Limestone Blend Certified Reference Material

Product No: AR4035
Lot No: 260427

Material and Intended Use

AR4035 is a limestone blend certified reference material (CRM). The intended use of this CRM is for the verification and calibration of combustion for the determination of carbon and sulfur. This CRM can also be used to validate value assignment of in-house reference materials. A unit consists of one bottle containing 25g of powder. All reference materials should be verified as fit for purpose prior to use.

Reported Values

Certified values for AR4035 are given in Table 1. Certified values are reported as $x \pm U_{95\%}$, where $U_{95\%}$ is half the 95% coverage interval around the certified value. The expanded uncertainty is $U_{95\%} = ku_c$, with the combined standard uncertainty, u_c, multiplied by the expansion factor $k = 2$. The true value of the analyte is believed to lie within the interval $x \pm U_{95\%}(x)$ with approximately 95% confidence. The estimation of combined standard uncertainty (u_c) includes contributions from material heterogeneity, calibration, measurement, and other factors (1-2). Sampling and calculation of reported values for each measurand were performed using practices consistent with ISO 17034:2016 (3) and ISO 33405:2024 (4).

Table 1. Certified values for AR4035, Lot 260427.

Property	Value	$U_{95\%}$
% Carbon	9.45	0.38
% Sulfur	0.206	0.018

% Carbon, Sulfur – Values indicate the amount of the element present in the material matrix as determined using combustion and are metrologically traceable to the International System of Units (SI) derived unit of mass fraction expressed as percent (%).

Instructions for Use

This product should be dried at 110°C for two hours prior to use. It is recommended to mix the contents of the bottle prior to analysis by repeated inversion for two minutes. Dried specimens should be stored in a desiccator and analyzed within 24 hours of drying. Bottles of powder should be kept sealed tight and stored in a cool, dry location.

For propagation of uncertainty, an estimate of the combined standard uncertainty can be obtained as $u_c = U_{95\%}(x)/k$, where $k = 2$ is the approximate coverage factor associated with the 95% coverage level. The resulting value for u_c is at the level of one standard deviation, and it can be combined with a laboratory's standard uncertainty estimates for their own sources of error to calculate estimates of uncertainty for test results from methods with which this CRM was used. A laboratory uncertainty estimate that includes the uncertainty of the CRM value is the basis for a link of metrological traceability from the test result for a sample to the CRM value.

Minimum Sample Size

It is recommended that no less than 0.2 g of CRM material be used for destructive test methods.

Period of Validity

This certification is valid for 25 years from the initial certification date, within the measurement uncertainties specified, provided the CRM is handled and stored in accordance with the instructions given in this certificate (see "Instructions for Use"). Accordingly, periodic recalibration or recertification of this CRM is not required. The certification is nullified if the CRM is damaged, contaminated, or otherwise modified.

Homogeneity

This product was manufactured from raw materials by blending and pulverizing. Units were randomly selected using practices consistent with ISO 33405:2024. Within-unit and among-unit variances were estimated from data of replicate determinations subjected to analysis of variance (ANOVA).

Maintenance of the Reference Material Certificate

Alpha Resources will monitor this CRM throughout the period of its availability. If substantive technical changes occur that affect the value assignment, AR will notify the purchaser.

Users of this CRM should ensure the Reference Material Certificate in their possession is current. This can be accomplished by contacting Alpha Resources at the following: Telephone - (269) 465-5559; Email - info@alpharesources.com; or via the Internet - https://www.alpharesources.com.

Methods and References

(1) JCGM 100:2008; Evaluation of Measurement Data – Guide to the Expression of Uncertainty in Measurement; (GUM 1995 with Minor Corrections), Joint Committee for Guides in Metrology (JCGM) (2008); available at https://www.bipm.org/utils/common/documents/jcgm/JCGM_100_2008_E.pdf (accessed February 2025)
(2) JCGM 101:2008; Evaluation of Measurement Data – Supplement 1 to the Guide for the Expression of Uncertainty in Measurement; Propagation Distributions Using a Monte Carlo Method; Joint Committee for guides in Metrology (JCGM) (2008); available at https://www.bipm.org/utils/common/documents/jcgm/JCGM_100_2008.pdf (accessed February 2025).
(3) ISO 17034:2016 – General requirements for the competence of reference material producers.
(4) ISO 33405:2024 – Reference materials – Approaches for characterization and assessment of homogeneity and stability.

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Global Technical Director
Certification Date: September 03, 2026

ANAB ANSI National Accreditation Board ACCREDITED ISO 17034 REFERENCE MATERIAL PRODUCER

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