

Alpha Resources, Inc.

Certificate Of Analysis

AR 589
TITANIUM STANDARD
LOT # 814C

*% CARBON
*MEAN = 0.008
*One Sigma Standard Deviation = +/- 0.001
*Expanded Uncertainty = +/- 0.002
*(k=2, 95% confidence) (n=55)

% HYDROGEN
MEAN = 0.0192
One Sigma Standard Deviation = +/- 0.0005
Expanded Uncertainty = +/- 0.0010
(k=2, 95% confidence) (n=80)

Method of Analysis is ASTM E 1941-10, E 1447-09 ARI 033, and ARI 036

Primary (NMI) Standards used for traceability:

NIST SRM 2454, 2453, 176, 173c, 173b

*The carbon certification was revised on November 17, 2016. The new data value and uncertainty reflect a larger test data set, testing method review, and the use of additional NIST SRM's 360b, 649, 2431, and 2432. There is no perceived detrimental impact on these results to the industry.

Notes

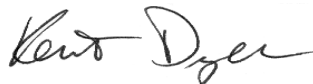
The mean analytical values were derived by separate data sets showing traceability to the above-mentioned reference standards, and reported in mass fraction. The precision values represent the estimated uncertainty derived from the data sets and may not represent your testing capabilities. Refer to your test method for the expanded method derived 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. This certificate cannot be reproduced except in full.

The material used in production of this standard was sampled in accordance with ARI 032. The samples for round robin testing were selected in accordance with ARI 014. The above values relate only to the material used to produce this standard. This bottle consists of 25g material in .25g pins (nominal) and is to be used directly from the bottle without preparation. Multiple pins may be used per test method requirements. This product has an indefinite shelf life. This reference material was produced in accordance to ISO Guide 34 and ISO Guide 31.

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 to the above-mentioned standards. For good laboratory practice it is recommended that all standards be verified prior to use. These test results are accredited under the Alpha Resources Inc. laboratory's ISO/IEC 17025 accreditation issued by ANSI-ASQ National Accreditation Board/ACCLASS. Refer to certificate and scope of accreditation AC-1200. The production of this calibration reference is accredited under Alpha resources Inc. ISO Guide 34 accreditation issued by ANSI-ASQ/ANAB. Please refer to certificate and scope of accreditation AR-1920.

Certified, August 19, 2014 (original certification date)



Kent Dyer, Technical Manager

This certificate was revised on February 20, 2015, to amend new Carbon and ISO Guide 34 accreditation.