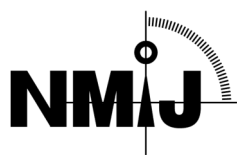


National Institute of Advanced Industrial Science and Technology

National Metrology Institute of Japan



Reference Material Certificate

NMIJ CRM 4064-a00



Ethane

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 intended for use in the calibration of instruments. In addition, it is intended as raw material for preparation of standard gases.

Certified Value

The certified value of this CRM is 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)	Cylinder Number
Ethane	74-84-0	0.9999	0.0001	FVN21566

Analysis

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

Impurities	Analytical Instruments
Nitrogen	Gas chromatograph with thermal conductivity detector (GC-TCD)
Oxygen	Gas chromatograph with thermal conductivity detector (GC-TCD)
Carbon dioxide	Gas chromatograph with thermal conductivity detector (GC-TCD)
Methane	Gas chromatograph with flame ionization detector (GC-FID)
Ethene (Ethylene)	Gas chromatograph with flame ionization detector (GC-FID)
Propane	Gas chromatograph with flame ionization detector (GC-FID)
Propene (Propylene)	Gas chromatograph with flame ionization detector (GC-FID)
Butane	Gas chromatograph with flame ionization detector (GC-FID)
Water	Capacitance type hygrometer

Metrological Traceability

The gas chromatographs were calibrated using NMIJ reference gases prepared by the gravimetric method in accordance with ISO 6142-1:2015. The capacitance-type hygrometer was calibrated using a reference dew point meter traceable to the International System of Units (SI). Therefore, the certified value is traceable to the SI.

Expiration of Certification

This certificate is valid for one year from the date of shipment, provided that this CRM 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 3 L. Specification of the outlet of the cylinder is W22-14threads left male. The amount of ethane in the cylinder was approximately 0.5 kg when this CRM was certified.

Instructions for Storage

This CRM should be stored in compliance with high pressure gas regulations and other relevant laws. The CRM should not be exposed to sunlight and should be stored at 40 °C or less and in well-ventilated area. The CRM should be secured with a chain to prevent it falling. As ethane is flammable, open flames or other ignition source should not be permitted near this CRM. Care should be taken to ensure that there are no ethane leaks. Refer to the safety data sheet (SDS) on this CRM for storage.

Instructions for Use

To avoid change in purity, do not use this CRM when residual amount is below 0.2 kg. This CRM should be used at 19 °C to 28 °C. Since the concentration of impurities may change due to a sudden temperature change, it should be placed for enough time at a use environment. We recommend sufficient substitution of residual gas in regulators, valves, piping, measuring instruments, and other apparatus with this CRM before use. Operation for purge should be carried out using this CRM of 1.6 L or more. To avoid contamination, we recommend checking pipe joints for leaks. Do not elute this CRM in the liquid phase. The certification is not valid if this CRM is used as a liquid.

Precautions for Handling

This CRM should be handled in compliance with high pressure gas regulations and other relevant laws. This CRM is a simple asphyxiant that should only be handled in well-ventilated areas. Wear protective equipment when handling this CRM. As ethane is flammable, open flames or other ignition source should not be permitted near this CRM. Care should be taken to ensure that there are no ethane leaks. This CRM should be returned to Center for Quality Management of Metrology of AIST after use or after the expiry date. Refer to the SDS on this CRM before use.

Preparation

Ethane purification and filling the cylinder with ethane were conducted by Takachiho Chemical Industrial Co., Ltd.

NMIJ Analysts

The technical manager for this CRM is SHIMOSAKA T., the production manager is WATANABE T., and the analysts are WATANABE T., MATSUMOTO N., and TAKADA K.

Information

If substantive technical changes occur that affect the certification before the expiration of this certificate, NMIJ will notify the registered customers. 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:
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://unit.aist.go.jp/nmij/english/refmate/>

Sample

National Institute of Advanced Industrial Science and Technology

National Metrology Institute of Japan



Reference Material Certificate

NMIJ CRM 4064-a01



Ethane

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 intended for use in the calibration of instruments. In addition, it is intended as raw material for preparation of standard gases.

Certified Value

The certified value of this CRM is 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)	Cylinder Number
Ethane	74-84-0	0.9999	0.0001	FVN55969

Analysis

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

Impurities	Analytical Instruments
Nitrogen	Gas chromatograph with thermal conductivity detector (GC-TCD)
Oxygen	Gas chromatograph with thermal conductivity detector (GC-TCD)
Carbon dioxide	Gas chromatograph with thermal conductivity detector (GC-TCD)
Methane	Gas chromatograph with flame ionization detector (GC-FID)
Ethene (Ethylene)	Gas chromatograph with flame ionization detector (GC-FID)
Propane	Gas chromatograph with flame ionization detector (GC-FID)
Propene (Propylene)	Gas chromatograph with flame ionization detector (GC-FID)
Butane	Gas chromatograph with flame ionization detector (GC-FID)
Water	Capacitance type hygrometer

Metrological Traceability

The gas chromatographs were calibrated using NMIJ reference gases prepared by the gravimetric method in accordance with ISO 6142-1:2015. The capacitance-type hygrometer was calibrated using a reference dew point meter traceable to the International System of Units (SI). Therefore, the certified value is traceable to the SI.

