_4 units (no units)			1.49138	4.41935	4.419355	2.40367	7.68	7.68	0.65534	10	10	2.97938	59.7	59.7	2.53659	45.2308	45.23077	4.27692	9.2381	9.2381	0.95057	18.95	18.95	129.5	740	740		
S/Ci(inf)	index_5 units (no units)			9.21429	9.05714	9.057143	6.50847	4.71433	4.71433	23.6818	16.4211	16.4211	4.66667	1.39288	1.392857	0.88235	5	5	11.8222	15.9268	15.9268	15.1905	9.58974	9.5897437	0.15625	1.22222	1.22222		
Na+K+Fe+S_ash	index_6 units (% ash_ox_norm)			0.18339	0.44183	0.892374	0.12652	1.65644	2.89634	0.0263	1.36095	2.89703	0.07281	0.78571	1.001372	0.05358	0.96606	1.084009	0.08299	0.90226	1.70144	0.19547	2.30216	3.3420574	0.01937	1.29771	1.28089		
(Ca+K)/Si	index_7 units (no units)			21.6%	12.2%	28.0%	22.6%	17.1%	32.7%	27.1%	10.1%	21.4%	21.4%	4.3%	5.9%	23.7%	10.4%	11.9%	9.8%	7.3%	16.4%	31.9%	13.7%	20.5%	2.5%	2.7%	2.9%		
Na+K	% ash_ox_norm			0.50581	0.24921	1.246057	0.89583	0.39962	1.99809	0.58925	0.29487	1.47436	25.7857	3.10769	15.53846	4.39073	4.41481	22.07407	0.61654	0.32006	1.60031	1.53605	1.0508	5.2540107	156	16.8409	84.2045		
					11.6%	3.1%	7.1%	10.9%	2.5%	4.8%	20.6%	1.7%	3.6%	19.4%	1.0%	1.4%	20.5%	1.3%	1.5%	6.5%	2.1%	4.7%	26.3%	2.0%	3.0%	0.6%	0.1%	0.1%	
weighted index (from 0 - worse- to 1 - best)	ash_content_815	% DM	30.00%		1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0.2	0.2	0.2	
	volatile_matter	% DM	50.00%		1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0.2	0.2	0.2	
	N	% DM	1.00%	3.00%	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	1	1	1	0.5	0	0	1	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	
	S	% DM	0.20%	0.50%	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	1	1	1	0.5	1	1	1	1	1	1	1	1	1	1	1	
	Cl_ppm	ppm in DM	1500	8000	0.5	1	1	0.5	1	1	0	1	1	0.5	1	1	0.5	1	1	1	1	1	0.5	1	1	0	1	1	
	alkali (K+Na)	ppm in DM	2500	6000	0	0.5	0.5	0	0.5	0.5	0	0.5	0.5	0.5	1	1	0	1	1	0	0.5	0.5	1	1	1	1	1	1	
	H/C_atom	no unit			0.83333	0.66667	0.684743	0.83333	0.72222	0.70189	0.88889	0.77778	0.76191	0.81702	0.8385	0.838499	0.77778	0.72222	0.701224	0.88889	0.77778	0.79717	0.83333	0.66667	0.6623633	0.88889	0.88889	0.89879	
	O/C_atom	no unit			0.7716	0.64814	0.645841	0.74692	0.61111	0.61155	0.82956	0.70542	0.705424	0.82956	0.55555	0.558481	0.80247	0.60494	0.60388	0.83333	0.61728	0.6157452	0.69753	0.5	0.50158				
	Na+K/1,7	index_1 units (% ash_ox_norm)			0.758	0.93348	0.845027	0.77184	0.94678	0.89652	0.58864	0.96746	0.92895	0.59008	0.96256	0.975517	0.5552	0.97213	0.967175	0.86606	0.95649	0.89994	0.5	0.95829	0.9367223	0.98723	1	0.99988	
