

Analysis of Silanes

By Gas Chromatography



Engineered Solutions, Guaranteed Results.



WASSON-ECE
INSTRUMENTATION

Silane Analysis

Uses of Silanes

Several applications exist for silanes and functionalized silanes including depositing amorphous silicon on glass and other surfaces for solar panel manufacturing and applying polycrystalline silicon layers on silicon wafers during semiconductor production.

As we move towards semiconductors based on smaller traces and faster electronics, the quality of polysilicon used in the production process must be higher. In addition, new processes are also being developed to lower the cost of solar panels, increasing the need for high purity silanes.

Silane Sampling

Due to the pyrophoric nature of silanes, special considerations and precautions are taken to ensure safe sampling, and avoid sample decomposition and atmospheric contamination. For the sampling of silanes Wasson-ECE utilizes orbital welding, face sealing fittings and high purity components. Orbital welding is a process of fusing tubing and components together by means of an arc that is rotated mechanically 360 degrees around the weld. By maintaining a perfect balance between gravitational force and surface tension this process avoids inclusions and imperfections in the weld seams.

For systems that analyze high purity silanes Wasson-ECE uses high purity electropolished tubing which helps combat contamination and corrosion. For streams containing chloro/fluorosilanes, Hastelloy®C or Monel 400 tubing is used to combat against corrosion caused by chloride and fluoride ions. These specialized components provide the highest degree of efficiency and safety during the sampling and analysis of silanes.



Orbital welded fitting used in system fabrication



Silane Analysis

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Wasson-ECE has the capability to analyze trace impurities in high purity silane streams, including components listed in Tables 1-4. The GC system is first purged with UHP (5.0) grade helium or argon; the sample is pre-purged to avoid instantaneous combustion with oxygen as well as cross contamination with previous samples.

Wasson-ECE performs the complex separations using multiple valve configurations, with various column phases and employing pulsed discharge helium ionization (PDHID), thermal conductivity (TCD) and flame ionization detectors (FID).

Table 1: Trace Permanent Gas Impurities in High Purity Silane

ANALYTE	LDL*
Hydrogen	1 ppm
Argon/Oxygen	50 ppb
Nitrogen	100 ppb
Methane	25 ppb
Carbon Monoxide	25 ppb

* Lower Detection Limit (LDL) denotes the concentration at which the signal is 2.5 times greater than the background noise signal.

Table 2: Analysis of Trace Helium and C₃-C₅ Hydrocarbons in High Purity Silane

ANALYTE	LDL
Helium	1 ppm
Propane	25 ppb
Propylene	25 ppb
i-Butane	25 ppb
n-Butane	25 ppb
Isobutylene	25 ppb
c-2-Butene	25 ppb
i-Pentane	25 ppb
n-Pentane	25 ppb
1,3-Butadiene	25 ppb

Table 3: Trace Carbon Dioxide and C₂ Hydrocarbons in High Purity Silane

ANALYTE	LDL
Carbon Dioxide	25 ppb
Ethane	25 ppb
Ethylene	25 ppb
Acetylene	25 ppb

Table 4: Analysis of Trace Chlorosilanes, Disilanes, and Disiloxane in High Purity Silane

ANALYTE	LDL
Monochlorosilane (MCS)	25 ppb
Dichlorosilane (DCS)	25 ppb
Trichlorosilane (TCS)	25 ppb
Silicon Tetrachloride (STC)	25 ppb
Disilane	150 ppb
Disiloxane	25 ppb

Global Experience and Reputation

Wason-ECE Instrumentation specializes in configuring and modifying new or existing gas chromatographs exclusively from Agilent Technologies to become guaranteed, turn-key analytical systems. We have been providing analytical solutions to some of the biggest companies worldwide for more than 22 years. Our reputation extends to more than 45 countries, with thousands of projects, involving the most demanding clients.

The complete analytical method is developed, tested, and documented utilizing our experience working with numerous companies with similar needs and goals. Our field engineers then install each system and provide training. After installation, and throughout the life of the chromatograph, our support chemists are ready to help. We can assist with application details, questions, training, calibration, maintenance, and on-site service. Wasson-ECE brings experience and efficiency to your project, giving you confidence in the quality of your results.



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