GB

NATIONAL STANDARD OF THE

PEOPLE'S REPUBLIC OF CHINA

ICS 17.180.99

N 52

GB/T 30431-2013

Gas Chromatograph for Laboratory

实验室气相色谱仪

Issued on: December 31, 2013 **Implemented on: August 01, 2014**

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

Standardization Administration of PRC.

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Gas Chromatograph for Laboratory

1 Scope

This Standard specifies the requirements, test methods, inspection rules, marking, package, transportation and storage of gas chromatograph for laboratory.

This Standard is applicable to the general gas chromatograph for laboratory (hereinafter referred to as “instrument”).

2 Normative References

The following documents are essential to the application of this document. For the dated documents, only the versions with the dates indicated are applicable to this document; for the undated documents, only the latest version (including all the amendments) are applicable to this document.

GB/T 191-2008 Packaging - Pictorial Marking for Handling of Goods (ISO 780:1997, MOD)

GB/T 2829-2002 Sampling Procedures and Tables for Periodic Inspection by Attributes (Apply to Inspection of Process Stability)

GB 4793.1-2007 Safety Requirements for Electrical Equipment for Measurement, Control, and Laboratory Use-Part 1: General Requirements (IEC 61010-1:2001, IDT)

GB/T 11606-2007 Methods of Environmental Test for Analytical Instruments

GB/T 13384-2008 General Specifications for Packing of Mechanical and Electrical Product

GB/T 30430-2013 Standard Column Used for Evaluating Gas Chromatography

3 Abbreviation

The following abbreviations are applicable to this document.

TCD: Thermal Conductivity Detector

4.3.2 Dielectric strength

The 1500V, 50Hz AC voltage shall be subjected to among the power phase, the medium connecting line and casing of the instrument; there is no breakdown or arc-over phenomena for 1min.

4.3.3 Protective grounding

The protection connection impedance of the instrument shall be no greater than 0.1Ω.

4.3.4 Safety protection sign of the instrument

For the instruments equipped with radioactive source detector, there shall have radioactive source safety pattern and sign on the outside; the high-temperature heating zone of the instrument shall have an anti-scald mark.

4.4 Sealing for airway system

4.4.1 Sealing for airway system of carrier gas

Under the condition of room temperature, the pressure drop within 30min is no greater than 0.01MPa under the hydrogen pressure of 0.3MPa.

4.4.2 Sealing for airway system of fuel gas

Under the condition of room temperature, the pressure drop within 30min is no greater than 0.01MPa under the hydrogen pressure of 0.3MPa.

4.4.3 Sealing for airway system of combustion-supporting gas

Under the condition of room temperature, the pressure drop within 30min is no greater than 0.01MPa under the air pressure of 0.3MPa.

4.5 Column heater temperature control system

4.5.1 Temperature control range: 20°C~350°C above the room temperature.

4.5.2 Temperature stability: no greater than 0.5%.

4.5.3 Temperature gradient: no greater than 2.5%.

4.5.4 Minimum adjustment of the setting temperature: no greater than 1°C.

4.5.5 The deviation between the setting temperature and actual temperature shall not exceed ±3%.

4.5.6 Programmed temperature-rise repeatability: no greater than 1%.

20°C; alternating heat and humidity: relative humidity is 95%, and temperature is 55°C; the inclined drop height is 250mm; the number of collisions is 1000 times. After the test, the package box shall not have heavy deformation or damage; the tested instrument shall be free of the mechanical damages such as deformation, loosening, coating peeling, etc.; inspect the instrument under the normal working conditions, it shall meet the requirements of 4.2~4.10.

4.12 Completeness of the instrument

The complete set of the instruments shall include at least the following parts:

a) One host of the gas chromatograph;

b) One set of chromatographic data workstation or one recorder;

c) One set of necessary accessories and spare parts.

5 Test Methods

5.1 Test conditions

5.1.1 Test environmental conditions

See 4.1.

5.1.2 Test equipment and tool

The equipment and tool for instrument test include:

a) Contact current tester;

b) Withstand voltage tester: AC voltage (0~1500) V; frequency 50Hz;

c) Grounding resistance tester;

d) Pressure gauge;

e) Platinum resistance: Pt100(R (0) = 100Ω; W=0.00385);

f) Digital multimeter;

g) Thermometer: temperature resistance 400°C;

h) Stopwatch: the scale value 0.01s;

i) Chromatographic data workstation or recorder;

5.3.2 Dielectric strength

The power plug of the instrument shall not connect to the power grid; connect the high-voltage output line of the withstand voltage tester with the live and neutral lines of the instrument power plug; the low-potential output line (black) is connected to the protective grounding terminal of the instrument power plug. Turn on the power switch of the instrument; turn on the withstand voltage tester to increase the voltage gradually to 1500V; keep for 1min; all parts of the instrument have no breakdown or arc-over phenomena.

5.3.3 Protective grounding

It shall be performed as stipulated in 6.5.1.3 of GB 4793.1-2007.

5.3.4 Safety protection sign of the instrument

Visual inspection.

5.4 Sealing of airway system

5.4.1 Sealing for airway system of carrier gas

Connect the chromatographic column to the detector; block the outlet; connect the pressure gauge to the system; inject the carrier gas (hydrogen) as per the analysis procedure; use the regulating value to make the pressure behind the valve 0.3MPa; shut off the gas source; make system stabilize for 5min; observe the pressure drop after 30min.

