

Sulfur in Coal Certified Reference Material (4%)

Product No: AR1746

Lot No: 250106

Material and Intended Use

AR1746 is a sulfur in coal certified reference material (CRM). The intended use of this CRM is for the calibration and verification of tube furnace combustion and other appropriate analysis methods for the determination of sulfur. This CRM can also be used to verify value assignment of in-house reference materials. A unit consists of one bottle containing 50 g of reference material as a 60-mesh powder. All reference materials should be verified as fit for purpose prior to use.

Instructions for Use

This product should be dried at 70°C for a minimum of 12 hours or until constant mass before use. The minimum sample size for analysis is dependent upon the test method and instrumentation used. It is recommended that no less than 0.5 g of material be used for destructive test methods. Bottles of powder should be kept sealed tight and stored in a cool, dry location. Reported values are valid for 15 years from the initial date of release if handling and storage instructions are followed. Values are rendered null and void if the CRM is in any way modified or damaged.

Reported Values

Property values for a chemical element indicate the amount of each element present in the overall material matrix and are metrologically traceable to the International System of Units (SI) derived unit of mass fraction expressed as a percent (%). Certified values are reported as the mean property value with an expanded uncertainty ($U_{95\%}$). The true value of the measurand is believed to lie within the expanded uncertainty coverage interval with 95% confidence. Expanded uncertainty is calculated by application of a coverage factor (k) to the combined standard uncertainty (u_c). For laboratory uncertainty budgets, the combined standard uncertainty can be calculated as $u_c = U_{95\%}/k$, where k is approximately equal to 2. The estimation of combined standard uncertainty (u_c) includes contributions from material homogeneity, primary calibrants, characterization, and other factors. Sampling and calculation of reported values for each measurand are performed using practices consistent with ISO 17034:2016 and ISO 33405:2024. Certified values are accredited under Alpha Resources, LLC ISO/IEC 17025 and ISO 17034 certificates issued by ANSI National Accreditation Board (ANAB), AT-1200 and AR1920.

Table 1. Certified values for AR1746, Lot 250106.

Property	Value	$U_{95\%}$	Method & Detection	n
%Sulfur	3.88	0.15	Combustion/IR	39

Assigned values were validated using the following primary reference standards:

NIST	2685c, 2684c
AR	1710-710621

Homogeneity

This product was manufactured from raw material using pulverizing and blending. Samples were randomly selected using practices consistent with ISO 33405:2024. Homogeneity was evaluated by replicate analysis. Within- and between-sample variance was evaluated using Analysis of Variance (ANOVA).

Methods and References

ARI-LAB-621 – Alpha Resources Method, Carbon and Sulfur Analysis by Induction Furnace Combustion/IR Detection

ASTM D4239 – Standard Test Method for Sulfur in the Analysis Sample of Coal and Coke Using High-Temperature Tube Furnace Combustion

ISO/IEC 17025:2017 – General requirements for the competence of testing and calibration laboratories

ISO 17034:2016 – General requirements for the competence of reference material producers

ISO 33401:2024 – Reference materials – Contents of certificates, labels, and accompanying documentation

ISO 33405:2024 – Reference materials – Approaches for characterization and assessment of homogeneity and stability

ISO Guide 30:2015 – Terms and definitions used in connection with reference materials



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