



White Horse Reference Materials

Product Information Sheet

WHRM-TRMHa

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H₂, N₂ AND O₂ IN TITANIUM ALLOY

INTENDED USE: This Reference Material (RM) [also termed Control Material, statistical process control material, QCM material, verifier. etc.] is intended for the demonstration of in-control status of a measurement process over time and to check instrumental performance, including repeatability.

It is also intended for use much as a CRM is used for instrument calibration and drift correction as taught in ASTM E2972 Section 6.5. as it satisfies ISO 17025 requirements for characterization in compliance with ISO 17034 and associated documents.

DESCRIPTION: One bottle consists of ~100 titanium pins of approximately 2.5 mm diameter by 4.5 mm length with a nominal weight of 0.1 g.

	Mass Fraction	Expanded Uncertainty	
Hydrogen (H)	88.4 mg/kg	1.3 mg/kg	S=0.67 mg/kg
Nitrogen (N)	0.009 mg/kg	0.001 mg.kg	
Oxygen (O)	0.178 mg/kg	0.005 mg/kg	

MASS FRACTION VALUE: The values listed above are the amount of analyte contained in Grade 5 titanium expressed as mass fraction realized using the inert gas fusion methods ASTM E-1447 and E1019. The estimated true values are based on a statistical evaluation of data supplied by analyzers with various detection technologies at White Horse Reference Materials (WHRM) and participating laboratories. For use as a hydrogen process control reference, simple standard deviation is provided. Uncertainty values from WHRM and participating outside laboratories. For use as a hydrogen process control reference, simple standard deviation is provided as attained during heterogeneity testing from an n=50 dataset.

MINIMUM SAMPLE SIZE: To relate analytical determinations to the assigned values on this Product Information Sheet, a minimum sample quantity of 0.2 g is recommended for hydrogen analysis, and 0.1g for nitrogen and oxygen analysis.

PERIOD OF VALIDITY: The statement of WHRM-TRMHa estimated value is valid, within the measurement uncertainty specified, indefinitely, provided the RM is handled and stored in accordance with the instructions given in this document (see "Instructions for Handling and Use"). This document is nullified if the RM is damaged, contaminated, or otherwise modified.

MAINTENANCE OF RM DOCUMENT: WHRM will monitor this RM over the period of validity. If substantive technical changes occur that affect the value assignment, WHRM will publish on its website the revised document and make an effort to notify the end user.

INSTRUCTIONS FOR HANDLING AND USE: The material does not require additional preparation prior to weighing, if stored as outlined per instructions given in this document (see “Storage Information”).

STORAGE INFORMATION: The material should be stored in its original, tightly capped bottle in a cool, dry location. Use a clean, dry tool to handle the pins, and do not touch the pins with any material likely to contaminate the surface.

PREPARATION AND ANALYSIS: The material for WHRM-TRMHa was obtained in the form of pins prepared by White Horse Technical Services (WHTS) using a proprietary process. The material was blended and bottled at WHTS. The starting material for preparation of WHRM-TRMHa was a Grade 5 titanium alloy, manufactured in the form of wire by Perryman Company (Houston, PA).

Heterogeneity testing was performed at WHRM using inert gas fusion with thermal conductivity detection in-house using a LECO hydrogen analyzer following ASTM E1447. Material hydrogen heterogeneity was low and fit for purpose for value assignment with the standard deviation of a single determination equal to 0.67 mg/kg H calculated from 50 sample analyses selected from 10 bottles for 5 repetitions consisting of two pins each.

Quantitative hydrogen analysis of the material for WHRM-TRMHa was performed at WHRM using inert gas fusion with thermal conductivity detection. As required by ASTM E1447, each sample consisted of two pins for a mass per sample of approximately 0.2 g. Additional quantitative analysis for H₂, N₂, O₂ was performed by various commercial laboratories, using various makes and models of analyzers. The estimated mg/kg value and uncertainty values reported are the result of Hierarchical Bayesian statistical analysis of results.

STATISTICAL ANALYST: 

TITLE: Owner