5.4.2 Sealing for airway system of fuel gas

Inject the hydrogen from the fuel gas inlet; block its outlet; connect the pressure gauge to the system; use the regulating valve to make the system pressure of 0.3MPa; shut off the gas source; stabilize for 5min; observe the pressure drop after 30min.

5.4.3 Sealing for airway system of combustion-supporting gas

Inject air from the combustion-supporting gas inlet; block its outlet; connect the pressure gauge to the system; use the regulating valve to make the system pressure of 0.3MPa; shut off the gas source; stabilize for 5min; observe the pressure drop after 30min.

5.5 Test and calculation method of column heater

5.5.1 Temperature stability of column heater

Fix the thermometer in the effective space of the column heater. Test at the two temperature points that are 90% of the minimum controllable temperature and

5.6.5.3.1 Test conditions

The sulfur type sample is the parathion-methyl anhydrous ethanol solution with concentrations of 0.5, 5, 25, 50 (ng/μL).

The rest conditions are the same as 5.6.1.

The phosphorus type sample is the parathion-methyl anhydrous ethanol solution with concentrations of 1, 10, 20, 50, 100, 500, 1000 (ng/μL).

The rest conditions are the same as 5.6.1.

5.6.5.3.2 Test methods

The test is divided into sulfur type and phosphorus type; the specific methods are as follows:

a) Sulfur type: After the instrument is stable; inject 1μL of sample; inject sample of each solution for 7 times; separately take the arithmetic mean of peak area of parathion-methyl; draw the relationship curve between the sample-injecting amount of parathion-methyl and peak area; obtain the maximum sample-injecting amount of parathion-methyl allowed to maintain the linear response, i.e. the upper lime of linear range. The ratio between the upper limit sample-injecting amount and minimum detection amount is the linear range of sulfur type.

b) Phosphorus type: After the instrument is stable; inject 1μL of sample; inject sample of each solution for 7 times; separately take the arithmetic mean of peak area of parathion-methyl; draw the relationship curve between the sample-injecting amount of parathion-methyl and peak area; obtain the maximum sample-injecting amount of parathion-methyl allowed to maintain the linear response, i.e. the upper lime of linear range. The ratio between the upper limit sample-injecting amount and minimum detection amount is the linear range of phosphorus type.

5.6.6 Nitrogen Phosphorus Detector (NPD) system

5.6.6.1 Detection limit

Specimen: A 10ng/μL azobenzene-10 ng/μL malathion-isooctane mixed solution.

Set the chromatographic data workstation or recorder on the appropriate range; after the instrument is stable, inject 1μL of sample; continuously inject samples for 7 times; calculate the peak areas of azobenzene and malathion; separately take the arithmetic mean of the peak area; calculate the detection limit of nitrogen as per Formula (10); calculate the detection limit of phosphorus as per Formula (11).

6.3 Type inspection

6.3.1 Type test shall be carried out according to the requirements of 4.2~4.11 in case of one of the following conditions:

a) Plant-transferring production and finalizing of the new and old products;

b) After the formal production, if there are major changes in structure, materials and processes that may affect the product performance;

c) Inspect once every three years for the normally produced products;

d) When the production is resumed after a long-time shutdown;

e) When there is a significant difference between the exit-factory inspection results and the previous type inspection results;

f) When the type inspection is proposed by the national quality supervision department.

6.3.2 The samples for the type inspection shall be randomly selected from the products that have passed the exit-factory inspection.

6.3.3 The type inspection shall be carried out according to the provisions of GB/T 2829-2002; take one-time sampling; the inspection items of the device, unqualified quality level (RQL), determining level (DL) shall be performed as per the provisions of Table 3. The batch quality shall be expressed by the number of unqualified products per hundred units of products.

6.3.4 If the type inspection is unqualified; analyze the causes, find out the questions, and implement the corresponding measures; after improving the device products, repeat the type inspection. If the type inspection fails again, then suspend the production, and devices shall not leave the factory; after the problems are solved; and the type inspection is qualified, then the exit-factory inspection can be resumed.

6.3.5 If the type inspection is qualified, and the exit-factory inspection is also qualified, then the products shall leave the factory or store in the warehouse as the qualified products. If the products leave the factory after storing in the warehouse for 12 months, then the exit-factory inspection shall be repeated.

7 Marking, Package, Transportation and Storage

7.1 Marking of the instrument

The nameplate of the instrument shall be fixed in an appropriate and conspicuous position, it shall contain the following markings:

a) Manufacturer's name and address;

b) Instrument name, model specification;

c) Exit-factory No.;

d) Production date;

e) Technical parameters that must be marked;

f) Other information required by relevant regulations.

7.2 Package

7.2.1 The instrument package shall implement GB/T 13384-2008.

7.2.2 The marking of the package box shall be clear and firm, the contents of which include:

a) Manufacturer's name and address;

b) Instrument name, model specification;

c) Appearance dimension: length × width × height, in mm; gross weight and net weight, in kg;

d) Exit-factory No., package box serial number, quantity and exit-factory date;

e) Package and transportation icon: "fragile items", "upward", "fear of rain", etc., which shall comply with the provisions of GB/T 191-2008.

7.2.3 Random files shall include:

a) Packing list;

b) Product certificate;

c) Instructions for use (the safety requirements shall comply with the provisions of Clause 5 in GB 4793.1-2007);

d) List of spare parts, etc.

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