



Certificate of Analysis

Certified Reference Material

WHRM-TJa

ISSUE DATE: July 01, 2017

REVISION DATE: July 01, 2017

INTENDED USE: This Certified Reference Material (CRM) is intended primarily for use as a calibrant for calibrating instruments used to determine the hydrogen content in titanium alloys.

MINIMUM SAMPLE SIZE: To relate analytical determinations to the assigned values on this Certificate of Analysis, a minimum sample quantity of 0.2 g is recommended.

DESCRIPTION OF THE MATERIAL: 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 (mg/kg)	Expanded Uncertainty (mg/kg)
Hydrogen (H)	127.0	3.6

CERTIFIED MASS FRACTION VALUE: The certified mass fraction value listed above is the best estimate of the true value based on statistical evaluations of data provided in-house at White Horse Reference Materials (WHRM) using an interstitial gas fusion analyzer with thermal conductivity detection technology and Cold Neutron Prompt Gamma Activation Analysis. The expanded uncertainty expresses contributions from the recognized sources of uncertainty, including differences between analytical methods, differences among samples, dispersion of values resulting from sample preparation and replicated measurement, preparation and measurement of calibrants, analytical calibration functions, assay of primary materials, and calibration for instrumentation mass measurement.

METROLOGICAL TRACEABILITY: The certified value is metrologically traceable to the SI unit of mass, expressed as milligrams per kilogram. The estimate comes from fitting a statistical model to the measurements made directly on the WHRM-TJa material using two test methods as well as quality control measurements made on NMI reference materials

PERIOD OF VALIDITY: The certification of **WHRM-TJa** is valid, within the measurement uncertainty specified, until **July 01, 2032**, provided the CRM is handled and stored in accordance with the instructions given in this certificate (see "Instructions for Handling and Use"). The certification is nullified if the CRM is damaged, contaminated, or otherwise modified.

MAINTENANCE OF CRM CERTIFICATION: WHRM will monitor this CRM over the period of its certification. If substantive technical changes occur that affect the certification before the expiration of certification, WHRM will notify the purchaser. Registration (see attached sheet or register online) will facilitate notification.

INSTRUCTIONS FOR HANDLING AND USE: The material does not require preparation prior to weighing, if stored as outlined per instructions given in this certificate (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 with moisture or hydrocarbon compounds.

PREPARATION AND ANALYSIS: The material for WHRM-TJa was obtained in the form of pins prepared by White Horse Technical Services (WHTS) using a proprietary process based on a process developed by NIST for the development of SRMs 2452, 2453, and 2454. The material was blended and bottled at WHTS. The starting material for preparation of WHRM-TJa was a 6 % Al and 4 % V titanium alloy manufactured in wire form by Perryman Company (Houston, PA).

Homogeneity testing was performed at WHTS using inert gas fusion with thermal conductivity detection following ASTM E1447 Standard Test Method for Determination of Hydrogen in Titanium and Titanium Alloys by the Inert Gas Fusion Thermal Conductivity/Infrared Detection Method. Material heterogeneity was low and fit for the purpose of value assignment with the standard deviation of a single determination equal to 1.2 mg/kg H based on samples consisting of two pins each.

Quantitative analyses of the material for WHRM-TJa was performed at White Horse Reference Materials using inert gas fusion with thermal conductivity detection and gas dosing calibration. As required by ASTM E1447, each sample consisted of two pins for a mass per sample of approximately 0.2 g. Additional quantitative analyses of the material for WHRM-TJa was performed by a subcontractor using Cold Neutron Prompt Gamma Activation Analysis (PGAA) with each sample consisting of three pins for a mass per sample of approximately 0.3 g.

10902 Grand Avenue Suite K, Temple City, CA 91780 • (626) 840-9004 • Sales@WH-RM.com WHRM Doc. COA-TJa-42917

CERTIFIED BY: 

TITLE: Owner