# Titanium Pin Certified Reference Material

## Product No: AR642

## Lot No: 240808

**Material and Intended Use**

AR642 is a titanium pin certified reference material (CRM). The intended use of this CRM is for the verification and calibration of inert gas fusion and other appropriate analysis methods for the determination of oxygen, nitrogen, and hydrogen. This CRM can also be used to validate value assignment of in-house reference materials. A unit consists of one bottle containing 10 g of reference material in nominal 0.1 g pins. All reference materials should be verified as fit for purpose prior to use.

**Instructions for Use**

This product requires no preparation prior to use. The minimum sample size for analysis is dependent upon the test method and instrumentation used. It is recommended that no less than 1 pin of CRM material be used for destructive test methods. Bottles of pins should be kept sealed tight and stored in a cool, dry location. Property values are valid for 20 years from the initial date of certification 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 AR642, Lot 240808.**

| Element | Certified Value | $U_{95\%}$ | Method & Detection | n |
|---|---|---|---|---|
| % Oxygen | 0.0453 | 0.0120 | Inert Gas Fusion/IR | 59 |
| % Hydrogen | 0.0046 | 0.0013 | Inert Gas Fusion/TC | 60 |

Certified values were validated using the following primary reference standards:

| | |
|---|---|
| **NIST** | 360b |
| **NCS** | NS 11091, NS 11107, NS11108, NS 11107, NS 11090, NS111089 |
| **AR** | 650-240320, 642-521N, 651-621R, 641-720D |

**Table 2. Reference values for AR642, Lot 240808.**

| Element | Reference Value | Method & Detection | n |
|---|---|---|---|
| % Nitrogen | 0.0025 | Inert Gas Fusion/TC or IR | 59 |

**Homogeneity**

This product was manufactured from a single heat lot of bulk material. 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-622 – Alpha Resources Method, Oxygen/Nitrogen Analysis*
*ARI-LAB-623 – Alpha Resources Method, Hydrogen Analysis*
*ASTM E1409 – Standard Test Method for Determination of Oxygen and Nitrogen in Titanium and Titanium Alloys by Inert Gas Fusion*
*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 Spectrometry*
*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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**Certification Date:** January 6, 2025

ANAB ACCREDITED ISO 17034 REFERENCE MATERIAL PRODUCER

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