HYDROGENATED TERPHENYLS

CAS number: 61788-32-7

Synonyms: Partially hydrogenated terphenyl, HB-40, Therminol 66

Chemical formula: $C_{18}H_{20}$

Structural formula: —

Workplace exposure standard (amended)

TWA: **0.5 ppm (4.9 mg/m^3)**

STEL: **2 ppm (19 mg/m^3)**

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 0.5 ppm (4.9 mg/m^3) is recommended to protect for liver damage and local irritant effects in exposed workers.

A STEL of 2 ppm (19 mg/m^3) is recommended to protect for acute local irritant effects in exposed workers.

Discussion and conclusions

Hydrogenated terphenyls comprise a complex mixture of ortho-, meta- and para-terphenyls in various stages of hydrogenation. It is used in heat-transfer agents, dye solvents in carbonless paper and in plasticizer applications.

Critical effects of exposure are irritation of the upper respiratory tract following acute exposures and adverse liver and kidney effects from chronic exposures as observed in animals (ACGIH, 2018). No adverse effects are reported for workers exposed at 0.1 ppm (0.89 mg/m^3) (ACGIH, 2018). In a sub chronic inhalation study of rats, slight, non-significant changes in liver weight were observed between 1 ppm (10 mg/m^3) and 10 ppm (100 mg/m^3) with a NOAEC of 9.8 ppm (98 mg/m^3), with respect to historical control values, reported (ACGIH, 2018). Based on these same human and animal studies, primary agencies assign different recommendations.

The non-significant liver effects observed in rats at 10 and 100 ppm and the absence of adverse effects at 0.1 ppm in workers support retention of the existing TWA of 0.5 ppm (4.9 mg/m^3).

A STEL of 2 ppm (19 mg/m^3) is recommended to protect for potential acute exposures that have caused headaches, nausea and acute irritation in accidentally over-exposed workers (ACGIH, 2018; SCOEL, 1994).

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.

A skin notation is not recommended based on the available evidence.

APPENDIX

Primary sources with reports

Source	Year set	Standard
SWA	***1991***	***TWA: 0.5 ppm (4.9 mg/m^3)***
ACGIH	***2001***	***TLV-TWA: 0.5 ppm (4.9 mg/m^3)***

TLV-TWA intended to minimise potential for eye and respiratory tract irritation and adverse liver and kidney effects. Value based on slight increases in liver weights at 10 and 100 mg/m^3 of rats in a sub-chronic inhalation study and considered to be protective of transient changes to lung and eye and respiratory tract irritation.

Summary of information:

Comprise a complex mixture of terphenyl isomers, which release irritating vapours and carbon monoxide upon heating. 40% hydrogenated terphenyls (HB-40) used as nuclear reactor coolants.

Human data:

- Occupational reports of defatting of skin and temporary local irritation from direct contact
- Nausea and upper respiratory tract irritation from overheated HB-40 reported (concentration and duration not specified)
- Negative sensitisation results (n=51, alternating days, 15 d, challenge 14 d after last dose)
- Dermal application studies indicate no systemic absorption from direct contact
- Workplace study at nuclear power plant (n=122, 6 mo–7 yr) with exposure range 0.094–0.89 mg/m^3 reported no evidence for skin tumorigenicity, adverse haematological effects or skin sensitisation
    - acted as a primary skin irritant particularly on wet and sweaty skin under personal protective equipment.

Animal data:

- Oral LD_{50} for HB-40: 10,200–17,500 mg/kg (rats), 12,500 mg/kg (mice)
- LD_{LO}: 6,800 mg/kg (rabbits, 24 h, dermal); moderately irritating to skin, non-irritating to eyes
- LC_{50}: >4,700 mg/m^3 (rats, duration unspecified);
    - respiratory irritation and increased nasal, eye and mouth secretions at 2,500–4,700 mg/m^3 (4 h)
- Transient changes to alveolar structure at 500 mg/m^3 in acute inhalation study (mice, 4–7 h/d, up to 8 d); symptoms progressed after 2 d with each additional exposure
- Slight to moderate erythema, oedema, blanching and subcutaneous haemorrhaging at 125–2,000 mg/kg in repeat dermal application study (rabbits, 6 h/d, 21 d); micro-abscesses at application site at 2,000 mg/kg
- Dose-dependent increased liver weights in males at all tested exposures 10–500 mg/m^3 in sub-chronic inhalation study (rats, 6 h/d, 5 d/wk, 14 wk):
    - NOAEC: 98 mg/m^3 reported by cited authors based on historical control group ranges
    - no changes to haematological parameters at any level
    - decreased blood glucose and other blood chemistry parameters in females at 500 mg/m^3, increased total protein and calcium at 100 mg/m^3 (10 ppm)
- NOAEL: 15 mg/kg/d for increased liver and kidney weights and haematological changes in repeat feeding study (rats, 3 mo); LOAEL: 150 mg/kg/d

