



# Certificate of Analysis

AR-1947

SWITCHGRASS BIOMASS CRM

LOT # 521P

## DRIED BASIS VALUES

() Indicates reference or information only value.

Proximate Analysis			n=	k=	METHOD	Ultimate Analysis			n=	k=	METHOD
% Ash	4.43 ± 0.48		13	2.2	ISO18122/D3174	% Carbon	45.87 ± 2.61		18	2.1	ISO16948/D5373
% Volatile Matter	81.37 ± 2.86		6	2.4	ISO18123/D3175	% Hydrogen	5.91 ± 0.28		18	2.1	ISO16948
*BTU / lb.	*7940 ± 285		9	2.3	ISO18125/D5865	% Nitrogen	0.60 ± 0.08		19	2.1	ISO16948
*- HHV only						% Sulfur	(0.05)		--	--	ISO16994/D4239
Mineral Analysis			n=	k=	METHOD	Mineral Analysis			n=	k=	METHOD
% Silicon	1.26 ± 0.55		5	2.6	D4326/ISO16968	% Nickel	(0.0005)		5	--	D4326/ISO16968
% Aluminum	0.053 ± 0.008		5	2.6	D4326/ISO16968	% Vanadium	(0.0002)		3	--	ICP/OES
% Titanium	0.0050 ± 0.0009		5	2.6	D4326/ISO16968	% Copper	(0.0037±0.0013)		3	3.2	D4326/ISO16968
% Iron	0.04 ± 0.02		5	2.6	D4326/ISO16968	% Arsenic	(0.0028)		3	--	ICP/OES
% Calcium	0.28 ± 0.07		5	2.6	D4326/ISO16968	% Cadmium	N/A		-	--	ICP/OES
% Magnesium	0.09 ± 0.01		5	2.6	D4326/ISO16968	% Chromium	(0.0009)		5	--	D4326/ISO16968
% Potassium	0.09 ± 0.03		5	2.6	D4326/ISO16968	% Molybdenum	(0.0006)		3	--	ICP/OES
% Sodium	(0.0082±0.0016)		3	3.2	ICP/OES	% Fluorine	(0.0006±0.0003)		4	2.8	ISO16994
% Zinc	0.0029 ± 0.0005		5	2.6	D4326/ISO16968	% Chlorine	0.0057 ± 0.0003		4	2.8	ISO16994
% Phosphorus	0.062 ± 0.007		5	2.6	D4326/ISO16968	µg/g Mercury	0.0085 ± 0.0012		7	2.4	ASTM D6722
% Strontium	0.0006 ± 0.0001		5	2.6	D4326/ISO16968						
% Barium	(0.0011±0.0003)		2	4.3	D4326						
% Manganese	0.0055 ± 0.0010		5	2.6	D4326/ISO16968						

REFERENCES USED: CRM760, HP Benzoic Acid, HP Sucrose, CRM210, CRM115, CRM897, SRM143d, AR1946-815A, BF0017

This reference is made of finely pulverized wood (-40mesh) that has been kept at 0°C for a minimum of 72 hours and then dried at 120°C for a minimum of 1 hour before blending for homogeneity. The intended use is for a control or test method validation/quality check of laboratory test procedures. Typical sample size for analytical testing and minimum size is subject to the test method and instrumentation used. The uncertainty values represent the expanded uncertainty at 95% confidence obtained through analytical testing by the mentioned test methods utilizing ISO Guide 35, and the Guide to Uncertainty Measurement. Metrological traceability is to the SI derived units expressed as mass fraction percent, µg/g, or BTU/lb. Normal test procedures should be employed when using this standard; this includes using the *reproducibility* and *repeatability* factors of the method for establishing analytical uncertainty if needed. When necessary, professional judgment is applied toward consideration of data and statistical information. The statistical analysis and the overall direction and coordination of the analytical measurements leading to certification were performed by K.E. Dyer, Chief Chemist at Alpha Resources.

The material used in production of this standard was identified in accordance with ARI-LAB-603. The samples for round-robin testing were selected in accordance with ARI-LAB-625. The above values relate only to the material used to produce this standard. The analytical samples should be dried or corrected for moisture as per the test method you are using. This bottle contains 50g fine wood powder. While unable to determine a definite shelf life this reference standard should be reviewed 20 years from the date of certification. Once opened this certificate is valid for two years. Keep sealed tight and store under normal laboratory conditions. This certificate cannot be reproduced except in full. Remedies for any claimed defect in this product will be limited to product replacement or refund of the purchase price. In no event shall Alpha Resources be liable for incidental or consequential damages.

This is a Certified Reference Material (CRM) and is traceable to the above-mentioned references. For good laboratory practice it is recommended that all standards be verified as fit for purpose prior to use. This standard was produced in accordance with ISO 17034 (RMP) accreditation issued by ANSI-ASQ/ANAB. Refer to certificate and scope of accreditation AR1920.

### EXPIRATION DATE

THIS CRM IS VALID FOR TWO YEARS FROM THE DATE OF OPENING

CERTIFIED June 14, 2022

Kent Dyer