National Institute of Advanced Industrial Science and Technology
National Metrology Institute of Japan

Reference Material Certificate
NMIJ CRM 4052-c01

Propane

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 instruments.

Certified Value
The certified value for propane in this CRM is given in the table below. The quoted uncertainty 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, Amount-of-substance fraction (mol/mol)</th>
<th>Expanded uncertainty, Amount-of-substance fraction (mol/mol)</th>
<th>Cylinder Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>Propane</td>
<td>74-98-6</td>
<td>0.9995</td>
<td>0.0005</td>
<td>GAJ69114</td>
</tr>
</tbody>
</table>

Analysis
The certified value was determined by the subtracting method which complied with requirement described in the ISO 6142-1:2015. Impurities in this CRM were determined by a gas chromatograph with a thermal conductivity detector (GC-TCD), gas chromatograph with a flame ionization detector (GC-FID), and a capacitance type hygrometer.

<table>
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<tr>
<th>Impurities</th>
<th>Analytical Instruments</th>
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<tbody>
<tr>
<td>Nitrogen</td>
<td>Gas chromatograph with thermal conductivity detector (GC-TCD)</td>
</tr>
<tr>
<td>Oxygen</td>
<td>Gas chromatograph with thermal conductivity detector (GC-TCD)</td>
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<tr>
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<td>Water</td>
<td>Capacitance type hygrometer</td>
</tr>
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Metrological Traceability
The gas chromatographs were calibrated using NMIJ’s primary reference gases prepared by the gravimetric method. The capacitance type hygrometer was calibrated using a reference dew point meter which is traceable to the International System of Units (SI). Therefore the certified value is traceable to the SI.

Mutual Recognition Arrangement under Meter Convention
The certified value 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...
Expiration of Certification
This certificate is valid for one year from the date of shipment, provided that the material is stored in accordance with the instructions given in this certificate.

Sample Form
This CRM is supplied in a manganese steel cylinder with an inner volume of approximately 4.8 L. Specification of the outlet of the cylinder is W22.5-14threads left female.

Instructions for Storage
This CRM should be stored in compliance with regulations of high pressure gas and so on. The CRM should not be exposed to direct sunlight. The CRM should be kept temperature below 40 °C and stored at a place with good ventilation. The CRM should be fastened with chain to avoid it from falling down. Since propane is flammable, open flames and other source of ignition should not be permitted near the CRM. The CRM should be taken care to leaks.

Instructions for Use
We recommend sufficient substitution of residual gas in a regulator, valves, piping, measuring instruments, and so on with this CRM before use. To avoid contamination, we recommend checking leakage from the joints of piping. Do not elute this CRM as liquid phase. The certification is not valid if the CRM is used as liquid. To avoid change in purity, do not use the CRM below 0.2 kg of residual amount. It is desirable that this CRM is used at 19 °C to 28 °C.

Precaution for Handling
Wear a protective equipment during handling. Open flames should not be permitted near this CRM. The CRM should be used at a place with good ventilation. Refer to the safety data sheet (SDS) on the CRM before use.

Preparation
This CRM is a commercially available high-purity propane gas whose certified value was determined by NMIJ.

NMIJ Analysts
The technical manager for this CRM is T. Shimosaka, the production manager is T. Watanabe, and the analysts are T. Watanabe, N. Matsumoto, and K. Takada.

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.

June 21, 2017
Ryoji Chubachi
President
National Institute of Advanced Industrial Science and Technology
If you have any questions about this CRM, please contact:
National Institute of Advanced Industrial Science and Technology,
National Metrology Institute of Japan,
Center for Quality Management of Metrology, Reference Materials Office,
1-1-1 Umezono, Tsukuba, Ibaraki 305-8563, Japan
Phone: +81-29-861-4059; Fax: +81-29-861-4009, https://www.nmij.jp/english/service/C/
Date of Shipment: Xxxxxx XX, 20XX

National Institute of Advanced Industrial Science and Technology

National Metrology Institute of Japan

Reference Material Certificate

NMIJ CRM 4052-c02

Propane

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 instruments.

Certified Value

The certified value for propane in this CRM is given in the table below. The quoted uncertainty 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>CAS No.</th>
<th>Certified value, Amount-of-substance fraction (mol/mol)</th>
<th>Expanded uncertainty, Amount-of-substance fraction (mol/mol)</th>
<th>Cylinder Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>Propane</td>
<td>74-98-6</td>
<td>0.9995</td>
<td>0.0005</td>
</tr>
</tbody>
</table>

Analysis

The certified value was determined by the subtracting method which complied with requirement described in the ISO 6142-1:2015. Impurities in this CRM were determined by a gas chromatograph with a thermal conductivity detector (GC-TCD), gas chromatograph with a flame ionization detector (GC-FID), and a capacitance type hygrometer.

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<th>Impurities</th>
<th>Analytical Instruments</th>
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<td>Gas chromatograph with thermal conductivity detector (GC-TCD)</td>
</tr>
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Metrological Traceability

The gas chromatographs were calibrated using NMIJ’s primary reference gases prepared by the gravimetric method. The capacitance type hygrometer was calibrated using a reference dew point meter which is traceable to the International System of Units (SI). Therefore the certified value is traceable to the SI.

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Wear a protective equipment during handling. Open flames should not be permitted near this CRM. The CRM should be used at a place with good ventilation. Refer to the safety data sheet (SDS) on the CRM before use.

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Phone: +81-29-861-4059; Fax: +81-29-861-4009, https://www.nmij.jp/english/service/C/
This certified reference material (CRM) was produced in accordance with the NMJ’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 instruments.

**Certified Value**
The certified value for propane in this CRM is given in the table below. The quoted uncertainty 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%.

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<tr>
<td>Propane</td>
<td>0.9995</td>
<td>0.0005</td>
<td>GAJ75034</td>
</tr>
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</table>

**Analysis**
The certified value was determined by the subtracting method which complied with requirement described in the ISO 6142-1:2015. Impurities in this CRM were determined by a gas chromatograph with a thermal conductivity detector (GC-TCD), gas chromatograph with a flame ionization detector (GC-FID), and a capacitance type hygrometer.

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<td>74-98-6</td>
<td>0.9995</td>
<td>0.0005</td>
<td>GAJ76432</td>
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Date of Shipment: Xxxxxx XX, 20XX

http://kcdb.bipm.org/AppendixC/default.asp).

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