# Boron oxide

| CAS number: | 1303-86-2 |
| --- | --- |
| Synonyms: | Diboron trioxide, boric oxide, boric anhydride,  boron trioxide, boria, fused boric acid |
| Chemical formula: | B2O3 |

Workplace exposure standard (interim)

| TWA: | **10 mg/m3** |
| --- | --- |
| STEL: | **—** |
| Peak limitation: | **—** |
| Notations: | **—** |
| IDLH: | **2,000 mg/m3** |
| Sampling and analysis: | The recommended value is quantifiable through available sampling and analysis techniques. |

## Recommendation and basis for workplace exposure standard

An interim TWA of 10 mg/m3 is recommended to protect for eye and respiratory tract irritation 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

Boron oxides are commonly used in production of heat-resistant glass, fire retardant materials and uses in the electronics industry.

Limited data from human and animal studies suggest that boron oxide has low toxicity and irritant effects (ACGIH, 2018). Based on the available data, the critical effects of exposure to boron oxides are unclear.

A TWA of 10 mg/m3 is recommended based on the limited available data. A review by HCOTN (2005) recommends a TWA of 1 mg/m3 and a STEL of 3 mg/m3. However, there is limited evidence to support these recommendations. As there is limited evidence to support the HCOTN recommendation, a further review of the literature should be undertaken 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: 10 mg/m3 | |
|  |
| ACGIH 2001 TLV-TWA: 10 mg/m3 |
| TLV-TWA recommended to minimise risk of ocular and respiratory irritation.  Insufficient data to assign a carcinogenicity notation.  Insufficient data available to assign a skin or sensitisation notation.  Summary of data:  Human data:   * Respiratory and eye irritation reported by workers exposed to both boric acid and boron oxide (1.2–8.5 mg/m3) * Exposed workers (n=113) reported eye and respiratory tract symptoms significantly more frequently than control group workers (n =214) * Uncertainty regarding self-reported symptoms in workers and relationship to airborne concentration.   Animal data:   * No adverse effects, apart from mild nasal irritation, following exposure to boron oxide aerosols (rats, 6 h/d, 5 d/wk). Reported exposures: * 470 mg/m3, 10 wk * 175 mg/m3, 12 wk * 57 mg/m3, 24 wk * Low order acute toxicity noted: * LD50: 3,163 mg/kg (mice, oral) * LD50: 1,868 mg/kg (mice, intraperitoneal) * Caused conjunctivitis and skin erythema in rabbits (ocular instillation and topical application respectively). |
| DFG 1999 Not assigned |
| Insufficient data to establish a value.  No NOAEL able to be determined from animal data available.  Summary of data:  Animal data:   * Increased urinary creatinine and volume effects from prolonged inhalation in rats (77 mg/m3 for 24 wk). |
| SCOEL NA NA |
| No report. |
| OARS/AIHA NA NA |
| No report. |
| HCOTN 2005 TWA: 10 mg/m3 |
| A health based recommended occupational exposure limit (HBROEL) review identified the Garabrant *et al* (1984) worker study as a base for deriving a revised exposure limit, but states the effects identified “cannot be ascribed to diboron trioxide exposures alone” with the contribution to total dust concentrations unknown.  TWA of 1 mg/m3 and STEL of 3 mg/m3 for inhalable dust recommended based on an assessment factor of 4 applied with no available NOAEL and the uncertainty of the conclusions from the Garabrant *et al* study. However, there is limited evidence to support these recommendations.  No evidence of mutagenicity or genotoxicity studies.  No evidence of reproductive toxicity studies.  Boron oxide (diboron trioxide) noted to react with water to form boric acid which is absorbed through gastrointestinal tract and open wounds. |

### Secondary source reports relied upon

NIL.

### 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 | 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: | 69.64 |
| --- | --- |
| 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) (1999) Boron oxide – MAK value documentation.

Health Council of the Netherlands (HCOTN) (2005) Diboron trioxide. Health-based reassessment of administrative occupational exposures limits. The Hague: Health Council of the Netherlands; publication no. 2000/15OSH/145.

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