Source	Year set	Standard
• No evidence for carcinogenic initiation or promotion in chronic dermal application study with HB-40 (mice, 37 wk with HB-40 followed by 22 wk with croton oil, dose unspecified) • Cleared from lungs within 24 h, ingested substance concentrations peaked at 4–5 h in gut, liver and kidneys, but decreased significantly after 1 d and almost disappeared after 1 wk • No foetal or maternal toxicity at 125 or 500 mg/kg in repeat gavage developmental study (rats, GD 6–15); 1,500 mg/kg was teratogenic and maternally toxic • No genotoxic effects reported in *in vitro* or *in vivo* studies. Insufficient data to recommend a TLV-STEL or notations for carcinogenicity, skin absorption or sensitisation.		
DFG	***NA***	***NA***
No report.		
SCOEL	***1994***	***TWA: 2 ppm (19 mg/m³); STEL: 5 ppm (48 mg/m³)***
Summary of additional data: Critical effects are liver and kidney damage. TWA and STEL recommendation based on NOAEL of 98 mg/m³ and corresponding LOAEL of 500 mg/m³ for systemic effects in rats in 14 wk inhalation study (also cited in ACGIH, 2018). Since no human data available for exposures above 0.89 mg/m³ a factor of 5 is applied to the NOAEL for systemic effects in rats to arrive at the TWA of 19 mg/m³. The STEL is expected to be protective of irritational effects from exposure peaks based on reports of skin irritation and headaches at unspecified concentrations in accidentally exposed workers from nuclear power plant case study (also cited in ACGIH, 2018). Skin notation not warranted based on available evidence. Human data: • Skin irritation, headaches and sore throats from accidental spillage/exposure noted in nuclear power plant workplace study (also cited in ACGIH, 2018). Animal data: • No acute inhalational toxicity data reported • Non-genotoxic *in vitro* or *in vivo*. Sensitisation potential not discussed.		
OARS/AIHA	***NA***	***NA***
No report.		
HCOTN	***NA***	***NA***
No report.		

Secondary source reports relied upon

Source		Year	Additional information

ECHA	✓	2019	• Derived no-effect-level based on sub-chronic inhalation study with treatment range 10–500 mg/m^3 (also cited by ACGIH, 2018):
			  ○ NOAEL of 100 mg/m^3 for increased liver weight used as starting point in DNEL calculation, overall assessment factor of “6” and “3” applied to arrive at systemic DNEL of 8.38 mg/m^3 and local irritation DNEL of 83.8 mg/m^3, respectively
			  ○ DNEL calculation not presented
			• Non-mutagenic *in vitro* or *in vivo*.

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	NA
NICNAS	NA
EU Annex	NA
ECHA	—
ACGIH	—
DFG	NA
SCOEL	—
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	
Adverse effects in human case study:	no
Dermal LD_{50} ≤1000 mg/kg:	no
Dermal repeat-dose NOAEL ≤200 mg/kg:	
Dermal LD_{50}/Inhalation LD_{50} <10:	
In vivo dermal absorption rate >10%:	
Estimated dermal exposure at WES >10%:	
	a skin notation is not warranted

IDLH

Is there a suitable IDLH value available?	No

Additional information

Molecular weight:	241
Conversion factors at 25°C and 101.3 kPa:	1 ppm = 9.86 mg/m^3; 1 mg/m^3 = 0.1 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* on the ACGIH website.

EU Scientific Committee on Occupational Exposure Limits (SCOEL) (1994) Recommendation from the Scientific Committee on Occupational Exposure Limits for hydrogenated terphenyl. SEG/SUM/72.

European Chemicals Agency (ECHA) (2019) Terphenyl, hydrogenated – REACH assessment.