	Ca/P	index_2 units (no units)			0.51161	0.50698	0.506983	0.5066	0.50729	0.50729	0.50369	0.50369	0.50369	0.51426	0.57857	0.57857	0.51343	0.50346	0.503458	0.5255	0.51136	0.51136	0.50578	0.50737	0.5073742	0.505	0.50421	0.50421	
	Ca/(Na+K)	index_3 units (no units)			0.50081	0.50279	0.502788	0.50143	0.50499	0.50499	0.50024	0.50656	0.50656	0.50182	0.54016	0.540155	0.50152	0.53037	0.53										

					PaperInd_Barks			PaperInd_BiologicalSludge			PaperInd_Mix			PaperInd_PrimarySludge			PotatoInd_AerobicSludge			PotatoInd_GreyStarch			RawCompost			RootsResidues_ShreddedStumps			
	Parameters	Units	typical	limit	raw	htc	htc-ind	raw	htc	htc-ind	raw	htc	htc-ind	raw	htc	htc-ind	raw	htc	htc-ind	raw	htc	htc-ind	raw	htc	htc-ind	raw	htc	htc-ind	
actual value of index	ash_content_815	% DM		30.00%	4.1%	4.4%	3.4%	29.3%	48.5%	45.3%	21.8%	26.2%	24.1%	31.0%	35.8%	34.1%	40.4%	64.7%	26.2%	58.1%	73.7%	19.5%	11.7%	18.2%	7.5%	5.4%	7.0%	3.3%	
	volatile_matter	% DM		50.00%	75.0%	65.2%	65.8%	64.6%	50.9%	54.0%	67.7%	56.4%	58.0%	63.9%	48.4%	49.7%	53.3%	29.7%	62.0%	36.8%	19.5%	59.6%	67.2%	55.8%	63.1%	80.5%	67.3%	70.0%	
	LHV	MJ/kg			19	24.5	24.7439	8.8	8.01	8.4957	11.7384	14.1	14.508	7.6	8.84	9.07398	12.79	8.65	18.06369	7.03	5.84	17.86488	17.34	18.7	21.15403	18.07	20.26	21.07405	
	C	% DM			51.3%	62.3%	62.9%	30.0%	28.2%	29.9%	36.4%	41.2%	42.4%	28.7%	30.6%	31.4%	30.3%	20.6%	43.0%	19.0%	14.9%	45.6%	44.6%	50.1%	56.7%	47.4%	53.2%	55.3%	
	H	% DM			6.3%	6.1%	6.2%	3.1%	2.5%	2.7%	4.1%	3.5%	3.6%	2.9%	2.5%	2.6%	4.6%	2.1%	4.4%	2.4%	0.9%	2.8%	5.6%	5.1%	5.8%	5.7%	5.3%	5.5%	
	N	% DM	1.00%	3.00%	0.6%	0.7%	0.7%	0.4%	0.3%	0.3%	0.4%	0.4%	0.4%	0.2%	0.2%	0.2%	4.4%	1.7%	3.6%	0.6%	0.6%	1.8%	0.9%	1.1%	1.2%	0.2%	0.4%	0.4%	
	S	% DM	0.20%	0.50%	0.1%	0.0%	0.0%	0.1%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.6%	0.2%	0.5%	0.1%	0.0%	0.1%	0.2%	0.1%	0.2%	0.0%	0.0%	0.0%	
	Cl_ppm	ppm in DM	1500	8000	222	86	86.856	272	50.1	53.1379	236.531	51.1	51.1	177	22.2	22.7876	2214	454	948.08283	2620	720	2202.5192	3438	380	429.8681	443	350	364.06311	
	alkali (K+Na)	ppm in DM	2500	6000	3307	419	423.171	790	969	1027.76	1541.44	436	436	620	486	498.863	22613	16404	34256.279	17133	19831	60664.109	14042	4602	5205.929	2733	1388	1443.7703	
	P_fuel	% DM			0.1%	0.2%	0.1%	0.3%	0.6%	0.5%	0.2%	0.3%	0.2%	0.1%	0.1%	0.1%	1.7%	1.9%	0.8%	0.1%	0.1%	0.8%	0.2%	0.3%	0.1%	0.0%	0.1%	0.0%	0.0%
	H/C_atom	no unit			1.42987	1.1916	1.16689	1.19156	1.0724	1.05635	1.32906	1.0724	1.01225	1.19156	0.95325	0.97349	1.78734	1.19156	1.21469	1.42987	0.71493	0.71973	1.54902	1.19156	1.21296	1.42987	1.19156	1.18708	
