# Zinc chloride (fume)

| CAS number: | 7646-85-7 |
| --- | --- |
| Synonyms: | Butter of zinc, tinning flux, zinc dichloride |
| Chemical formula: | ZnCl2 |

Workplace exposure standard (amended)

| TWA: | **—** |
| --- | --- |
| STEL: | **2 mg/m3** |
| Peak limitation: | **—** |
| Notations: | **—** |
| IDLH: | **50 mg/m3** |
| **Sampling and analysis:** The recommended value is quantifiable through available sampling and analysis techniques. | |

## Recommendation and basis for workplace exposure standard

A TWA is not recommended based on the available data.

A STEL of 2 mg/m3 is recommended to protect for irritation of the respiratory tract in exposed workers.

It is recommended an evaluation of additional sources be conducted at the next scheduled workplace exposure standard review.

## Discussion and conclusions

Zinc chloride is an inorganic corrosive salt used in soldering flux, iron galvanising, textiles, adhesives, deodorants, embalming fluids, organic syntheses, petroleum refining and as a wood preservative and electrolyte in dry cell batteries. It is also used in smoke bombs and screening smokes.

The critical effects of exposure are irritation and damage to the respiratory tract due to corrosivity.

Limited evidence regarding chronic exposure is available. An average concentration of 4.8 mg/m3 over a 30-minute period causes mild, transient irritation of the respiratory tract in bearing manufacture workers. No sensory effects reported at 0.07 and 0.4 mg/m3. Upper respiratory tract irritation is noted in subjects accidentally exposed at 400 mg/m3 at an airport disaster drill. The symptoms correlate with the presumed intensity and duration of exposure. There are several case reports of death due to respiratory effects and insufficiency following acute accidental exposure at high concentrations (ACGIH, 2018). Exposure at 120 mg/m3 for two minutes causes irritation of the nose, throat and chest, cough and nausea in human subjects (DFG, 2009).

An absence of chronic exposure data limits the ability to confidently recommend a TWA. Therefore, the current TWA is recommended to be removed. Based on evidence that 4.8 mg/m3 for 30 minutes caused mild transient irritation, a STEL of 2 mg/m3 as derived by ACGIH (2018) is recommended to protect for irritant effects due to the corrosive action of the compound.

Given the limited data regarding chronic exposures, 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: 1 ppm (2 mg/m3) | |
|  |
| ACGIH 2018 TLV-TWA: 1 mg/m3; TLV-STEL: 2 mg/m3 |
| TLV-TWA and TLV-STEL recommended to minimise the potential for dermal and respiratory tract irritation and pulmonary toxicity and depending on exposure concentrations and duration include pneumonitis, pulmonary oedema and damage to mucous membranes.  Summary of data:   * Prime evidence for recommendation: 30 min exposure at 4.8 mg/m3 caused mild, transient respiratory irritation in human subjects: * 0.4 mg/m3 not considered irritating.   Human data:   * Symptoms of acute inhalation of the fume, described as hyperpyrexia, tachypnoea, cyanosis, "burning in the throat," transient bilateral pneumonitis, pneumothorax, sub pleural emphysematous lesions and progressive adult respiratory distress * Several case reports of death following acute accidental exposure to high concentrations; death occurring because of acute respiratory damage and insufficiency: * in one such incident, a concentration of 4,075 mg/m3 in an air sample collected at the scene * Participants in an airport disaster drill where a smoke bomb was deployed exposed at concentrations estimated at 400 mg/m3: * URT irritative symptoms in exposed victims correlated with presumed intensity and duration of exposure * cough and hoarse or sore throat common early symptoms * late onset symptoms, including nausea, fatigue or headache, appeared 2–20 h post-exposure * no effect of exposure on forced expiratory volume or forced vital capacity * 7 subjects had persistent symptoms 48 h post-exposure * Average concentration of 4.8 mg/m3 over 30-min period caused mild, transient irritation of the respiratory tract in bearing manufacture workers: * exposure to levels between 0.07–0.4 mg/m3 for 30 min failed to cause sensory effects.   Animal data:   * 10 min exposure in rats to fume ≥1,980 mg/m3 lethal * Focal alveolitis, consolidation, emphysema, macrophage infiltration and pulmonary fibrosis found in guinea pigs that died following exposure at 248 mg/m3 1 h/d, 5 d/wk for 3 wk * Rats and mice exposed at 254 mg/m3 for 1 h/d, 5 d/wk survived 20 wk of exposure: * animals developed pulmonary macrophage infiltration when studied 13 mo after treatment * No carcinogenic evidence of zinc compounds after administration by any route other than injection.   Insufficient evidence to recommend a skin, sensitiser or carcinogen notation. |
| DFG 2009 MAK: 2 mg/m3 (inhalable fraction)  MAK: 0.1 mg/m3 (respirable fraction) |
| MAK for zinc and its inorganic compounds includes zinc chloride. Effects different based on particle sizes.  Summary of additional data (ZnCl2):   * In humans, readily soluble and irritating on inhalation, local corrosive effect after ingestion and corrosive to eyes * Acute exposure to fumes (particle diameter not specified), for 5 h at 600 mg/m3, caused metal fume fever; a sweetish metallic taste and throat irritation experienced 4–12 h after exposure; influenza‐like symptoms can follow, characteristic of metal fume fever * Exposure at 40 mg/m3 aerosol (particle diameter not specified) produced a metallic taste: * majority of volunteers, exposure at 80 mg/m3 (zinc: 38.4 mg/m3) for 2 min resulted in slight nausea and cough, whereas exposure to 120 mg/m3 (zinc: 57.6 mg/m3) for 2 min caused irritation of the nose, throat and chest as well as cough and nausea * In animals, severely irritating to skin. |
| SCOEL NA NA |
| No report. |
| OARS/AIHA NA NA |
| No report. |
| HCOTN NA NA |
| No report. |

### Secondary source reports relied upon

| Source |  | Year | Additional information |
| --- | --- | --- | --- |
| NICNAS |  | 2014 | * Critical health effects include local effects due to corrosivity * Effects on fertility observed at very high doses of soluble zinc chemicals, levels at which occurs are unlikely to result from industrial use. |

### 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 | — |
| NICNAS | — |
| EU Annex | NA |
| ECHA | — |
| ACGIH | — |
| DFG | — |
| 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? | Yes |
| --- | --- |

## Additional information

| Molecular weight: | 136.28 |
| --- | --- |
| Conversion factors at 25°C and 101.3 kPa: | 1 ppm = NA; 1 mg/m3 = NA |
| 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) (2010) Zinc and its inorganic compounds – MAK value documentation.

National Industrial Chemicals Notification and Assessment Scheme (NICNAS) (2014) Zinc chloride (ZnCl2): Human health tier II assessment – IMAP report.

US National Institute for Occupational Safety and Health (NIOSH) (1994) Immediately dangerous to life or health concentrations – Zinc chloride fume.