# 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 |
| TLV-TWA recommended to minimise the potential for respiratory and eye irritation and for liver toxicity.Summary of data:No human data available.Animal data:* 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
* 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 *via* ingestion and 10% absorption *via* inhalation in rats; no further explanation provided.

Insufficient data to recommend a sensitiser, skin or carcinogen notation or STEL. |
| DFG 1999 Not assigned |
| Summary of additional data:* 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/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) 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).