

## Certificate of Analysis Part No. B2321 Ultimate Coal Standard

Certificate Number 776419  
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### Dried Basis Values

Proximate Analysis		ASTM	Ultimate Analysis		ASTM
% Ash	10.02 ± 0.26	D3174/D7582	% Carbon	71.57 ± 1.16	D5373
% Volatile Matter	35.80 ± 2.52	D3175/D7582	% Hydrogen	4.80 ± 0.43	D5373
% Fixed Carbon (calculated)	(54.18)	D3172	% Nitrogen	1.26 ± 0.02	D5373
% Sulphur	1.12 ± 0.04	D4239	% Oxygen (calculated)	(11.23)	D3176
Btu/lb	12533 ± 151	D5865	MAF/DAF BTU	13954 ± 116	D3180
Mineral Analysis		ASTM	Sulphur Forms		ASTM
Silica	44.20 ± 5.12	D4326/D6349	% Pyritic	0.36 ± 0.07	D2492
Alumina	22.57 ± 1.68	D4326/D6349	% Organic (calculated)	(0.58)	D2492
Titania	1.23 ± 0.10	D4326/D6349	% Sulphate	0.18 ± 0.05	D2492
Ferric Oxide	10.22 ± 0.72	D4326/D6349	<b>Ash Fusion Temperature</b>		
Calcium Oxide	6.99 ± 1.13	D4326/D6349	<b>ASTM D1857</b>	<b>Degrees F</b>	<b>Degrees F</b>
Magnesium Oxide	2.05 ± 0.27	D4326/D6349	Initial Deformation	2181	2303
Potassium Oxide	1.90 ± 0.46	D4326/D6349	Softening	2254	2354
Sodium Oxide	0.60 ± 0.07	D4326/D6349	Hemispherical	2292	2407
Sulphur Trioxide	(9.30)	D4326/D6349	Fluid/Final	2360	2464
Phosphorus Pentoxide	0.36 ± 0.03	D4326/D6349	<b>Chlorine</b>		<b>ASTM</b>
Strontium Oxide	0.14 ± 0.02	D4326/D6349	% Chlorine	(0.0979)	D4208/D6721
Barium Oxide	0.27 ± 0.03	D4326/D6349			
Manganese Oxide	(0.02)	D4326/D6349			
Undetermined (calculated)	(0.15)				

REFERENCES USED: Sulphur - NIST SRM 2692, SRM 2693, SRM2692c, NCS FC28004f; BTU - NIST 39j(Benzoic Acid); C/H/N – Phenylalanine, EDTA, CRM-6, CRM-9; Form of Sulphur – QAR-RM-6, RM-1 SRM1635a; Mineral Analysis – NIST634a, 2689, USGS AGV-2; Chlorine – SRM2693, 2685c, 1635a. ( ) indicates reference only value

#### Notes:

The intended use of this standard is for the verification of various tests by the above-mentioned methods. 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 (k=2, @95% confidence) obtained through analytical testing by the mentioned ASTM methods. 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 material used in production of this standard was prepared and sampled in accordance with ARI 041. The samples for round robin testing were selected in accordance with ARI 031. 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 coal powder (-60 mesh). 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 Elemental Microanalysis Ltd be liable for incidental or consequential damages. This Reference Material 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 Reference Material is valid for two years from the date of opening.

Certified July 19, 2019

Elemental Microanalysis Limited