

ICS 71.100.20

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**NATIONAL STANDARD OF THE
PEOPLE'S REPUBLIC OF CHINA**

GB/T 15909-2017

Replacing GB/T 15909-2009

Gas for electronic industry - Silane

电子工业用气体 硅烷

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1 Scope

GB/T 15909-2017 is the Chinese national standard on gas for electronic industry - silane, in the field of chemical technology. The /T suffix marks it as a recommended standard: it is not compulsory by itself, but it becomes binding as soon as a contract, a tender or a customer specification calls it up - which in practice is how most foreign buyers meet it. It was issued on 31 May 2017 by the General Administration of Quality Supervision, Inspection and Quarantine of the People's Republic of China; Standardization Administration of China, and has been in force since 1 December 2017. Classification: ICS 71.100.20, CCS G86. This page is published from the official record of the standard held by the Chinese standards administration: the identification, the dates, the classification and the issuing body are taken from there. The clause text, the tables and the numeric limits are in the document itself, which is delivered complete in English translation.

This Standard specifies the technical requirements, test methods, marking, packaging, storage, transportation and safety of silane gas. This Standard applies to saline for electronic industry prepared by magnesium silicide method, reduction of silicon tetrafluoride by sodium aluminum hydride, and chlorosilane disproportionation process. It is mainly used for the production of high- purity polysilicon, low-temperature chemical vapor deposition of silicon dioxide, chemical vapor deposition of silicon nitride, polysilicon isolation layer, polysilicon ohmic contact layer and heterogeneous or homogeneous silicon epitaxial growth raw materials, ion implantation source and laser medium, etc.; it can also be used for the production of solar cells, optical fibers and photoelectric sensors. Molecular formula: SiH₄. Relative molecular mass: 32.117 (according to the international relative atomic mass in

2011);

1.00 Trial).**

GB38031-2020) to purchase

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Notes and Explanations

Note 1:**[GB/T 15909-2017](https://

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2 Normative references

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

GB 190, Packing symbol of dangerous goods

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

GB/T 5099, Seamless steel gas cylinders

GB/T 5832.1, Gas analysis - Determination of moisture - Part 1: Electrolytic method

GB/T 7144, Coloured cylinder mark for gases

GB/T 11446.1, Electronic Grade Water

GB/T 14193, Rules for filling of liquefied gas cylinders

GB 15258, General rules for preparation of precautionary label for chemicals phi - silane purity (volume fraction), 10-2.

4.3 Exhaust gas treatment measures When determining the impurity content in silane, measures shall be taken to treat silane exhaust gas, to prevent silane from polluting the environment.

4.4 Determination of the content of hydrogen, oxygen + argon, nitrogen, methane, hydrocarbons (C2~C4), carbon monoxide, carbon dioxide, chlorosilane and disilane Determine the content of hydrogen, oxygen + argon, nitrogen, methane, hydrocarbons (C2~C4), carbon monoxide, carbon dioxide, chlorosilane and disilane according to the

cutting sampling method specified in

GB/T 28726. Before testing the sample, high-purity helium can be used to fully purge the air and moisture in the pipeline system. After the test is completed, high-purity helium (or nitrogen) can be used to fully purge the residual silane in the system. Pre-separation column: 316 L stainless steel tube with a length of about 5 m and an inner diameter of about 2 mm, filled with Porapak Q (a kind of high-molecular polymer) with a particle size of 0.18 mm ~

0.25 mm, or other equivalent chromatographic columns. Chromatographic columns: Chromatographic column I: stainless steel column of about 3 m in length and 2 mm in inner diameter, filled with 5 A molecular sieve with a particle size of

4.5 Determination of water content Follow

GB/T 5832.1. Before introducing the silane product, dry nitrogen can be used to completely blow out the air in the instrument system. It is permitted to use other equivalent methods to determine the moisture content in silane gas for electronic industry. Where there is a dispute over the determination results, the method specified in

GB/T 5832.1 shall be used as the arbitration method. Detection limit: 0.05×10^{-6} (volume fraction).

4.6 Determination of the content of metals and other elements

4.6.1 Instruments Use inductively coupled plasma mass spectrometry (ICPMS) to determine the content of metals such as aluminum, antimony, arsenic, boron, gallium, phosphorus, chromium, copper, iron, nickel, zinc and other elements in silane. Detection limit: no more than 0.01 $\mu\text{g/L}$.

4.6.2 Materials and reagents

4.6.2.1 Nitric acid: The content of metals and other elements is less than 0.01 $\mu\text{g/L}$.

4.6.2.2 Determination absorption solution: 5% nitric acid.

4.6.2.3 Standard solutions of metals and other element ions: The content of metals and other elements in the standard solution shall be close to the corresponding content in the test sample.

4.6.2.4 Alkali absorption solution: 10% ~ 20% sodium hydroxide aqueous solution.

4.6.2.5 Test water: in accordance with the requirements of Grade EW-I in GB/T 11446.1.

4.6.2.6 Polytetrafluoroethylene gas-washing bottle: 50 mL.

4.6.2.7 Conical flask for alkali solution absorption: 2 000 mL, containing 1 500 mL of alkali

absorption solution.

4.6.2.8 Pipette.

4.6.2.9 Rotor flow meter.

4.6.3 Sample absorption

4.6.3.1 See Appendix A for the absorption device diagram.

4.6.3.2 Before sampling, use high-purity nitrogen to fully purge the gas line and valves.

4.6.3.3 After purging, use a pipette to accurately transfer 30 mL of absorption solution into the gas-washing bottle; after using nitrogen to purge for about 30 minutes, turn off the nitrogen, slowly open the silane cylinder, and adjust the flow rate; introduce about 20 L of silane at a flow rate of 300 mL/min; record the amount of absorbed silane sample. Record the values of atmospheric pressure and temperature.

4.6.3.4 After absorption is completed, use nitrogen to purge the gas line for about 30 minutes; turn off the nitrogen and remove the gas-washing bottle.

4.6.3.5 Make a nitrogen blank simultaneously.

4.6.4 Determination steps

4.6.4.1 Starting the instrument Turn on the instrument according to the inductively coupled plasma mass spectrometer (ICPMS) manual; adjust the various components of the instrument to meet the measurement conditions; start the measurement after the instrument is stable.

4.6.4.2 Determination 4.6.4.2.1 Determination of standard samples Inject the standard solution of metals and other elements. Record the signal intensity of metals and other elements in the standard solution. Repeat the injection of each standard solution at least twice until the relative deviation of the two parallel measurements is no more than 5%; take the average value. 4.6.4.2.2 Determination of samples Inject the sample solution after absorption under the same measurement conditions as the standard solution; record the signal intensities of different metals and other elements; repeat the injection at least twice until the relative deviation of the two parallel measurements is no more than 15%; take the average value. 4.6.4.2.3 Determination of blank Determine the blank absorption solution in the same manner as the sample.

4.6.5 Calculation of sample volume Calculate the sample volume according to Formula (3):
- production date or batch number, filling mass (kg); - a reference to this Standard, technical indicators and inspector number.

5.1.12 Silane products shall be stored in a cool, dry, ventilated warehouse, away from exposure to sunlight and away from heat sources.