# Silicon

| CAS number: | 7440-21-3 |
| --- | --- |
| Synonyms: | — |
| Chemical formula: | Si |

 Workplace exposure standard (interim)

| TWA: | **10 mg/m3** |
| --- | --- |
| 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 10 mg/m3 is recommended to protect for chronic respiratory conditions in exposed workers.

Given the limited data available from the primary sources, it is recommended that a review of additional sources be conducted at the next scheduled review.

## Discussion and conclusions

Silicon is used in the manufacture of electronics, alloys and polymers.

The critical effect of exposure is chronic bronchitis.

The toxicological database is extremely limited. Epidemiological data indicate that critical effects are likely due to non-substance-specific effects arising from exposure to nuisance dusts (ECHA, 2020). Pulmonary pneumoconiosis is evidenced only at high acute exposures when administered as intratracheal instillations in animals (HCOTN, 2002).

The exposure data in the available source material are insufficient to recommend a health-based OEL (HCOTN, 2002). However, epidemiological data indicate the substance is inert under workplace conditions and effects of exposure are attributable to nuisance dust effects.

In the absence of quantitative human or animal exposure data, the TWA of 10 mg/m3 is recommended be retained in the interim and further assessment of additional source material is recommended during subsequent reviews.

## 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: 10 mg/m3 |
|  |
| ACGIH NA NA |
| No report; previous TLV-TWA of 10 mg/m3 withdrawn (HCOTN, 2002) |
| DFG NA NA |
| No report. ECHA (2020) states: “DNEL based on DFG (2014) MAK for inert dust, 4 mg/m3” |
| SCOEL NA NA |
| No report |
| OARS/AIHA NA NA |
| No report |
| HCOTN 2002 TWA: 10 mg/m3 |
| Summary of information:Toxicological database is too limited to recommend a HBROEL) and there is insufficient information to comment on the suitability of the current administrative OEL.Very low likelihood of occupational exposure to elemental silicon due to its high reactivity, which typically forms silica under workplace conditions. No target organ can be determined from the available animal studies.Human data:* Dose-dependent cell necrosis *in vitro* in foetal lung cells at 50–150 µg/mL.

Animal data:* Intratracheal instillation studies results:
	+ pulmonary pneumoconiosis at 50 mg (rats); nodules in lungs after 3 mo, increased lung weight, formation of dust foci and bronchitis after 12 mo
	+ slight pulmonary epithelial lesions after 12 mo at 25 mg (rabbits)
	+ toxicity of silicon dust considered lower than that of quartz dust
* Increased levels of glycogen and decreased lactate levels in cornea at 1.55 mg/m3 and 7 cal/cm2 of radiant heat (Arc Thermal Performance Value (ATPV)) (rats, 2–8 mo, no further information provided)
* No signs of toxicity at 100–200 mg/animal in long-term repeat injection study (rats, guinea pigs, no further details on duration and administration route provided); cited article notes cellular changes typical of inert responses (no further information provided)
* Increased lipid peroxidation in lung and liver and blood albumin modification following intratracheal instillation of 50 mg of welding dust containing 2–20% Si and other elements (rats); haematological and metabolic changes (not specified) in cardiac respiratory system at 12.5 mg/kg/d of dust (rats, 1 mo)
* No ADME, mutagenicity or carcinogenicity data available for assessment.
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### Secondary source reports relied upon

| Source |  | Year | Additional information |
| --- | --- | --- | --- |
| NICNAS |  | 2018 | Tier I: no assessment. |
| ECHA |  | 2020 | * No substance-specific repeat inhalation data available, DNEL based on DFG (2014) MAK for inert dust, 4 mg/m3
* Epidemiological study of silicon/ferrosilicon manufacturing industry showed exposure is associated with increased risk of chronic bronchitis, consistent with exposure to other inert dusts, but no excess mortality from cancer or respiratory diseases:
	+ study limited due to mixed exposures to other compounds present in dust in such manufacturing conditions.
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### Carcinogenicity — non-threshold based genotoxic carcinogens

| Is the chemical mutagenic? | Insufficient data |
| --- | --- |
| Is the chemical carcinogenic with a mutagenic mechanism of action? | Insufficient data |
| **Insufficient data are available to determine if the chemical is a non-threshold based genotoxic carcinogen.** |

## Notations

| Source | Notations  |
| --- | --- |
| SWA | — |
| HCIS | NA |
| NICNAS | NA |
| EU Annex | NA |
| ECHA | — |
| ACGIH | NA |
| 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 assign a skin notation. |

### IDLH

| Is there a suitable IDLH value available? | No |
| --- | --- |

## Additional information

| Molecular weight: | 28.0855 |
| --- | --- |
| Conversion factors at 25°C and 101.3 kPa:  | 1 ppm = Number mg/m3; 1 mg/m3 = Number ppm |
| This chemical is used as a pesticide: |[ ]
| This chemical is a biological product: |[ ]
| 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

Health Council of the Netherlands (HCOTN) (2002) Silicon. Health-based calculated occupational cancer risk values. The Hague: Health Council of the Netherlands; publication no. 2000/15OSH/054.

European Chemicals Agency (ECHA) (2020) Silicon – REACH Assessment.