

Wood Fuels: Energy Crops

Appendix C.4 Alkali Deposit Investigation Samples Alkali Deposits Found in Biomass Power Plants: A Preliminary Investigation of Their Extent and Nature

National Renewable Energy Laboratory Subcontract TZ-2-11226-1

fuelsc4.xls

Fuel	Willow		Willow		Willow		Willow		Willow		Willow		Willow		Willow	
	SV1-3Yr		SV1-1Yr		SP3-1Yr		SH3-1Yr		SA22-1Yr		SA22-3Yr		SA22-Top		SA22-Butt	
Type	As Rec'd	Dry	As Rec'd	Dry	As Rec'd	Dry	As Rec'd	Dry	As Rec'd	Dry	As Rec'd	Dry	As Rec'd	Dry	As Rec'd	Dry
Proximate Analysis																
Fixed Carbon	12.40	13.82	12.09	13.99	14.22	15.75	14.09	16.14	14.75	16.67	14.47	16.07	16.70	17.99	13.18	14.81
Volatile Matter	76.52	85.23	73.38	84.91	74.99	83.05	71.74	82.16	72.43	81.83	74.01	82.22	73.92	79.67	74.82	84.13
Ash	0.85	0.95	0.95	1.10	1.08	1.20	1.49	1.70	1.33	1.50	1.54	1.71	2.17	2.34	0.94	1.06
Moisture	10.23	--	13.58	--	9.71	--	12.68	--	11.49	--	9.98	--	7.21	--	11.06	--
TOTAL	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00
Ultimate Analysis																
Carbon	44.07	49.09	41.43	47.94	45.41	50.29	42.65	48.85	44.03	49.75	44.92	49.9	45.86	49.42	43.53	48.95
Hydrogen	5.29	5.89	5.05	5.84	5.43	6.01	5.27	6.04	5.31	6.00	5.31	5.9	5.47	5.89	5.38	6.05
Oxygen	39.21	43.69	38.39	44.43	37.85	41.93	37.24	42.64	37.18	42.01	37.63	41.81	38.28	41.27	38.73	43.54
Nitrogen	0.32	0.35	0.55	0.63	0.45	0.5	0.62	0.71	0.58	0.65	0.55	0.61	0.89	0.96	0.32	0.36
Sulfur	0.03	0.03	0.05	0.06	0.07	0.07	0.05	0.06	0.08	0.09	0.07	0.07	0.12	0.12	0.04	0.04
Ash	0.85	0.95	0.95	1.1	1.08	1.2	1.49	1.70	1.33	1.50	1.54	1.71	2.17	2.34	0.94	1.06
Moisture	10.23	--	13.58	--	9.71	--	12.68	--	11.49	--	9.98	--	7.21	--	11.06	--
TOTAL	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00
HHV, Btu/lb	7,478	8,330	7,194	8,325	7,848	8,691	7,373	8,443	7,485	8,457	7,583	8,424	7,896	8,510	7,405	8,326
Chlorine %	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.01	<0.01	0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.01
Water Soluble Alkalis %																
Na2O	0.021	0.023	0.010	0.012	0.022	0.024	0.011	0.013	0.004	0.004	0.007	0.007	0.066	0.071	0.010	0.011
K2O	0.113	0.126	0.147	0.012	0.245	0.271	0.243	0.278	0.270	0.305	0.242	0.269	0.466	0.503	0.145	0.163
CaO																
Elemental Composition																
SiO2		8.08		16.76		2.83		1.11		1.89		2.35		2.05		1.82
Al2O3		1.39		3.01		0.12		0.09		0.16		1.41		1.97		1.48
TiO2		0.06		0.07		0.06		0.00		0.04		0.05		0.03		0.05
Fe2O3		0.84		0.85		0.42		0.21		0.30		0.73		0.35		0.49
CaO		45.62		34.83		36.51		40.48		32.00		41.20		34.18		44.68
MgO		1.16		2.46		1.54		3.04		7.67		2.47		2.98		2.16
Na2O		2.47		3.05		1.97		0.77		0.65		0.94		2.67		0.86
K2O		13.20		12.20		19.9		13.90		22.10		15.00		18.4		15.30
SO3		1.15		1.70		1.94		1.70		3.09		1.83		2.92		2.33
P2O5		10.04		10.36		12.9		8.16		11.68		7.40		7.1		7.18
CO2/other		13.67		17.58		19.85		27.10		17.65		18.24		22.64		18.34
Undetermined		2.32		-2.87		1.96		3.44		2.77		8.38		4.71		5.31
TOTAL		100.00		100.00		100.00		100.00		100.00		100.00		100.00		100.00

Alkali, Lb/MMBtu	0.18	0.20	0.30	0.30	0.40	0.32	0.58	0.21
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Last Updated: 2/27/96

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