Date of Shipment: Xxxxx xx, 20XX

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

Reference Material Certificate
NMIJ CRM 4051-c01

Methane

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.

Certified Value
The certified value for methane 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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<td>Methane</td>
<td>74-82-8</td>
<td>0.999999</td>
<td>0.000018</td>
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</table>

Analysis
The certified value was determined by the subtracting method which complied with requirement described in the ISO 6142:2001. Impurities in this CRM were determined by a gas chromatograph with a photoionization detector (GC-PID), gas chromatograph with a flame ionization detector (GC-FID), and a dew-point hygrometer.

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Metrological Traceability
The gas chromatographs were calibrated using NMIJ’s primary reference gases prepared by the gravimetric method. The dew-point 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 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 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 10 L. Specification of the outlet of the cylinder is W22-14 threads left male. Pressure of methane in the cylinder is above 8.5 MPa at the time of shipment.

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 ethane 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. It is desirable that this CRM is used at room temperature (19 °C to 28 °C), because the certified value is based on the analysis at about 24 °C. When pressure of this CRM is less than 1.5 MPa, the usage of the CRM should be stopped.

Precautions 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 methane gas which was supplied and filled by Tokyo Gas Chemicals Co., Ltd.

NMIJ Analysts
The technical manager for this CRM is T. Shimosaka. A responsibility for the production is T. Watanabe. Analyst for the production is T. Watanabe.

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:
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/

Revision history
April 1, 2015: “Metrology Management Center” was renamed to “Center for Quality Management of Metrology.”
June 21, 2017: The description in “Expiration of Certification” was changed to “one year after the date of shipment.”
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National Institute of Advanced Industrial Science and Technology

National Metrology Institute of Japan

Reference Material Certificate
NMIJ CRM 4051-c02

Methane

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.

Certified Value

The certified value for methane 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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<td>Methane</td>
<td>74-82-8</td>
<td>0.999999</td>
<td>5J-47581</td>
</tr>
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Analysis

The certified value was determined by the subtracting method which complied with requirement described in the ISO 6142:2001. Impurities in this CRM were determined by a gas chromatograph with a photoionization detector (GC-PID), gas chromatograph with a flame ionization detector (GC-FID), and a dew-point hygrometer.

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Metrological Traceability

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Precautions for Handling
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Preparation
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NMIJ Analysts
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National Institute of Advanced Industrial Science and Technology

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Reference Material Certificate
NMIJ CRM 4051-c03

Methane

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.

Certified Value
The certified value for methane 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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<td>Methane</td>
<td>74-82-8</td>
<td>0.999999</td>
<td>3BIS-83184</td>
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Analysis
The certified value was determined by the subtracting method which complied with requirement described in the ISO 6142:2001. Impurities in this CRM were determined by a gas chromatograph with a photoionization detector (GC-PID), gas chromatograph with a flame ionization detector (GC-FID), and a dew-point hygrometer.

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Metrological Traceability
The gas chromatographs were calibrated using NMIJ’s primary reference gases prepared by the gravimetric method. The dew-point 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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Sample Form
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Preparation
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NMIJ Analysts
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Date of Shipment: Xxxxx xx, 20XX

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

Reference Material Certificate
NMIJ CRM 4051-c04

Methane

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.

Certified Value
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The technical manager for this CRM is T. Shimosaka. A responsibility for the production is T. Watanabe. Analyst for the production is T. Watanabe.

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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:
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/

Revision history
April 1, 2015: “Metrology Management Center” was renamed to “Center for Quality Management of Metrology.”
June 21, 2017: The description in “Expiration of Certification” was changed to “one year after the date of shipment.”
Terms “Precautions for Storage” and “Instructions for Use” of the old version were revised and re-edited to terms “Instructions for Storage”, “Instructions for Use”, and “Precautions for Handling.”
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 analytical instruments.

**Certified Value**
The certified value for methane 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></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Methane</td>
<td>74-82-8</td>
<td>0.999999</td>
<td>3BIS-83187</td>
</tr>
</tbody>
</table>

**Analysis**
The certified value was determined by the subtracting method which complied with requirement described in the ISO 6142:2001. Impurities in this CRM were determined by a gas chromatograph with a photoionization detector (GC-PID), gas chromatograph with a flame ionization detector (GC-FID), and a dew-point hygrometer.

<table>
<thead>
<tr>
<th>Impurities</th>
<th>Analytical Instruments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nitrogen</td>
<td>Gas chromatograph with photoionization detector (GC-PID)</td>
</tr>
<tr>
<td>Oxygen</td>
<td>Gas chromatograph with photoionization detector (GC-PID)</td>
</tr>
<tr>
<td>Argon</td>
<td>Gas chromatograph with photoionization detector (GC-PID)</td>
</tr>
<tr>
<td>Hydrogen</td>
<td>Gas chromatograph with photoionization detector (GC-PID)</td>
</tr>
<tr>
<td>Carbon monoxide</td>
<td>Gas chromatograph with photoionization detector (GC-PID)</td>
</tr>
<tr>
<td>Carbon dioxide</td>
<td>Gas chromatograph with photoionization detector (GC-PID)</td>
</tr>
<tr>
<td>Ethane</td>
<td>Gas chromatograph with flame ionization detector (GC-FID)</td>
</tr>
<tr>
<td>Water</td>
<td>Dew-point hygrometer</td>
</tr>
</tbody>
</table>

**Metrological Traceability**
The gas chromatographs were calibrated using NMJ’s primary reference gases prepared by the gravimetric method. The dew-point 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 http://kcdb.bipm.org/AppendixC/default.asp).
Date of Shipment: Xxxxx xx, 20XX

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 10 L. Specification of the outlet of the cylinder is W22-14threads left male. Pressure of methane in the cylinder is above 8.5 MPa at the time of shipment.

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 ethane 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. It is desirable that this CRM is used at room temperature (19 °C to 28 °C), because the certified value is based on the analysis at about 24 °C. When pressure of this CRM is less than 1.5 MPa, the usage of the CRM should be stopped.

Precautions 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 methane gas which was supplied and filled by Tokyo Gas Chemicals Co., Ltd.

NMIJ Analysts
The technical manager for this CRM is T. Shimosaka. A responsibility for the production is T. Watanabe. Analyst for the production is T. Watanabe.

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