Expiration of Certification

This certificate is valid for one year from the date of shipment, provided that this CRM 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 3 L. Specification of the outlet of the cylinder is W22-14threads left male. The amount of ethane in the cylinder was approximately 0.5 kg when this CRM was certified.

Instructions for Storage

This CRM should be stored in compliance with high pressure gas regulations and other relevant laws. The CRM should not be exposed to sunlight and should be stored at 40 °C or less and in well-ventilated area. The CRM should be secured with a chain to prevent it falling. As ethane is flammable, open flames or other ignition source should not be permitted near this CRM. Care should be taken to ensure that there are no ethane leaks. Refer to the safety data sheet (SDS) on this CRM for storage.

Instructions for Use

To avoid change in purity, do not use this CRM when residual amount is below 0.2 kg. This CRM should be used at 19 °C to 28 °C. Since the concentration of impurities may change due to a sudden temperature change, it should be placed for enough time at a use environment. We recommend sufficient substitution of residual gas in regulators, valves, piping, measuring instruments, and other apparatus with this CRM before use. Operation for purge should be carried out using this CRM of 1.6 L or more. To avoid contamination, we recommend checking pipe joints for leaks. Do not elute this CRM in the liquid phase. The certification is not valid if this CRM is used as a liquid.

Precautions for Handling

This CRM should be handled in compliance with high pressure gas regulations and other relevant laws. This CRM is a simple asphyxiant that should only be handled in well-ventilated areas. Wear protective equipment when handling this CRM. As ethane is flammable, open flames or other ignition source should not be permitted near this CRM. Care should be taken to ensure that there are no ethane leaks. This CRM should be returned to Center for Quality Management of Metrology of AIST after use or after the expiry date. Refer to the SDS on this CRM before use.

Preparation

Ethane purification and filling the cylinder with ethane were conducted by Takachiho Chemical Industrial Co., Ltd.

NMIJ Analysts

The technical manager for this CRM is SHIMOSAKA T., the production manager is WATANABE T., and the analysts are WATANABE T., MATSUMOTO N., and TAKADA K.

Information

If substantive technical changes occur that affect the certification before the expiration of this certificate, NMIJ will notify the registered customers. 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

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April 1, 2020

ISHIMURA Kazuhiko
President

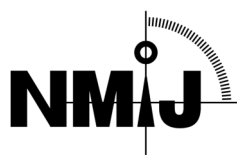
National Institute of Advanced Industrial Science and Technology

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://unit.aist.go.jp/nmij/english/refmate/>

Sample

National Institute of Advanced Industrial Science and Technology

National Metrology Institute of Japan



Reference Material Certificate

NMIJ CRM 4064-a02



Ethane

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 intended for use in the calibration of instruments. In addition, it is intended as raw material for preparation of standard gases.

Certified Value

The certified value of this CRM is 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)	Cylinder Number
Ethane	74-84-0	0.9999	0.0001	FVN55996

Analysis

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

Impurities	Analytical Instruments
Nitrogen	Gas chromatograph with thermal conductivity detector (GC-TCD)
Oxygen	Gas chromatograph with thermal conductivity detector (GC-TCD)
Carbon dioxide	Gas chromatograph with thermal conductivity detector (GC-TCD)
Methane	Gas chromatograph with flame ionization detector (GC-FID)
Ethene (Ethylene)	Gas chromatograph with flame ionization detector (GC-FID)
Propane	Gas chromatograph with flame ionization detector (GC-FID)
Propene (Propylene)	Gas chromatograph with flame ionization detector (GC-FID)
Butane	Gas chromatograph with flame ionization detector (GC-FID)
Water	Capacitance type hygrometer

Metrological Traceability

The gas chromatographs were calibrated using NMIJ reference gases prepared by the gravimetric method in accordance with ISO 6142-1:2015. The capacitance-type hygrometer was calibrated using a reference dew point meter traceable to the International System of Units (SI). Therefore, the certified value is traceable to the SI.

Expiration of Certification

This certificate is valid for one year from the date of shipment, provided that this CRM 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 3 L. Specification of the outlet of the cylinder is W22-14threads left male. The amount of ethane in the cylinder was approximately 0.5 kg when this CRM was certified.

Instructions for Storage

This CRM should be stored in compliance with high pressure gas regulations and other relevant laws. The CRM should not be exposed to sunlight and should be stored at 40 °C or less and in well-ventilated area. The CRM should be secured with a chain to prevent it falling. As ethane is flammable, open flames or other ignition source should not be permitted near this CRM. Care should be taken to ensure that there are no ethane leaks. Refer to the safety data sheet (SDS) on this CRM for storage.

