# Yttrium, metal And compounds (as Y)

| CAS number: | 7440‐65‐5 |
| --- | --- |
| Synonyms: | — |
| Chemical formula: | Y |

Workplace exposure standard (interim)

| TWA: | **1 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 1 mg/m3 is recommended to protect for pneumoconiosis, pulmonary fibrosis and respiratory function impairment 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

Yttrium is used in nuclear technology, metal alloys, coatings and lasers.

The critical effects of exposure are pneumoconiosis, pulmonary fibrosis and respiratory function impairment.

Human and animal exposure data are extremely limited. Pneumoconiosis and impairment of respiratory function are reported in miners exposed to dust mixtures containing 64.1% yttrium at concentrations of 1.3 to 25.9 mg/m3 (HCOTN, 2000). It may take one to three years for an inhaled dose to be eliminated based on a poorly documented report (HCOTN, 2000). Pulmonary fibrosis is also reported in rats eight months after exposure by intratracheal instillation at 50 mg per animal. (ACGIH, 2018).

ACGIH (2018) recommends a TWA equivalent of 1 mg/m3 based on the results of the intratracheal instillation study with rats but provides no further justification of this exposure limit. Based on a lack of adequate human and animal data, HCOTN (2000) and DFG (1998) do not recommend a health-based TWA equivalent. In view of this uncertainty and lack of available substance-specific data, the TWA of 1 mg/m3 is retained in the interim in accordance with the evaluation reported by ACGIH (2018). Further assessment of additional sources is recommended during subsequent reviews of the WES.

## Recommendation for notations

Not classified as a carcinogen according to the Globally Harmonized System of Classification and Labelling of Chemicals (GHS). However, an entry for the substance was not found in the HCIS database during this evaluation.

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 mg/m3 | |
|  |
| ACGIH 2001 TLV-TWA: 1 mg/m3 |
| TLV-TWA intended to protect for potential respiratory fibrosis as observed in rats.  Summary of information:  Human exposure data are very limited, TLV-TWA based on report of respiratory fibrosis in rats following intratracheal instillation.  Human data:   * No signs of hepatic necrosis in patients dosed (not specified) with <3.10 -(no further details provided) * No adverse effects associated with exposure reported in industrial investigation of yttrium vanadate europium phosphor exposure; mean Y levels: 1.4 mg/m3:   + mild irritation of eyes, URT and skin attributed to vanadium exposure in this study.   Animal data:   * IP LD50 of 350 and 500 mg/kg for nitrate and oxide, respectively (rats) and 85–100 mg/kg for the chloride (guinea pigs):   + LD50 studies show substance is moderately toxic * Substance is primarily deposited in bones within hours of administration * Hepatic necrosis at 50 mg/kg/d after 33 d (rats, no further details provided) * Pulmonary fibrosis, emphysema, granulomas, enlarged lymph nodes and giant cells and dust accumulation in lungs following single 50 mg intratracheal instillation (rats, observed for 8 mo) * No significant accumulation or mortality at 60 mg/kg/d in sub-chronic injection (not specified) study (rats, 5 mo); no significant skeletal accumulation after bone burden reached 150–200 ppm.   Insufficient data to recommend a TLV-STEL or notations for carcinogenicity, skin absorption and sensitisation. |
| DFG 1998 Not assigned |
| Summary of additional information:  Previous MAK of 5 mg/m3 (based on TLV-TWA from 1958) withdrawn due to lack of suitable data to support an evaluation. Critical effect are fibrotic changes in the lungs.  The nitrate is irritating to the eyes; the oxide is moderately irritating (no further details provided).  Human data:   * Fibrotic lung changes in exposed workers (n=6, no details on exposure provided); workers were co-exposed to scandium, lanthanum, cerium, thorium and ionising radiation:   + 2 cases of lung cancer, DFG considers study inadequate for evaluation.   Animal data:   * Lung t1/2 of 168 d following intratracheal instillation of 100 µg (rats); 0.1% of dose found in kidney after 162 d * Accumulation in kidney, liver, femur and spleen, concurrent dose-dependent decrease in iron concentration in liver, kidney and spleen and barium and strontium in femur reported in repeat oral dose study with exposure groups 0, 40, 200 and 1,000 mg/kg/d (rats, 28 d) * Delayed body weight gain and non-significant increase in lung adenocarcinomas and leukaemia in life-time drinking water study with yttrium chloride (rats):   + increased lifespan of dosed rats compared to controls   + agency considers study design inadequate for evaluation.   Insufficient data to recommend notations for carcinogenicity, skin absorption or sensitisation. |
| SCOEL NA NA |
| No report. |
| OARS/AIHA NA NA |
| No report. |
| HCOTN 2000 TWA: 1 mg/m3 |
| Summary of additional information:  Current administrative OEL is 1 mg/m3, HCOTN considers database too weak to derive health-based recommended OEL (HBROEL) or to comment on suitability of current administrative OEL. Toxicity expected to depend on solubility; variability in solubility of different compounds anticipated to complicate grouped assessment. Target organ is the lung.  Human data:   * 16% incidence of pneumoconiosis and respiratory function impairment in miners exposed to dust containing 64.1% yttrium at 1.3–25.9 mg/m3 (n=25, average employment 8.8 yr); referenced publication recommends OEL of 3 mg/m3, but agency considers the study inadequate to justify adoption of this recommendation * 3-phase clearance mechanism of inhaled dose with t1/2 of 8 and 20 d and 1–3 yr, respectively (no further details). |

### Secondary source reports relied upon

| Source |  | Year | Additional information |
| --- | --- | --- | --- |
| ECHA |  | 2020 | No hazard identified, therefore no DNEL recommended. |
| US NIOSH |  | 1994 | No evidence acute exposure to a high concentration would impede escape or cause any irreversible health effects within 30 min; IDLH based on being 500 times the NIOSH REL and OSHA PEL. |

### 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 | NA |
| ACGIH | — |
| DFG | Carcinogenicity – 3 |
| 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 notation.

### IDLH

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

## Additional information

| Molecular weight: | 88.90 |
| --- | --- |
| Conversion factors at 25°C and 101.3 kPa: | 1 ppm = 3.64 mg/m3; 1 mg/m3 = 0.27 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) (1998) Yttrium und seine verbindungen – MAK value documentation.

Health Council of the Netherlands (HCOTN) (2000) Yttrium and yttrium compounds. Health-based calculated occupational cancer risk values. The Hague: Health Council of the Netherlands; publication no. 2000/15OSH/017.

US National Institute for Occupational Safety and Health (NIOSH) (1994) Immediately dangerous to life or health concentrations – Yttrium compounds (as Y).