

Titanium Pin Certified Reference Material

Product No: AR589**Lot No: 240417**

Material and Use

AR589 is a titanium pin certified reference material (CRM). All reference materials should be verified as fit for purpose prior to use. The intended use of this CRM is for the verification and calibration of induction furnace combustion and inert gas fusion (or other appropriate) analyzers for the determination of carbon and hydrogen. Typical sample size for analytical testing is dependent upon the test method and instrumentation used, however, a minimum sample size of one pin is recommended. This product comes as nominal 0.25 g pins and should be kept sealed tight and stored under standard laboratory conditions. Certified values are valid for 15 years from the initial date of certification.

Table 1. Certified values for AR589, Lot 240417.

Element	Value	(+/-)	Method & Detection	n	k
% Carbon	0.0116	0.0020	Combustion/IR	47	2.0
% Hydrogen	0.0241	0.0027	Inert Gas Fusion/TC	50	2.0

Note: (+/-) indicates expanded uncertainty.

Reported Values

Certified values are metrologically traceable to the SI derived unit of mass fraction expressed as a percent. Measurand values are accredited under Alpha Resources, LLC ISO/IEC 17025 and ISO 17034 accreditation issued by ANSI National Accreditation Board (ANAB). Please refer to certificates and scopes of accreditation AT-1200 and AR-1920. Sampling and calculation of reported values for each analyte are performed in compliance with guidance found in ISO 17034, ISO 33401, and ISO Guide 35. Material homogeneity, uncertainty of primary reference standards, characterization uncertainty from contributing laboratories, and other factors are considered in the assessment of overall combined uncertainty. Analysis of variance is used in the calculation of uncertainty between contributing labs and between samples. Expanded uncertainty is calculated by application of a coverage factor to the combined uncertainty value.

The reported values were validated using the following primary reference standards:

NIST SRM	360b, 173c, 2454a, 649
AR	649-1217B, 589-814C

Methods and References

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

ARI-LAB-623 – Alpha Resources Method, Hydrogen Analysis

ASTM E1447 – Standard Test Method for Determination of Hydrogen in Reactive Metals and Reactive Metal Alloys by Inert Gas Fusion with Detection by Thermal Conductivity or Infrared Spectroscopy

ASTM E1941 – Standard Test Method for Determination of Carbon in Refractory and Reactive Metals and Their Alloys by Combustion Analysis

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

ISO Guide 35:2017 – Reference materials – General and statistical principles for certification

**Dustin Jenkins, Ph.D.****Global Technical Director****Certification Date:** August 29, 2024

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