National Institute of Advanced Industrial Science and Technology

National Metrology Institute of Japan

Reference Material Certificate

NMIJ CRM 5401-a
No. +++

Cyclohexane for Thermal Analysis

This certified reference material (CRM) was produced in accordance with the NMIJ's management system and is in compliance with ISO 17034 and ISO/IEC 17025. This CRM is intended for use in the calibration, quality control and validation of thermal analyzers such as differential scanning calorimeters and differential thermal analyzers.

Certified Values

The certified values are solid-solid phase transition temperature, melting point, enthalpies of solid-solid phase transition and fusion, given in the table below. The uncertainty of the certified value is the half-width of the expanded uncertainty interval calculated using a coverage factor (k) of 2, which gives a level of confidence of approximately 95 %.

Substance	CAS No.	Property	Certified Value	Expanded Uncertainty
Cyclohexane	110-82-7	Solid-solid Phase Transition Temperature	186.18 K	0.06 K
		Melting Point	279.86 K	0.07 K
		Solid-solid Phase Transition Enthalpy	80.2 J/g	1.2 J/g
		Fusion Enthalpy	31.9 J/g	1.0 J/g

Analysis

The certified values were determined by using adiabatic calorimeters. The combined standard uncertainties were estimated by the combination of standard uncertainties due to measurements, homogeneity tests and stability tests.

Metrological Traceability

Each certified value was determined by the adiabatic calorimetry and is traceable to the International System of Units (SI). Temperature (platinum resistance thermometer), voltage (digital multi-meter), resistance (standard resistor) and heating duration (universal counter) of adiabatic calorimeters were calibrated and they were traceable to the SI.

Expiration of Certification

This certificate valid for one year from the date of shipment, provided that the material remains unopened and is stored in accordance with the instructions given in this certificate.

Sample Form

This CRM is in the form of a colorless and clear liquid at room temperature. This CRM of ca. 1.5 mL in net volume is kept in an amber glass ampule with nitrogen gas.

Homogeneity

Ten groups of ampules were sampled from 2000 subdivided ampoules with almost same intervals in order of subdivision for a homogeneity test by adiabatic calorimetry. The property values of more than eight groups were measured and uncertainties of

homogeneities were estimated from the results. The homogeneities are reflected in the uncertainty of the certified values.

Instructions for Storage

This CRM should be stored at a temperature between 5 ˚C and 35 ˚C and shielded from light.

Instructions for Use

This CRM is for laboratory use only. The CRM should be used promptly once the ampule is opened. The CRM must be sealed in a sample pan when use.

Precautions for Handling

This CRM should be kept away from heat and ignition sources. Breathing vapor should be avoided. This CRM should be used only with adequate ventilation. Wear protective equipment such as safety glasses, safety mask and safety gloves in handling. Refer to the safety data sheet (SDS) on this CRM before use.

Preparation

This CRM was purified and subdivided by WAKO Pure Chemical industries, Ltd. This CRM was purified by recrystallization and distillation. Purified cyclohexane (1.5 mL each) was filled into 2000 of amber glass ampoules and sealed in nitrogen atmosphere.

Technical Information

Purity (amount-of-substance fraction) was measured by a freezing point depression method with an adiabatic calorimeter and was estimated to be more than 0.9999 mol/mol at the time of certification.

NMIJ Analysts

The technical manager for this CRM is KATO K. The production manager is SHIMIZU Y. The analysts are SHIMIZU Y. and OHTE Y.

Collaborator

This CRM is produced by WAKO Pure Chemical industries, Ltd.

Information

If substantive technical changes occur that affect the certification before the expiration of this certificate, NMIJ will notify the registered customer. Customer registration on the NMIJ Website (given below) will facilitate notification. Technical reports regarding this CRM can be obtained from the contact details given below.

Reproduction of Certificate

In reproducing this certificate, it should be clearly indicated that the document is a copy.

April 1, 2020

ISHIMURA Kazuhiko
President
National Institute of Advanced Industrial Science and Technology

If you have any questions about this CRM, please contact:
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National Metrology Institute of Japan,
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Revision History
December 20, 2013: The expiration of this certificate was changed from “Mar 31, 2015” to “Mar 31, 2021.”
April 1, 2015: “Metrology Management Center” was renamed to “Center for Quality Management of Metrology.”
March 19, 2020 The description in "Expiration in Certification" was changed to "one year from the date of shipment."