	O/C_atom	no unit			0.52548	0.3003	0.29883	0.47294	0.2177	0.21562	0.48965	0.22521	0.22776	0.48044	0.19518	0.19381	0.48044	0.36033	0.36077	0.78072	0.48795	0.48887	0.60055	0.36784	0.3701	0.64559	0.47294	0.47412	
	DT	degree C			1245	1365	1365	1500	1465	1465	na	1375	1375	1395	1345	1345	1165	1190	1190	1455	1465	1465	1205	1220	1220	1205	1220	1220	
	DT_calc	degree C			1674.72	1673.7	1669.51	1669.46	1669.6	1668.34	1669.62	1670.02	1670.02	1668.99	1669.16	1668.24	1682.1	1683.42	1676.3765	1686.16	1686.4	1682.5282	1678.99	1683.16	1675.994	1683.61	1681.524	1674.1164	
	Ca	% ash_ox_norm			47.3%	61.5%	78.7%	89.8%	88.9%	94.8%	88.1%	86.7%	94.1%	93.3%	92.2%	96.6%	7.2%	7.0%	17.2%	1.8%	1.0%	3.8%	21.7%	12.5%	30.6%	8.9%	12.4%	26.4%	
	Si	% ash_ox_norm			30.4%	22.5%	5.8%	2.0%	1.8%	0.4%	3.6%	4.1%	0.9%	1.7%	2.0%	0.4%	55.1%	62.9%	31.0%	83.7%	84.9%	64.3%	47.1%	66.9%	32.7%	68.6%	58.5%	24.9%	
	K	% ash_ox_norm			8.9%	1.0%	1.3%	0.1%	0.1%	0.1%	0.6%	0.1%	0.1%	0.1%	0.1%	0.1%	6.0%	2.5%	6.2%	2.4%	2.1%	7.9%	12.5%	2.4%	5.9%	4.9%	1.8%	3.8%	
	Fe	% ash_ox_norm			1.5%	3.2%	4.1%	0.3%	0.7%	0.7%	0.4%	0.8%	0.9%	0.3%	0.5%	0.5%	9.4%	8.3%	20.5%	2.2%	2.0%	7.6%	3.3%	5.2%	12.7%	3.9%	14.8%	31.6%	
	Na	% ash_ox_norm			0.9%	0.3%	0.4%	0.3%	0.1%	0.1%	0.3%	0.1%	0.1%	0.1%	0.1%	0.1%	1.6%	0.9%	2.2%	1.4%	1.3%	4.9%	2.6%	0.9%	2.2%	1.5%	0.8%	1.7%	
	Al	% ash_ox_norm			2.2%	4.8%	1.2%	5.3%	6.3%	1.3%	4.6%	6.1%	1.3%	3.4%	4.0%	0.8%	12.0%	11.5%	5.7%	7.0%	7.2%	5.5%	5.9%	7.0%	3.4%	8.9%	8.0%	3.4%	
	P_ash	% ash_ox_norm			3.4%	4.5%	5.8%	0.9%	1.2%	1.3%	0.8%	1.1%	1.2%	0.2%	0.3%	0.3%	4.6%	3.3%	8.1%	0.2%	0.2%	0.8%	1.4%	1.7%	4.2%	0.5%	1.4%	3.0%	
	S_ash	% ash_ox_norm			0.7%	0.7%	0.9%	0.3%	0.3%	0.3%	0.3%	0.3%	0.3%	0.2%	0.1%	0.1%	0.6%	0.6%	1.5%	0.1%	0.1%	0.4%	2.8%	1.3%	3.2%	0.5%	0.8%	1.7%	
	Na+K/1,7	index_1_units (% ash_ox_norm)			6.1%	0.9%	1.1%	0.4%	0.2%	0.2%	0.6%	0.2%	0.2%	0.2%	0.2%	0.2%	5.1%	2.4%	5.8%	2.8%	2.5%	9.6%	10.0%	2.3%	5.7%	4.4%	1.9%	4.0%	
	Ca/P	index_2_units (no units)			13.9118	13.667	13.6667	99.7778	74.0833	74.0833	104.256	78.8182	78.8182	466.5	307.333	307.333	1.56522	2.12121	2.1212121	9	5	4.9999999	15.5	7.35294	7.352941	17.8	8.857143	8.8571429	
	Ca/(Na+K)	index_3_units (no units)			4.82653	47.308	47.3077	224.5	444.5	444.5	97.9336	433.5	433.5	466.5	461	461	0.94737	2.05882	2.0588235	0.47368	0.29412	0.2941177	1.43709	3.78788	3.787879	1.39063	4.769231	4.7692308	
