Date of Shipment: Xxxxxx XX, 20XX

National Institute of Advanced Industrial Science and Technology

National Metrology Institute of Japan

Reference Material Certificate

NMIJ CRM 4040-b
No. +++

Acrylonitrile

This certified reference material (CRM) was produced in accordance with the NMIJ’s management system and in compliance with ISO GUIDE 34:2009 and ISO/IEC 17025:2005. This CRM is intended for use in the calibration of analytical instruments, quality control of analytical instruments, and validation of analytical techniques and instruments.

Certified Value

The certified value is purity in the mass 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%.

<table>
<thead>
<tr>
<th>Substance</th>
<th>CAS No.</th>
<th>Certified Value, Mass Fraction (kg/kg)</th>
<th>Expanded Uncertainty, Mass Fraction (kg/kg)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Acrylonitrile</td>
<td>107-13-1</td>
<td>0.9997</td>
<td>0.0010</td>
</tr>
</tbody>
</table>

Analysis

The certified values of this CRM were weighted means of the results of the following analytical method:

1. Freezing point depression method by differential scanning calorimeter (DSC).
2. A subtracting method which is complying with requirement described in the ISO GUIDE 35:2006: concentrations of impurities were determined by gas chromatograph with flame ionization detector (GC-FID), Karl-Fischer titrator (KF), and weighing of residue after evaporation.

The expanded uncertainty in the certified value is equal to $U = k u_c$, where $u_c$ is the combined standard uncertainty derived from the concentrations of impurities, between-method variance, homogeneity, long-term stability, with coverage factor ($k = 2$) corresponding to an approximately 95 % confidence interval.

Metrological Traceability

GC-FID was calibrated using NMIJ’s primary reference solutions prepared by the gravimetric blending method. Concentration of water which is one of the impurities was determined by KF. NMIJ CRM 5401-a which is traceable to the International System of Units (SI), was used for calibration of the DSC.

Indicative value

Benzene was determined by GC-FID, the indicative value is given in the table below. 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%.

<table>
<thead>
<tr>
<th>Substance</th>
<th>CAS No.</th>
<th>Indicative value, Mass fraction (mg/kg)</th>
<th>Expanded uncertainty Mass fraction (mg/kg)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Benzene</td>
<td>71-43-2</td>
<td>9.2</td>
<td>0.2</td>
</tr>
</tbody>
</table>

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 ca. 15 mL in net volume is kept in an amber glass ampule with argon gas.

Homogeneity
The homogeneity of this CRM is determined by measuring of ten ampules using GC-FID and KF. The homogeneity is reflected in the uncertainty of the certified value.

Instructions for Storage
This CRM should be stored in a cold (−20 °C) and dark place.

Instructions for Use
This CRM is for laboratory use only. The ampule of this CRM should be allowed to warm to room temperature before use, and then shaken well. Pay attention to avoid contamination with water from air. This CRM should be used promptly once the ampule is opened.

Precautions for Handling
Keep away from heat and ignition sources. Wear personal protective equipment such as safety glasses, safety mask and safety gloves when handling. Refer to the safety data sheet (SDS) on this CRM before use.

Preparation
This CRM is purified and packed by KANTO CHEMICAL CO., INC. Commercially high purity acrylonitrile was distilled and then 15 mL of this distilled acrylonitrile is separated into an amber glass ampule and sealed by melting for 200 ampules. All procedures were done in an argon atmosphere.

Technical Information
This CRM contains trace amount of water and 4-methoxyphenol as a stabilizer. This value at the time of the certification are not certified but are provided for information.

NMIJ Analysts
The technical manager for this CRM is K. Kato. A responsibility for production is T. Watanabe. Analysts for production are Y. Kitanaki, Y. Shimizu, T. Watanabe, Y. Ohno, K. Kato, and X. Bao.

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, 2015

Ryoji Chubachi
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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Phone: +81-29-861-4059; Fax: +81-29-861-4009, https://www.nmij.jp/english/service/C/

Revision history
September 11, 2014: The description in “Expiration of Certification” was changed to “one year from the date of shipment.”
April 1, 2015: “Metrology Management Center” was renamed to “Center for Quality Management of Metrology.”