Instructions for Use

To avoid change in purity, do not use this CRM when residual amount is below 0.2 kg. This CRM should be used at 19 °C to 28 °C. Since the concentration of impurities may change due to a sudden temperature change, it should be placed for enough time at a use environment. We recommend sufficient substitution of residual gas in regulators, valves, piping, measuring instruments, and other apparatus with this CRM before use. Operation for purge should be carried out using this CRM of 1.6 L or more. To avoid contamination, we recommend checking pipe joints for leaks. Do not elute this CRM in the liquid phase. The certification is not valid if this CRM is used as a liquid.

Precautions for Handling

This CRM should be handled in compliance with high pressure gas regulations and other relevant laws. This CRM is a simple asphyxiant that should only be handled in well-ventilated areas. Wear protective equipment when handling this CRM. As ethane is flammable, open flames or other ignition source should not be permitted near this CRM. Care should be taken to ensure that there are no ethane leaks. This CRM should be returned to Center for Quality Management of Metrology of AIST after use or after the expiry date. Refer to the SDS on this CRM before use.

Preparation

Ethane purification and filling the cylinder with ethane were conducted by Takachiho Chemical Industrial Co., Ltd.

NMIJ Analysts

The technical manager for this CRM is SHIMOSAKA T., the production manager is WATANABE T., and the analysts are WATANABE T., MATSUMOTO N., and TAKADA K.

Information

If substantive technical changes occur that affect the certification before the expiration of this certificate, NMIJ will notify the registered customers. 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

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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,
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://unit.aist.go.jp/nmij/english/refmate/>

Sample

National Institute of Advanced Industrial Science and Technology

National Metrology Institute of Japan



Reference Material Certificate

NMIJ CRM 4064-a03



Ethane

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 intended for use in the calibration of instruments. In addition, it is intended as raw material for preparation of standard gases.

Certified Value

The certified value of this CRM is 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)	Cylinder Number
Ethane	74-84-0	0.9999	0.0001	FVN56001

Analysis

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

Impurities	Analytical Instruments
Nitrogen	Gas chromatograph with thermal conductivity detector (GC-TCD)
Oxygen	Gas chromatograph with thermal conductivity detector (GC-TCD)
Carbon dioxide	Gas chromatograph with thermal conductivity detector (GC-TCD)
Methane	Gas chromatograph with flame ionization detector (GC-FID)
Ethene (Ethylene)	Gas chromatograph with flame ionization detector (GC-FID)
Propane	Gas chromatograph with flame ionization detector (GC-FID)
Propene (Propylene)	Gas chromatograph with flame ionization detector (GC-FID)
Butane	Gas chromatograph with flame ionization detector (GC-FID)
Water	Capacitance type hygrometer

Metrological Traceability

The gas chromatographs were calibrated using NMIJ reference gases prepared by the gravimetric method in accordance with ISO 6142-1:2015. The capacitance-type hygrometer was calibrated using a reference dew point meter traceable to the International System of Units (SI). Therefore, the certified value is traceable to the SI.

Expiration of Certification

This certificate is valid for one year from the date of shipment, provided that this CRM 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 3 L. Specification of the outlet of the cylinder is W22-14threads left male. The amount of ethane in the cylinder was approximately 0.5 kg when this CRM was certified.

Instructions for Storage

This CRM should be stored in compliance with high pressure gas regulations and other relevant laws. The CRM should not be exposed to sunlight and should be stored at 40 °C or less and in well-ventilated area. The CRM should be secured with a chain to prevent it falling. As ethane is flammable, open flames or other ignition source should not be permitted near this CRM. Care should be taken to ensure that there are no ethane leaks. Refer to the safety data sheet (SDS) on this CRM for storage.

Instructions for Use

To avoid change in purity, do not use this CRM when residual amount is below 0.2 kg. This CRM should be used at 19 °C to 28 °C. Since the concentration of impurities may change due to a sudden temperature change, it should be placed for enough time at a use environment. We recommend sufficient substitution of residual gas in regulators, valves, piping, measuring instruments, and other apparatus with this CRM before use. Operation for purge should be carried out using this CRM of 1.6 L or more. To avoid contamination, we recommend checking pipe joints for leaks. Do not elute this CRM in the liquid phase. The certification is not valid if this CRM is used as a liquid.

Precautions for Handling

This CRM should be handled in compliance with high pressure gas regulations and other relevant laws. This CRM is a simple asphyxiant that should only be handled in well-ventilated areas. Wear protective equipment when handling this CRM. As ethane is flammable, open flames or other ignition source should not be permitted near this CRM. Care should be taken to ensure that there are no ethane leaks. This CRM should be returned to Center for Quality Management of Metrology of AIST after use or after the expiry date. Refer to the SDS on this CRM before use.

Preparation

Ethane purification and filling the cylinder with ethane were conducted by Takachiho Chemical Industrial Co., Ltd.

NMIJ Analysts

The technical manager for this CRM is SHIMOSAKA T., the production manager is WATANABE T., and the analysts are WATANABE T., MATSUMOTO N., and TAKADA K.

Information

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April 1, 2020

ISHIMURA Kazuhiko
President

National Institute of Advanced Industrial Science and Technology

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Sample