SILICON TETRAHYDRIDE

CAS number: 7803-62-5

Synonyms: Silane, monosilane

Chemical formula: SiH_4

Workplace exposure standard (retained)

TWA: **5 ppm (6.6 mg/m^3)**

STEL: **—**

Peak limitation: **—**

Notations: **—**

IDLH: **—**

Sampling and analysis: The recommended value is quantifiable through available sampling and analysis techniques.

Recommendation and basis for workplace exposure standard

A TWA of 5 ppm (6.6 mg/m^3) is recommended to protect for irritation of the upper respiratory tract in exposed workers.

Discussion and conclusions

Silicon tetrahydride is used in the semiconductor industry as a source of pure silicon to form silicon crystals, and specialised thin layers in semiconductors, solar cells and photo cells.

Critical effects of exposure are upper respiratory tract, eyes and skin irritation.

Toxicity data are extremely limited. Considered a mildly toxic gas by inhalation and irritating to the skin, eyes and mucous membranes. A NOAEL of 1,000 ppm for a four-hour exposure is reported in mice. No effects reported in rats exposed at 51 ppm or 126 ppm for one hour (ACGIH, 2018). Exposure of mice at 1,000 ppm for four weeks resulted in inflammation of the nasal cavity as indicated by histological and haematological changes (ACGIH, 2018; HCOTN, 2000).

The TWA of 5 ppm is recommended to be retained. The TWA is consistent across primary sources and is cited as being protective of irritation in the upper respiratory tract based on evidence in animals.

Recommendation for notations

Not classified as a carcinogen according to the Globally Harmonized System of Classification and Labelling of Chemicals (GHS).

Not classified as a skin sensitiser or respiratory sensitiser according to the GHS.

There are insufficient data to recommend a skin notation.

APPENDIX

Primary sources with reports

Source	Year set	Standard
SWA	***1991***	***TWA: 5 ppm (6.6 mg/m^3)***
ACGIH	***2015***	***TLV-TWA: 5 ppm (6.57 mg/m^3)***
TLV-TWA recommended to minimise the potential for irritation of the eyes, mucous membranes, and respiratory tract; effects that, in general, are characteristic of exposure to silanes. Summary of data: Toxicity data are limited. Human data: • Mildly toxic by inhalation and silanes are, in general, irritating to the skin, eyes, and mucous membranes • No data regarding toxic effects and exposure concentration. Animal data: • Limit animal data • No effects in rats exposed at 51 ppm or 126 ppm for 1 h • 4 h LC_{50} estimated between 5,000–10,000 ppm • NOAEL in mice of 1,000 ppm for 4 h; 2,500 ppm for 1 h; 5,000 for 30 min • Mice exposed for 6 h/d, 5 d/wk for 2 or 4 wk at 1,000 ppm; nasal mucosal irritation reported in 6/10 mice in the 4 wk exposure group.		
DFG	***NA***	***NA***
No report.		
SCOEL	***NA***	***NA***
No report.		
OARS/AIHA	***NA***	***NA***
No report.		
HCOTN	***2000***	***TWA: 5 ppm (7 mg/m^3)***
NOTE: HCOTN have reported 5 ppm as 0.7 mg/m^3. This appears to be an error and according to HCOTN documented conversion factors (1 ppm= 1.3 mg/m^3) 5 ppm is ≡6.5 mg/m^3. Administrative OEL based on the acute toxicity of germanium tetrahydride. Summary of additional data: • No human data are available • Exposure of mice at 1,000 ppm for 4 wk resulted in inflammation of the nasal cavity as indicated by histological and haematological change (cited by ACGIH, 2018); based on this evidence current administrative OEL considered too low.		

Secondary source reports relied upon

NIL.

Carcinogenicity — non-threshold based genotoxic carcinogens

Is the chemical mutagenic?	No

The chemical is not a non-threshold based genotoxic carcinogen.

Notations

Source	Notations
SWA	—
HCIS	NA
NICNAS	NA
EU Annex	NA
ECHA	NA
ACGIH	—
DFG	NA
SCOEL	NA
HCOTN	—
IARC	NA
US NIOSH	NA

NA = not applicable (a recommendation has not been made by this Agency); — = the Agency has assessed available data for this chemical but has not recommended any notations

Skin notation assessment

Calculation
Insufficient data to recommend a skin notation.

IDLH

Is there a suitable IDLH value available?	No

Additional information

Molecular weight:	32.12
Conversion factors at 25°C and 101.3 kPa:	1 ppm = 1.309 mg/m^3; 1 mg/m^3 = 0.764 ppm
This chemical is used as a pesticide:	☐
This chemical is a biological product:	☐

Molecular weight:	32.12
Conversion factors at 25°C and 101.3 kPa:	1 ppm = 1.309 mg/m^3; 1 mg/m^3 = 0.764 ppm
This chemical is used as a pesticide:	☐
This chemical is a by-product of a process:	☐
A biological exposure index has been recommended by these agencies:	☐ ACGIH ☐ DFG ☐ SCOEL

Workplace exposure standard history

Year	Standard
Click here to enter year	

References

American Conference of Industrial Hygienists (ACGIH®) (2018) TLVs® and BEIs® with 7th Edition Documentation, CD-ROM, Single User Version. Copyright 2018. Reprinted with permission. See the *TLVs® and BEIs® Guidelines section* on the ACGIH website.

Health Council of the Netherlands (HCOTN) (2000) Silane. Health-based calculated occupational cancer risk values. The Hague: Health Council of the Netherlands; publication no. 2000/15OSH/014.