Si/Al	index_4_units (no units)			13.8182	4.6875	4.6875	0.37736	0.28571	0.28571	0.77937	0.67213	0.67213	0.5	0.5	0.5	4.59167	5.46957	5.4695652	11.9571	11.7917	11.791667	7.98305	9.55714	9.557143	7.70787	7.3125	7.3124999		
S/Cl(mn)	index_5_units (no units)			0.31532	0.814	1.03113	0.11029	0.5988	0.60176	0.13793	0.58708	0.63717	0.16949	0.45045	0.46	0.0271	0.13216	0.1559527	0.00382	0.01389	0.0171849	0.08144	0.34211	0.739771	0.11287	0.228571	0.4685333		
Na+K+Fe+S_ash	index_6_units (% ash_ox_norm)			12.0%	5.2%	6.7%	1.0%	1.2%	1.3%	1.6%	1.3%	1.4%	0.8%	0.8%	0.8%	17.6%	12.3%	30.3%	6.1%	5.5%	20.8%	21.2%	9.8%	24.0%	10.8%	18.2%	38.8%		
(Ca+K)/Si	index_7_units (no units)			1.84868	2.7778	13.8889	44.95	49.4444	247.222	24.798	21.1707	105.854	54.9412	46.15	230.75	0.23956	0.15103	0.7551669	0.05018	0.03651	0.1825677	0.72611	0.22272	1.113602	0.20117	0.242735	1.2136752		
Na+K	% ash_ox_norm			9.8%	1.3%	1.7%	0.4%	0.2%	0.2%	0.9%	0.2%	0.2%	0.2%	0.2%	0.2%	7.6%	3.4%	8.4%	3.8%	3.4%	12.9%	15.1%	3.3%	8.1%	6.4%	2.6%	5.5%		
weighted index (from 0 -worse- to 1 -best)	ash_content_815	% DM		30.00%	1	1	1	1	0.2	0.2	1	1	1	0.2	0.2	0.2	0.2	0.2	1	0.2	0.2	1	1	1	1	1	1	1	
	volatile_matter	% DM		50.00%	1	1	1	1	1	1	1	1	1	1	0.2	0.2	1	0.2	0.2	1	0.2	0.2	1	1	1	1	1	1	
	N	% DM	1.00%	3.00%	1	1	1	1	1	1	1	1	1	1	1	1	0	0.5	0	1	1	0.5	1	0.5	0.5	1	1	1	
	S	% DM	0.20%	0.50%	1	1	1	1	1	1	1	1	1	1	1	1	0	0.5	0.5	1	1	1	1	1	1	1	1	1	
	Cl_ppm	ppm in DM	1500	8000	1	1	1	1	1	1	1	1	1	1	1	1	0.5	1	1	0.5	1	0.5	1	1	1	1	1	1	
	alkali (K+Na)	ppm in DM	2500	6000	0.5	1	1	1	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0.5	0.5	0.5	0.5	1	1	
	H/C_atom	no unit			0.83333	0.7222	0.71063	0.72222	0.66667	0.65918	0.78633	0.66667	0.63862	0.72222	0.61111	0.62055	1	0.72222	0.7330079	0.83333	0.5	0.502238	0.88889	0.72222	0.732201	0.83333	0.722224	0.720135	
	O/C_atom	no unit			0.79012	0.6049	0.60375	0.74692	0.53704	0.53533	0.76066	0.54321	0.54531	0.70987	0.51852	0.51739	0.75308	0.65432	0.6546805	1	0.75926	0.7598757	0.85185	0.66049	0.662352	0.88888	0.746916	0.7478867	
	Na+K/1,7	index_1_units (% ash_ox_norm)			0.81428	0.9746	0.96706	0.99083	0.99694	0.99662	0.98213	0.99694	0.99653	0.99694	0.99694	0.99671	0.84502	0.92934	0.823247	0.91586	0.92431	0.708497	0.69759	0.93114	0.828955	0.86785	0.944984	0.880591	
	Ca/P	index_2_units (no units)			0.51328	0.513	0.51301	0.60562	0.57799	0.57799	0.61044	0.58308	0.58308	1	0.82883	0.82883	0.5	0.5006	0.5005979	0.508	0.50369	0.5036938	0.51499	0.50622	0.506224	0.51746	0.507842	0.5078419	
	Ca/(Na+K)	index_3_units (no units)			0.50306	0.5318	0.53178	0.65155	0.80026	0.80026	0.566	0.79282																	