

HAFNIUM

CAS number: 7440-58-6

Synonyms: —

Chemical formula: Hf

Structural formula: —

Workplace exposure standard (retained)

TWA: 0.5 mg/m³

STEL: —

Peak limitation: —

Notations: —

IDLH: 50 mg Hf/m³

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 mg/m³ is recommended to protect for respiratory and eye irritation and liver effects in exposed workers.

Discussion and conclusions

Hafnium is used in control rods in nuclear reactors and the manufacture of light bulb filaments, electrodes and special glasses.

No human data are available. Critical effects of exposure in animal studies are respiratory and eye irritation and liver damage. Irritation of the eyes is reported after ocular application of hafnium tetrachloride in rabbits. In a 90 day feeding study in rats, borderline responses in the liver are reported in most exposed animals at 1% in the diet and occasionally in animals at 0.1 %. A calculated air concentration of 0.7 mg/m³ equates to the dietary response level of 0.01% (ACGIH, 2018).

A TWA of 0.5 mg/m³, as derived by ACGIH (2018), is recommended to be retained and is considered protective of respiratory and eye irritation and liver damage as reported in animals.

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: 0.5 mg/m³
ACGIH	2001	TLV-TWA: 0.5 mg/m³
<p>TLV-TWA recommended to minimise the potential for respiratory and eye irritation and for liver toxicity.</p> <p>Summary of data:</p> <p>No human data available.</p> <p>Animal data:</p> <ul style="list-style-type: none"> No published studies on the toxicity of metallic form Hf compounds cause liver damage 1 mg HfCl₄ applied to eyes of rabbits produced transient irritation Single intratracheal injections of 50 mg HfO₂ or HfC in rats resulted in pronounced cell reaction in the lungs around the dust and moderate production of collagen fibres in the alveolar walls 9 months after exposure -1% dietary level produced borderline response in the liver in a 90-d feeding study of HfCl₄ in rats <ul style="list-style-type: none"> occasional response at 0.1% (considered a LOAEL) Basis for TWA: A dietary level NOAEL of 0.01% was presumably derived by dividing the LOAEL by a factor of 10; this corresponds ≈0.7 mg/m³ assuming 100% absorption <i>via</i> ingestion and 10% absorption <i>via</i> inhalation in rats; no further explanation provided. <p>Insufficient data to recommend a sensitiser, skin or carcinogen notation or STEL.</p>		
DFG	1999	Not assigned
<p>Summary of additional data:</p> <ul style="list-style-type: none"> Previous MAK of 0.5 mg/m³ Existing data not suitable for deriving a scientifically based MAK. 		
SCOEL	NA	NA
No report.		
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	—
HCIS	NA
NICNAS	NA
EU Annex	NA
ECHA	NA
ACGIH	—
DFG	—
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:	178.49
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"/>



Molecular weight:	178.49
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This chemical is a by-product of a process:	<input type="checkbox"/>
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A biological exposure index has been recommended by these agencies:	<input type="checkbox"/> ACGIH	<input type="checkbox"/> DFG	<input type="checkbox"/> SCOEL
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Workplace exposure standard history

Year	Standard
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[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) (1999) Hafnium – MAK value documentation.

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