# Copper fume, dust and mist (As cu)

| CAS number: | 7440-50-8 |
| --- | --- |
| Synonyms: | — |
| Chemical formula: | Cu |
| Structural formula: | — |

Workplace exposure standard (amended)

| TWA: | **0.01 mg/m3** |
| --- | --- |
| STEL: | — |
| Peak limitation: | — |
| Notations: | — |
| IDLH: | **100 mg/m3** |
| Sampling and analysis: | There is uncertainty regarding quantification of the recommended value with currently available sampling and/or analysis techniques. |

## Recommendation and basis for workplace exposure standard

A TWA of 0.01 mg/m3 is recommended to protect for irritant and adverse lung effects in exposed workers.

## Discussion and conclusions

Copper is a widely used structural metal particularly in situations where high electrical and thermal conductivity are required. Copper compounds are also used in pesticides.

The critical effect associated with inhalation is local irritation of the respiratory tract. Concentrations of metal copper dust in the order of 0.1 mg/m3 are reported to be associated with a condition similar to metal fume fever. A study in workers reports a NOAEC of 0.008 mg/m3 for influenza-like symptoms (DFG, 2015). A four week inhalation study in rats identified a LOAEC of 0.17 mg/m3 reported for marked inflammatory reactions in the lungs (ACGIH, 2018; DFG, 2015; SCOEL, 2014). DFG (2015) and SCOEL (2014) derived a human equivalent NOAEC of 0.012 mg/m3 and 0.016 mg/m3, respectively.

Given the observed NOAEC in humans of 0.008 mg/m3 and supported by the derived human equivalent NOAECs from animal studies (SCOEL, 2014), a TWA of 0.01 mg/m3 is recommended to protect for irritant and lung effects across various states in exposed workers.

## 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: 0.2 mg/m3 | |
|  |
| ACGIH 2001 TLV-TWA: 0.2 mg/m3 (Fume as Cu);  TLV-TWA: 1 mg/m3 (Dusts and Mists as Cu) |
| TLV-TWAs recommended to minimise the potential for irritant effects and systemic effects similar to metal fume fever.  Summary of data:  Fumes are considered the primary exposure consideration in relation to health effects.  Human data:   * Health effects from Cu fumes reported as irritation of the upper respiratory tract, metallic or sweet taste sensation, nausea, metal fume fever and in some occurrences, discoloration of the skin and hair * No adverse effects resulting from exposure to 0.4 mg/m3 Cu fumes (industry experience in UK) * Short-term exposure to 1–3 mg/m3 Cu welding fume resulted in altered taste and no nausea * No complaints reported at concentrations of 0.02–0.4 mg/m3 (no further information provided) * Concentrations of metal Cu dust in the order of 0.1 mg/m3 reported to be associated with condition similar to metal fume fever (no further information provided) * Exposure to Cu salts as dust or mist can cause can result in irritation of nasal mucous membranes, sometimes of the pharynx and on occasion, ulceration with perforation of the nasal septum * Cu salts act as irritants on eyes and skin.   No animal data presented.  Insufficient data to recommend a skin, sensitiser or carcinogen notation. |
| DFG 2015 MAK: 0.01 mg/m3 (respirable fraction) |
| MAK recommended to protect for local effects on the respiratory tract in exposed workers.  Summary of additional data:   * A repeated exposure study in workers report influenza-like symptoms after exposure * 0.12–0.36 mg/m3 of fine metallic Cu * NOAEC of 0.008 mg/m3 * study considered to be insufficiently documented * LOAEC of 0.2 mg/m3 in rats for marked inflammatory reactions in the lungs (rats, inhalation, 4 wk )   Derived a NOAEC of 0.067 mg/m3 by applying a factor of 3 to the LOAEC in rats  A human equivalent concentration of 0.012 mg/m3 is then estimated based on a retained particle doses model comparison between humans and rats  The TWA is considered protective and is supported by the evidence in humans. |
| SCOEL 2014 TWA: 0.01 mg/m3 (respirable fraction) |
| TWA recommended to protect for local action on the respiratory tract including immunosuppression attributable to disturbance of alveolar macrophage function.  Summary of additional data:   * NOAEC of 0.13 mg/m3 CuSO4in hamsters for dose-dependent decrease of the endocytotic capacity of lung macrophages; single 4 h dose * LOAEC of 0.17 mg/m3 in rats (same study as DFG, 2015) * NOAEC in rats calculated as 0.067 mg/m3 (1/3 LOAEC) * human NOAEC ≡0.016 mg/m3  Cu using a Multiple-Path Particle Deposition model * TWA of 0.01 mg/m3 is supported by the derived NOAEC (0.016 mg/m3) and the human NOAEC of 0.008 mg/m3 (DFG, 2015) * Due to uncertainites a scientifically based STEL cannot be derived * Copper compounds were not mutagenic in most studies in bacteria and yeasts * Dermal uptake of Cu compounds is considered to be low. |
| OARS/AIHA NA NA |
| No report. |
| HCOTN NA NA |
| No report. |

### Secondary source reports relied upon

| Source |  | Year | Additional information |
| --- | --- | --- | --- |
| ECHA |  |  | * NOAEC of 0.2 mg/m3 (Cu2O), based on highest dose tested and lack of findings in lung weight ratios (rats, inhalation, 28 d). |

### 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

| Calculation |
| --- |
| Insufficient data to assign a skin notation. |

### IDLH

| Is there a suitable IDLH value available? | Yes |
| --- | --- |

## Additional information

| Molecular weight: | 63.55 |
| --- | --- |
| 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

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) (2015) Copper and its inorganic compounds – MAK value documentation.

European Chemicals Agency Regulation (ECHA) No 1907/2006 of the European Parliament and of the Council of 18 December 2006 concerning the Registration, Evaluation, Authorisation and Restriction of Chemicals (REACH).

EU Scientific Committee on Occupational Exposure Limits (SCOEL) (2014) Recommendation from the Scientific Committee on Occupational Exposure Limits for copper and its inorganic compounds. SCOEL/SUM/171.

US National Institute for Occupational Safety and Health (NIOSH) (1994) Immediately dangerous to life or health concentrations – copper (dust and mists, as Cu).