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Translated by: www.ChineseStandard.net
Wayne Zheng et al.
Email: Sales@ChineseStandard.net

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GB

National Standard

of the People's Republic of China

GB/T 4842-2006

Replacing GB/T 4842-1995, GB/T 10624-1995

Argon

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Issued on: September 1, 2006 **Implemented on: February 1, 2007**

Issued by: General Administration of Quality Supervision, Inspection and Quarantine;

Standardization Administration Committee.

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Foreword

This Standard replaces GB/T 4842-1995 "Pure argon" and GB/T 10624-1995 "High purity argon".

The main differences between this Standard AND GB/T 4842-1995, GB/T 10624-1995 are as follows:

- MERGE two standards into one;
- MODIFY the scope of high purity argon (Chapter 1 of this Standard, and Chapter 1 of GB/T 10624-1995);
- ADD pallet-loaded, cluster-bottled, and tanker-loaded argon products. And SPECIFY the inspection methods (4.1.3 of this Standard);
- MODIFY the normative references (Chapter 2 of this Standard, Chapter 2 of GB/T 4842-1995, and Chapter 2 of GB/T 10624-1995);
- MODIFY the contents of technical indicators: DELETE superior-class and A-class products of high purity argon. DIVIDE pure argon’s total carbon content into methane, carbon monoxide, and carbon dioxide; high purity argon’s total carbon content is methane + carbon monoxide + carbon dioxide, and it can be determined separately. ADJUST hydrogen, oxygen, nitrogen, and water content. INCLUDE water content in purity calculation (3.4.2 of this Standard, 3.4.1 of GB/T 4842-1995, and 3.4.1 of GB/T 10624-1995);
- MODIFY the sampling methods of pure argon (4.1.2 of this Standard, Chapter 5 of GB/T 10624-1995);
- ADD new analysis method: ADD zirconia gas chromatography method to determine hydrogen, oxygen, methane, and carbon monoxide in argon gases. ADD ion migration gas chromatography method, argon ionization gas chromatography method, and argon discharge ionization gas chromatography method to determine hydrogen, oxygen, nitrogen, methane, carbon monoxide, and carbon dioxide components in argon

gases. ADD other methods for the determination of water. When there occurs a variety of analysis methods, add specified arbitration method (4.3 of this Standard);

- DELETE the method of adopting ion migration gas chromatography method to determine nitrogen in argon gases, in previous standard (4.2 of GB/T 10624-1995);
- ADD safety specifications (5.6 of this Standard);
- ADD the Normative Appendix A. And INCLUDE the methods of adopting ion migration gas chromatography method, argon ionization gas chromatography method, and argon discharge ionization gas chromatography method to determine hydrogen, oxygen, nitrogen, methane, carbon monoxide, and carbon dioxide components in argon gases INTO this Appendix (Appendix A of this Standard).

Appendix A and Appendix B of this Standard are normative.

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

This Standard shall be centralized by the National Standardization Technical Committee of Gases.

Main drafting organizations of this Standard: The Oxygen Co., Ltd. of Wuhan Iron and Steel Group. Kena Science and Technology Development Co., Ltd. of Dalian Institute of Chemical Physics, Chinese Academy of Sciences. Beijing Sys Ruitai Sciences and Technology Co., Ltd. and Southwest Research Institute of Chemical Industry.

Main drafters of this Standard: Chen Wenyu, Wang Guiyue, Zhang Bingxin, and Zhou Pengyun.

The previous versions replaced by this Standard are: GB 4842-1984, GB

4843-1984, GB 10624-1989, GB 10625-1989, GB/T 4842-1995, GB/T 10624-1995.

Argon

1 Scope

This Standard specifies the requirements, test methods, packaging, labeling, storage, and security of pure argon and high purity argon.

This Standard applies to the gaseous and liquid pure argon, and high purity argon extracted from the air and ammonia exhaust by cryogenic method; and pure argon and high purity argon obtained by purification method. They are mainly used in metal smelting and welding, semiconductor manufacturing, electric light, preparation of standard samples, scientific research and other industries.

Molecular formula: Ar.

Relative molecular mass: 39.948 (according to 2001 international relative atomic mass).

2 Normative references

The provisions in following documents become the provisions of this Standard through reference in this Standard. For dated references, the subsequent amendments (excluding corrections) or revisions do not apply to this Standard, however, parties who reach an agreement based on this Standard are encouraged to study if the latest versions of these documents are applicable. For undated references, the latest edition of the referenced document applies.

GB 190-1990 Labels for packages of dangerous goods

GB/T 3723 Sampling of chemical products for industrial use - Safety in sampling

GB 5099 Seamless steel gas cylinders (GB 5099-1994, neq ISO 4705: 1993)

GB/T 5832.1 Determination of moisture in gases - Part 1:Electrolytic method

GB/T 5832.2 Determination of moisture in gases - Part 2: Dew point method

determination results, take the ion migration gas chromatography method as arbitration method.

