# Tin (metal and inorganic compounds)

| CAS number: | 7440-31-5 (Tin) |
| --- | --- |
| Synonyms: | Stannum |
| Chemical formula: | Sn |

Workplace exposure standard (retained)

| TWA: | **2 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

The TWA of 2 mg/m3 is recommended to protect for stannosis, a mild form of pneumoconiosis, in exposed workers.

A priority review of the data for the chemical in the next scheduled review of the workplace exposure standards is recommended.

## Discussion and conclusions

Metallic tin is processed to yield tin foil or solder and is used in the manufacture of numerous alloys such as bronze. Because of its resistance to corrosion, tin is used as a protective coating for other metals. Another important property of tin is its ability to form alloys with other metals. Thus, tin metal is commonly used in tin plating, manufacture of food cans and solder and alloy production. Dental amalgams contain varying proportions of tin.

The critical effect of exposure is stannosis, a mild form of pneumoconiosis.

Limited toxicological data are available in the sources. Long-term inhalation exposure to stannic oxide is associated with stannosis in workers. No further exposure data are available. Five cases of stannosis were reported in the United States in 1954 (ACGIH, 2018; DFG, 2000). No data concerning the effects after inhalation exposure in experimental animals are available.

The TWA of 2 mg/m3 is consistent across primary sources ACGIH and HCOTN and is recommended to be retained. ACGIH (2018) states that a TWA of 2 mg/m3 is protective of stannosis 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.

## 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: 2 mg/m3 (Metal) TWA: 2 mg/m3 (Oxide & inorganic compounds, except SnH4, as Sn) | |
|  |
| ACGIH 2001 TLV–TWA: 2 mg/m3 (as Sn) |
| TLV-TWA intended to minimise the potential for stannosis, a mild form of pneumoconiosis. Recommended for occupational exposure to elemental Sn, tin oxides and inorganic compounds, except tin hydride.  Summary of data:   * No derivation presented.   Human data:   * Sn salts considered highly toxic once in the blood stream: * symptoms reported include hyperaemia, vascular changes and bleeding in the CNS, liver, heart and other organs * Exposure to dust and fume of Sn (oxide) recognised to result in stannosis, a mild pneumoconiosis, of which >150 cases have been reported in world literature * No reported cases of massive fibrosis from overexposure to Sn * Five cases of stannosis reported in the United States in 1954; one a retired smelter and bagger of SnO2 for 22 years: * no chest symptoms developed until several years later when dyspnoea occurred; * vital capacity was 70% of normal and maximal breathing capacity was 61%.   Animal data:   * No data relating to inhalation exposure have been presented.   Insufficient data to recommend a skin, sensitiser, carcinogenicity notation or a TLV-STEL. |
| DFG 2000 Not assigned |
| MAK cannot be derived scientifically from the results of available studies.  Summary of additional data:   * No data for the threshold of effects or effect profile of repeatedly inhaled organic Sn compounds * In the only study with volunteers, Sn doses of 0.7 mg/kg had no effects; no dose was determined. |
| SCOEL 2003 Not assigned |
| Scientific data considered insufficient to derive a health-based OEL value.  Summary of additional data:   * Deposition of tin particles in the lungs of Sn ore miners induces stannosis * The scientific literature consists of case reports in humans, with poor exposure assessment and old methods of examination. |
| OARS/AIHA NA NA |
| No report. |
| HCOTN 2005 TWA: 2 mg/m3 |
| Summary of additional data:   * No derivation provided * Notes ACGIH TLV-TWA * No further information. |

### 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 | NA |
| HCIS | NA |
| NICNAS | NA |
| EU Annex | NA |
| ECHA | NA |
| ACGIH | NA |
| DFG | NA |
| SCOEL | NA |
| HCOTN | NA |
| 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

Insufficient data to assign a skin notation.

### IDLH

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

## Additional information

| Molecular weight: | 118.7 |
| --- | --- |
| Conversion factors at 25°C and 101.3 kPa: | 1 ppm = 0.21 mg/m3; 1 mg/m3 = 4.85 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

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*](http://www.acgih.org/tlv-bei-guidelines/policies-procedures-presentations) on the ACGIH website.

Deutsche Forschungsgemeinschaft (DFG) (2000) Tin and its inorganic compounds (apart from SnH4) – MAK value documentation.

EU Scientific Committee on Occupational Exposure Limits (SCOEL) (2003) Recommendation from the Scientific Committee on Occupational Exposure Limits for tin and inorganic tin compounds. SCOEL/SUM/97.

Health Council of the Netherlands (HCOTN) (2005) Tin and inorganic tin compounds. Health-based recommended occupational exposure limit. The Hague: Health Council of the Netherlands; publication no. 2005/06OSH.