

Alpha Resources, LLC

Certificate Of Analysis

AR-2775

ULTIMATE COAL STANDARD

LOT # 751215

LID # 751215

DRIED BASIS VALUES

| Proximate Analysis | | ASTM | Ultimate Analysis | | ASTM |
|----------------------------|-------------|-------------|--------------------------|------------|-------|
| % Ash..... | 6.80 ± 0.43 | D3174/D7582 | % Carbon..... | 69.38±1.71 | D5373 |
| % Volatile Matter..... | 42.12±0.94 | D3175/D7582 | % Hydrogen..... | 4.59±0.19 | D5373 |
| % Fixed Carbon(calculated) | 51.08 | D3172 | % Nitrogen..... | 0.93±0.16 | D5373 |
| % Sulfur..... | 0.39±0.02 | D4239 | % Oxygen (calculated)... | 17.91 | D3176 |
| Btu/lb..... | 11713±76 | D5865 | MAF/DAF BTU | 12567±78 | D3180 |

Mineral Analysis

| | | ASTM | Sulfur Forms | | ASTM |
|---------------------------|---------------|-------------|-------------------------------|------------------|------------------|
| Silica..... | 28.88 ±2.91 | D4326/D6349 | % Pyritic..... | (0.01) | D2492 |
| Alumina..... | 14.78 ±1.83 | D4326/D6349 | % Organic (calculated)... | 0.37±0.03 | D2492 |
| Titania..... | 1.29 ±0.29 | D4326/D6349 | % Sulfate..... | (0.01) | D2492 |
| Ferric Oxide..... | 5.06 ±0.85 | D4326/D6349 | | | |
| Calcium Oxide..... | (22.61 ±4.13) | D4326/D6349 | Ash Fusion Temperature | Degrees F | Degrees F |
| Magnesium Oxide..... | 5.68 ±0.90 | D4326/D6349 | ASTM D1857 | Reducing | Oxidizing |
| Potassium Oxide..... | 0.22 ±0.03 | D4326/D6349 | Initial deformation... | 2146 | 2170 |
| Sodium Oxide..... | 1.61 ±0.29 | D4326/D6349 | Softening..... | 2170 | 2198 |
| Sulfur Trioxide..... | (13.86±2.01) | D4326/D6349 | Hemispherical..... | 2180 | 2207 |
| Phosphorus Pentoxide..... | 0.77±0.20 | D4326/D6349 | Fluid/Final..... | 2206 | 2241 |
| Strontium Oxide..... | 0.39±0.09 | D4326/D6349 | | | |
| Barium Oxide..... | 0.63±0.11 | D4326/D6349 | % Chlorine D4208/D6721 | (0.004) | |
| Manganese Oxide... | (0.05) | D4326/D6349 | | | |
| Undetermined (calculated) | (4.17) | | | | |

REFERENCES USED: Sulfur - NIST SRM 2682b, 2693; BTU - Benzoic Acid () 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, and may not reflect your testing capabilities. 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, Technical Manager at Alpha Resources.

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). Kept sealed this product has an indefinite shelf life. 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 (Working Standard) and is traceable (Sulfur) to the above mentioned NMI references. For good laboratory practice it is recommended that all standards be verified prior to use. This standard was produced in accordance to ISO Guide 34 and ISO Guide 31.

EXPIRATION DATE

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

CERTIFIED November 15, 2016

