# Oxygen difluoride

| CAS number: | 7783-41-7 |
| --- | --- |
| Synonyms: | Difluorine monoxide, fluorine monoxide |
| Chemical formula: | OF2 |

Workplace exposure standard (amended)

| TWA: | **—** |
| --- | --- |
| STEL: | **—** |
| Peak limitation: | **—** |
| Notations: | **—** |
| IDLH: | **0.5 ppm** |
| **Sampling and analysis:** N/A | |

## Recommendation and basis for workplace exposure standard

This chemical has been nominated for removal from the *Workplace exposure standards for airborne contaminants* due to a lack of evidence that it is used or generated in Australian workplaces or that it presents a potential for legacy exposure. Therefore, a TWA is not recommended.

## Discussion and conclusions

Oxygen difluoride is used as an oxidiser in rocket propellants. There is lack of evidence that this chemical is used or generated in Australian workplaces or that it presents a potential for legacy exposure.

Critical effects of exposure in humans are severe headaches, which have been reported in laboratory workers exposed above 0.1 ppm (ACGIH, 2018; HCOTN, 2004).

In animals, acute exposures at 0.5 ppm are associated with severe pulmonary oedema and congestion of kidneys and internal genitalia. A NOAEC of 0.1 ppm for these effects is reported in a sub-chronic inhalation study (ACGIH, 2018; HCOTN, 2004).

This chemical has been nominated for removal from the WES list. A TWA is not recommended.

## 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 Peak limitation: 0.05 ppm (0.11 mg/m3) | |
|  |
| ACGIH 2001 TLV-CEILING: 0.05 ppm (0.11 mg/m3) |
| TLV-Ceiling intended to minimise potential for headache and irritation of the respiratory tract.  Congestion and distension of kidneys and internal genitalia is reported in exposed animals; the margin of safety provided by the TLV-Ceiling for these effects is unknown.  Summary of data:  TLV-Ceiling based on acute exposure data in monkeys and dose-response relationship shown in repeat exposure studies in animals, supported by the TLV recommendations for the toxicologically similar ozone and fluorine gases.  Human data:   * Human exposure data are limited to qualitative reports of intractable headaches in inadvertently exposed laboratory workers carrying out controlled animal exposure studies (no further exposure details provided)   Animal data:   * LC50 (1 h): 1.5 ppm (mice), 2.6 ppm (rats), 16–20 ppm (monkeys), 20–26 ppm (dogs):   + symptoms included lachrymation, dyspnoea, weakness, vomiting; massive pulmonary oedema and haemorrhage were reported at autopsy * Lethal at 0.5 ppm to various model species (not specified, 7 h/d, 2 d):   + causes drowsiness <0.5 ppm   + pulmonary oedema and haemorrhage >0.5 ppm   + exposure also caused distention and congestion of the kidneys and internal genitalia (no details on exposure provided) * NOAEL of 0.1 ppm for signs of toxicity (presumably symptoms from acute exposure experiment) in sub-chronic inhalation study with 5 model species:   + cited article also describes acute exposure experiment with presumably the same model species (5 model species; species not specified but one non-rodent, 7 h/d, 30 d) - (identified by HCOTN, 2004 as mice, rats, guinea pigs, rabbits, dogs) * Younger animals more susceptible to pulmonary effects than older animals; tolerance developed following single doses at 0.1 ppm (no further details provided) * Mice gained tolerance at 1 ppm (60 min) followed by 4.25 ppm (60 min) after 8 d * No ADME or mutagenicity data presented.   Insufficient data to recommend notations for carcinogenicity, skin absorption or sensitisation. |
| DFG NA NA |
| No report. |
| SCOEL NA NA |
| No report. |
| OARS/AIHA NA NA |
| No report. |
| HCOTN 2004 Ceiling Limit: 0.05 ppm, (0.1 mg/m3) |
| Summary of additional data:  Based on available evidence, current administrative ceiling OEL considered too high to be protective of severe pulmonary effects, which occur at an order of magnitude above the current Ceiling Limit.  Human data:   * Severe headaches at 0.1–10 ppm in laboratory personnel carrying out controlled animal exposure experiments (no further details, also cited in ACGIH, 2018) * Odour threshold 0.1–4 ppm.   Animal data:   * Non-lethal to 10/10 rats at 10 ppm (5 min) and 5 ppm (15 min); lethal to 7/10 at 20 ppm (5 min), 9/10 at 30 ppm (5 min) and 10/10 at 40 ppm (5 min); lethal to 7/10 at 10–15 ppm (15 min):   + death occurred between 10–60 h following exposure. * No evidence of toxicity at 0.1 ppm in sub-chronic inhalation study (mice, rats, guinea pigs, rabbits, dogs, 7 h/d, 30 d, also cited in ACGIH, 2018); some variability in toxicity (not specified) at 2–5 ppm depending on age and species, older mice more resistant than younger ones:   + agency considers this report insufficiently documented to derive health-based OEL. * Tolerance can be produced when induction concentration is near lethal levels * No ADME or mutagenicity data presented. |

### Secondary source reports relied upon

| Source |  | Year | Additional information |
| --- | --- | --- | --- |
| US NIOSH |  | 1994 | IDLH based on acute inhalation toxicity data in humans. |

### 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 | — |
| ACGIH | — |
| DFG | NA |
| SCOEL | NA |
| HCOTN | — |
| 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: | 54 |
| --- | --- |
| Conversion factors at 25°C and 101.3 kPa: | 1 ppm = 2.25 mg/m3; 1 mg/m3 = 0.44 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.

Health Council of the Netherlands (HCOTN) (2004) Oxygen difluoride. Health-based Reassessment of Administrative Occupational Exposure Limits. The Hague: Health Council of the Netherlands; publication no. 2000/15OSH/126.

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