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GB/T 4844-2011

Replacing GB 4844.2-1995 and GB/T 4844.3-1995

Pure Helium, High Pure Helium and Ultra Pure Helium

纯氦、高纯氦和超纯氦

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Standardization Administration of the People's Republic of China.

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Foreword

This Standard was drafted in accordance with the rules given in GB/T 1.1-2009.

This Standard replaces GB 4844.2-1995, *Pure Helium* and GB/T 4844.3-1995, *High Purity Helium*. This Standard integrates the content of GB 4844.2-1995 and GB/T 4844.3-1995. Compared with GB 4844.2-1995 and GB/T 4844.3-1995, the major technical changes of this Standard, in addition to editorial changes, are as follows:

-- the application scope is modified and ultra pure helium and liquid helium are added (see Article 1; Article 1 of GB 4844.2-1995 and Article 1 of GB/T 4844.3-1995);

-- the normative references are modified (see Article 2; Article 2 of GB 4844.2-1995 and Article 2 of GB/T 4844-1995);

-- the specifications for pure helium and high pure helium are modified and the specifications for ultra pure helium are added (Table 1; Table 1 of GB 4844.2-1995 and Table 1 of GB/T 4844.3-1995);

-- the test methods are modified (see Article 5; Article 4 of GB 4844.2-1995 and Article 5 of GB/T 4844.3-1995);

-- the technical content of packaging, storage and transportation of products is modified (see Article 6; Article 5 of GB 4844.2-1995 and Article 6 of GB/T 4844.3-1995);

-- the safety warnings about helium are added (see 6.2);

-- the volume conversion coefficient K value of helium at different temperature under the pressure of 16.5 MPa ~ 30.0 MPa (see Table B.2, Table B.3 and Table B.4).

This Standard was proposed by China Petroleum and Chemical Industry Association.

This Standard shall be under the jurisdiction of the National Standardization Technical Committee on Gases (SAC/TC 206).

The drafting organizations of this Part: Southwest Research and Design Institute of Chemical Industry, Chengdu Natural Gas General Plant, Shanghai Huaai Chromatography Co., Ltd., Beijing AP BAIF Gases Industry Co., Ltd., Xi'an Dingyan Technology Co., Ltd.

The main drafters of this Part: Liu Zejun, Fu Yongcheng, Fang Hua, Li Jianhao, Chen Yali, Luo Yuguo, Shi Zhaoqi.

The previous editions of GB 4844.2-1995 are as follows:

-- GB 4844-1984;

Pure Helium, High Pure Helium and Ultra Pure Helium

1 Application Scope

This Standard specifies the specifications, inspection rules, test methods, and product packaging, marking, storage and transportation and safety warnings of gaseous helium and liquid helium.

This Standard applies to pure helium, high pure helium and ultra pure helium which are extracted using the cryogenic method and mainly used for light-guide fibre, laser, welding and cutting, diving breathing, cryogenic superconductor, supercharge, cleaning, protective gas and so on.

Molecular formula: He.

Relative molecular mass: 4.002 602 (according to *2007 International Relative Atomic Masses*).

2 Normative References

The following referenced documents are indispensable for the application of this document. For dated references, only the edition dated applies to this document. For undated references, the latest edition of the referenced documents (including all amendments) applies to this Part.

GB 190, *Packing Symbol of Dangerous Goods*

GB 5099, *Seamless Steel Gas Cylinders*

GB/T 5832.1, *Gas Analysis – Determination of Moisture – Part 1: Electrolytic Method*

GB/T 5832.2, *Gas Analysis – Determination of Moisture – Part 2: Dew Point Method*

GB/T 5832.3, *Determination of Moisture in Gases – Part 3: The Method of Cavity Ring-down Spectroscopy*

GB 7144, *Coloured Cylinder Mark for Gases*

GB 14194, *Rules for Filling of Permanent Gas Cylinders*

JB/T 5905, *Cryogenic Liquid Containers Insulated with Evacuated Multilayer Insulations*

JB 6898, *Storage and Shipping Device for Low Temperature Liquid – Safety Use Manual*

in Annex A to this Standard shall be used as the arbitration method.

