

PENTABORANE

CAS number: 19624-22-7

Synonyms: Pentaborane 9, pentaboron nonahydride

Chemical formula: B₅H₉

Workplace exposure standard (amended)

TWA: 0.005 ppm (0.013 mg/m³)

STEL: —

Peak limitation: —

Notations: —

IDLH: 1 ppm

Sampling and analysis: The recommended value is quantifiable through available sampling and analysis techniques.

Recommendation and basis for workplace exposure standard

A TWA of 0.005 ppm (0.013 mg/m³) is recommended to protect for central nervous system (CNS) effects in exposed workers.

The STEL has been removed as insufficient data are available regarding acute effects and exposure concentrations.

Discussion and conclusions

Pentaborane is used in ducted jet engines and as a rocket fuel.

Critical effects of exposure are CNS related toxicity. Limited toxicological data are available.

Accidental inhalation exposures at the workplace are associated with CNS intoxication. No exposure data are provided. Symptoms include tremors and convulsions at high concentrations and behavioural changes at lower concentrations. Inhalation of 0.2 ppm over four weeks caused toxic symptoms such as ataxia, hind limb immobility and muscle tremors in five animal species (ACGIH, 2018; DFG, 2001).

Given the limited available data, the SWA TWA of 0.005 ppm by ACGIH (2018) and DFG (2001) is recommended to be retained to limit CNS effects in exposed workers. Insufficient data are available to recommend a STEL and the TWA is considered sufficiently low to protect for transient excursions in exposure concentrations above the TWA that may be encountered in the workplace.

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 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: 0.005 ppm (0.013 mg/m³); STEL: 0.015 ppm (0.039 mg/m³)
ACGIH	2001	TLV-TWA: 0.005 ppm (0.013 mg/m³); TLV-STEL: 0.015 ppm (0.039 mg/m³)
<p>TLV-TWA recommended to minimise the potential for adverse CNS effects.</p> <p>TLV-STEL recommended for additional margin of safety.</p> <p>Summary of data:</p> <p>OEL based on limited animal data.</p> <p>Human data:</p> <ul style="list-style-type: none"> Symptoms consistent with CNS intoxication reported following accidental inhalation exposures of workers: <ul style="list-style-type: none"> tremors and convulsions following large exposures; no concentrations reported behavioural changes including loss of recent memory and poor judgment at lower concentrations. <p>Animal data:</p> <ul style="list-style-type: none"> 4 h LC₅₀ of 6 ppm for rats and 3 ppm for mice Rats exposed 5 h/d, 5 d/wk for up to 4 wk; hyperexcitability, tremors and decreased body weight in first week; no further information Rats, rabbits, monkeys and dogs exposed repeatedly at 1 ppm for 4 wk or at 0.2 ppm for 6 mo; concentrations calculated not measured; no further information: <ul style="list-style-type: none"> weight loss in all species at 1 ppm; rats appreciably less active; rabbits developed ataxia at 0.2 ppm, monkeys were apathetic, suffered anorexia and appeared anesthetised progressive incoordination, hind limb immobility and muscle tremors in both nonhuman primates and dogs. <p>Insufficient data to recommend a skin, sensitiser or carcinogen notation.</p>		
DFG	2001	MAK: 0.005 ppm (0.013 mg/m³)
<p>MAK based on CNS effects in humans and animals.</p> <p>Summary of additional data:</p> <ul style="list-style-type: none"> Mild to severe symptoms seen in accidental workplace exposures at between 0.1–1 ppm; initial symptoms abnormal coordination, headache, dizziness, nausea, vomiting and photophobia; symptoms noted later include spasms of muscle groups and grand mal-like convulsions occur without tongue bite and various degrees of hypoesthesia; no further information Inhalation at 0.2 ppm produced significant toxic symptoms in five animal species (cited by ACGIH, 2001). 		
SCOEL	NA	NA
No report.		



Source	Year set	Standard
OARS/AIHA	NA	NA
No report.		
HCOTN	NA	NA
No report.		

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:	63.17
Conversion factors at 25°C and 101.3 kPa:	1 ppm = Number mg/m ³ ; 1 mg/m ³ = Number ppm
This chemical is used as a pesticide:	<input type="checkbox"/>
This chemical is a biological product:	<input type="checkbox"/>
This chemical is a by-product of a process:	<input type="checkbox"/>
A biological exposure index has been recommended by these agencies:	<input type="checkbox"/> ACGIH <input type="checkbox"/> DFG <input type="checkbox"/> 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](#) on the ACGIH website.

Deutsche Forschungsgemeinschaft (DFG) (2001) Pentaboran – MAK value documentation.

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