4.3.5 It is allowed to determine the trace methane, carbon monoxide and carbon dioxide in pure argon and high purity argon according to the methods specified in GB/T 8984.1 or other equivalent methods. It is allowed to determine the total content of trace methane, carbon monoxide, and carbon dioxide in high purity argon according to the methods specified in GB/T 8984.2. When there exists dispute to the above determination results, take the methods specified in GB/T 8984.1 as arbitration method.

4.4 Determination of water content

EXECUTE it according to GB/T 5832.1 or GB/T 5832.2.

It is allowed to use other equivalent methods to determine the water content in argon. When there exists dispute to the determination results, take the methods specified in GB/T 5832.2 as arbitration method.

5 Labeling, packaging, storage, and security

5.1 Argon gas cylinders shall comply with the specifications of GB 5099. And the color and labeling of gas cylinders shall comply with the specifications of GB 7144. When being transported, gas cylinders shall be accompanied by the labels specified in Chapter 3 of GB 190-1990.

5.2 Filling, storage and transportation

5.2.1 Bottled gaseous argon shall comply with the relevant specifications of GB 14194 and "Gas Cylinder Safety Supervision Regulations".

5.2.2 Liquid argon shall comply with the relevant specifications of JB/T 5905, JB/T 6897, JB/T 6898, and "Pressure Vessel Safety Supervision Regulations".

5.2.3 Pipe-transported gaseous argon shall comply with "Pressure Pipe Safety Management and Supervision Regulations".

5.3 The finished product pressure of bottled argon at 20 °C is not less than 13.5 MPa. The precision of pressure gauges used for measurement is not less

$$V = m/1.662 \qquad \cdots\cdots(2)$$

In the formula:

V - Volume of gaseous argon converted from liquid argon. The unit is cubic meter (m^3);

m - Mass of liquid argon. The unit is kilogram (kg);

1.662 - Argon density. The unit is kilogram per cubic meter (kg/m^3).

6.2 Calculation of gaseous argon volume

Calculation of gaseous argon volume refers to Appendix B.

Appendix A

(Normative)

Determination of hydrogen, oxygen, nitrogen, methane, carbon monoxide, and carbon dioxide in argon

A.1 Instruments

USE the gas chromatography that is equipped with ion migration detector, argon ionization detector or argon discharge ionization detector to determine hydrogen, oxygen, nitrogen, methane, carbon monoxide, and carbon dioxide in argon.

A.2 Principle

A.2.1 Principles of ion migration gas chromatography method

USE the argon gases of which the purity (volume fraction) is not less than 99.999 9% as carrier gases. The carrier gases will produce a steady base-current in the detector that contains tritium source. When diatomic-molecule (such as hydrogen, oxygen, nitrogen, etc.) components or multi-atoms (such as carbon monoxide, carbon dioxide, etc.) components in the sample gases enter into the detectors, the free electrons in the detectors have a non-elastic collision with the molecules of these components. The electrons lose energy. And these molecules are converted into the corresponding ions. When the electrons' migration-speed along the direction of anode increasing, the ions' migration-speed along the direction of cathode will increase, too. APPLY a wave voltage between the 2 electrodes of the detector. Within 1 period of the voltage, the electrons just pass through the detector. The more electrons trapped by anode, the more electrons trapped by cathode, then the more base-current produced by trapping electrodes. Within a certain content range, impurity content in sample gases is proportional to the increased amount of the base-current. So this principle can determine the

to calculate results.

USE external standard method to calculate hydrogen, oxygen, nitrogen, methane, carbon monoxide, and carbon dioxide content. CALCULATE according to the formula (A.1):

$$\phi_i = \frac{A_i(h_i)}{A_S(h_S)} \times \phi_S \qquad \text{(A.1)}$$

In the formula:

Φ_i - Content of the components tested in sample gases (volume fraction);

A_i (h_i) - Peak area or peak height of the components tested in sample gases. The unit is square millimeter (mm^2) or millimeter (mm);

A_S (h_S) - Peak area or peak height of the corresponding known components in gas standard samples. The unit is square millimeter (mm^2) or millimeter (mm);

Φ_S - Content of the corresponding known components in gas standard samples (volume fraction).

10	0.108	0.132	0.153	0.158	0.164	0.169	0.175	0.180	0.924
15	0.105	0.128	0.149	0.154	0.159	0.165	0.170	0.175	0.932
20	0.103	0.124	0.145	0.150	0.155	0.161	0.166	0.171	0.940
25	0.101	0.121	0.142	0.147	0.152	0.157	0.162	0.167	0.947
30	0.099	0.119	0.139	0.144	0.149	0.154	0.158	0.163	0.944
35	0.097	0.116	0.136	0.140	0.145	0.150	0.155	0.160	—
40	0.095	0.114	0.133	0.137	0.142	0.147	0.152	0.156	—

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