5.3 Determination of water content

5.3.1 Determination of water content in pure helium and high pure helium

As specified in GB/T 5832.1 or GB/T 5832.2. In case of any dispute in the test result, the method specified in GB/T 5832.2 shall be used as the arbitration method.

5.3.2 Determination of water content in ultra pure helium

As specified in GB/T 5832.3.

6 Packaging, Marking, Storage and Transportation and Safety Warnings

6.1 Packaging, marking and storage and transportation

6.1.1 The packaging, storage and transportation of helium shall be as specified in *Supervision Regulation on Safety for Gas Cylinder* and *Supervision Regulation on Safety Technology for Stationary Pressure Vessel*.

6.1.2 The gas cylinders for helium shall be as specified in GB 5099; the imported helium cylinders shall conform to the relevant national regulations.

6.1.3 The packing containers of liquid helium shall be as specified in JB/T 5905; the imported helium cylinders shall conform to the relevant national regulations.

6.1.4 The large-volume seamless steel gas cylinders and unit load cylinders shall conform to relevant regulations.

6.1.5 The packing marks of helium shall be as specified in GB 190. The coloured cylinder marks for helium shall be as specified in GB 7144.

6.1.6 The filling of gas cylinders shall be as specified in GB 14194.

6.1.7 The minimum pressure of bottled helium shall not be lower than 97% of the nominal working pressure of gas cylinders at 20°C. The accuracy of pressure gauges used for measurement shall not be lower than grade 1.5. The residual pressure of the helium cylinders returned to factory shall not be lower than 0.2 MPa.

6.1.8 See Annex B for the volume calculation of helium under the conditions of 20°C and 101.3 MPa.

6.1.9 Before the delivery of bottled helium, examine the nozzle and neck of gas cylinders to confirm there is no leakage; put on the cylinder cap and vibration control ring.

A.2.2 Carrier gas: high pure helium or ultra pure helium; its neon content shall be one order of magnitude lower than that specified in Table 1.

A.2.3 Purifier: capable of purifying all component contents in helium carrier gas to one order of magnitude lower than that specified for ultra pure helium in Table 1.

A.2.4 Standard specimen: prepared by using helium as base gas. All component contents in the standard specimen for the analysis of pure helium shall be similar to those specified in Table 1. All component contents (volume fraction) in the standard specimen for the analysis of high pure helium and ultra pure helium are $1 \times 10^{-6} \sim 5 \times 10^{-6}$.

A.3 Determination conditions

A.3.1 Chromatographic columns:

Column 1: used for the separation of neon, hydrogen, oxygen + argon and nitrogen. It is a stainless-steel tube which is about 3 m long and about 3 mm in inner diameter; it contains 5A molecular sieve which is about 1 m long and 0.25 mm ~ 0.40 mm in grain size, and cocoanut active charcoal which is about 2 m long and 0.25 mm ~ 0.40 mm in grain size. The degree of separation of the chromatographic column for all components shall be greater than 1. The use of other equivalent chromatographic columns is allowed.

Column 2: used for the separation of carbon monoxide, carbon dioxide and methane. It is a stainless-steel tube which is about 0.5 m long and about 2 mm in inner diameter; it contains TDX-01 of grain size 0.25 mm ~ 0.40 mm. The use of other equivalent chromatographic columns is allowed.

A.3.2 Operating parameters: all operating parameters of the instruments shall be selected in accordance with the instructions to the instruments and the requirements for detection limits.

A.4 Test procedures

A.4.1 Start the instruments in accordance with their instructions and regulate all operating parameters until the instruments operate normally.

A.4.2 Access standard specimen to the instruments and inject specimen after full replacement to obtain a representative specimen. Repeat specimen injection for 3 times. Measure the chromatographic response values of all components; when the relative deviation of two adjacent values is less than 5%, take their mean value.

A.4.3 Access specimen to be tested to the instruments under the same conditions as those for standard specimen, and inject specimen after full replacement to obtain a representative specimen. Repeat specimen injection for 3 times. Measure the chromatographic response values of all components; when the relative deviation of two adjacent values is less than 5%, take their mean value.

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