

National Institute of Advanced Industrial Science and Technology

## National Metrology Institute of Japan



## Reference Material Certificate

NMIJ CRM 4021-a  
No. +++

Ethylbenzene

This certified reference material (CRM) is produced in accordance with the NMIJ's management system and is in compliance with ISO 17034 and ISO/IEC 17025. This CRM is primarily intended for use in calibrating analytical instruments. It is also intended for quality control of analytical instruments, and validation of analytical techniques and instruments.

**Certified Value**

The certified value is purity (amount-of-substance fraction), 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 %.

	CAS No.	Certified Value, Amount-of-Substance Fraction (mol/mol)	Expanded Uncertainty, Amount-of-Substance Fraction (mol/mol)
Ethylbenzene	100-41-4	0.9988	0.0020

**Analysis**

The certified value was determined by the freezing point depression method with a differential scanning calorimeter (DSC) by using stepwise scan method. The combined standard uncertainty was estimated by the combination of standard uncertainties due to purity determination, homogeneity test and stability test.

**Metrological Traceability**

The calibration of temperature of the DSC was performed with NIST SRM 1745 (indium) and NIST SRM 2225 (mercury). The calibration of enthalpy of the DSC was performed with NIST SRM 2225 (mercury). The certified value is determined by the freezing point depression method with the DSC and is traceable to the International System of Units (SI).

**Indicative Value**

Purity in the mass fraction is given in the table below. It was obtained by converting the purity in the amount-of-substance fraction using the average molecular weight of impurities. The uncertainty of the indicative 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 %.

	CAS No.	Indicative value, Mass fraction (kg/kg)	Expanded uncertainty Mass fraction (kg/kg)
Ethylbenzene	100-41-4	0.9991	0.0016

**Mutual Recognition Arrangement under Meter Convention**

This certificate is consistent with the calibration and measurement capabilities (CMCs) that are included in Appendix C of the Mutual Recognition Arrangement (MRA) drawn up by the International Committee for Weights and Measures (CIPM). Under the MRA, all participating institutes recognize the validity of each other's calibration and measurement certificates for the quantities, ranges and measurement uncertainties specified in Appendix C (as for Appendix C of MRA, see <http://kcdb.bipm.org/AppendixC/default.asp>).

**Expiration of Certification**

This certificate is 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 15 mL in net volume is kept in an amber glass ampoule with argon gas.

**Homogeneity**

One ampoule for every 50 ampoules in order of subdivision was sampled. Area percentage of ethylbenzene by gas chromatography and water content by Karl-Fischer titration were measured and evaluated as homogeneity tests for the sampled ampoules. Homogeneity of this CRM was confirmed from the results that the variation of purity (amount-of-substance fraction) between the ampoules was small compared to the uncertainty of purity determination.

**Instructions for Storage**

This CRM should be stored at a temperature between -15 °C and -25 °C in clean place and shielded from light.

**Instructions for Use**

This CRM is for laboratory use only. The ampoules of this CRM should be allowed to warm to room temperature before opening. This CRM should be used promptly once the ampoule is opened.

**Precautions for Handling**

Keep away from heat and ignition sources. 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 KANTO CHEMICAL CO., INC. This CRM was purified by distillation and drying. Fifteen mL each of ethylbenzene was filled into an amber glass ampoule in argon atmosphere.

**Technical Information**

This CRM contains *p*-xylene and *m*-xylene as impurities. The mass fraction of *p*-xylene and *m*-xylene determined by gas chromatography were 52 mg/g and 19 mg/g, respectively at the time of certification.

**NMIJ Analysts**

The technical manager for this CRM is NOMURA A. The production manager is IHARA T. and the analysts are SHIMIZU Y., OHTE Y., KITAMAKI Y., BAO X., YOSHIMURA E. and FUJIKI N.

**Collaborator**

Impurity analysis and stability tests until 2005 were performed by National Institute of Technology and Evaluation.

**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

March 17, 2005: The expiration of this certificate was changed to "March 31, 2010" from "March 31, 2005".  
December 08, 2009: The expiration of this certificate was changed to "March 31, 2020" from "March 31, 2010".  
April 1, 2015: "Metrology Management Center" was renamed to "Center for Quality Management of Metrology."  
November 16, 2018: Expanded uncertainty of certified value was changed.  
The description on "Indicative Value" and "Mutual Recognition Arrangement under Meter Convention" were added  
The descriptions in "Analysis," "Instructions for storage" and "Technical Information" were changed.  
The description in "Expiration of Certification" was changed to "one year from the date of shipment."