# SulFuryl fluoride

| CAS number: | 2699-79-8 |
| --- | --- |
| Synonyms: | Sulfuric oxyfluoride, sulphuryl fluoride, sulfuryl difluoride, Vikane® |
| Chemical formula: | SO2F2 |
| Structural formula: | — |

Workplace exposure standard (amended)

| TWA: | **—** |
| --- | --- |
| STEL: | **—** |
| Peak limitation: | **—** |
| Notations: | **—** |
| IDLH: | **200 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

Sulfuryl fluoride is used as a fumigant insecticide. 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 chronic exposure are CNS depression, lung and kidney damage and dental fluorosis as observed in animals.

The available occupational exposure data indicate that average workplace air concentrations are typically 5 ppm for fumigators. A maximum air concentration of 10 ppm for the workplace is suggested in one study, but no further details on this assessment are provided (ACGIH, 2018). Acute exposures in humans are associated with dyspnoea, nausea, eye and pulmonary irritation and gastrointestinal distress (ACGIH, 2018; HCOTN, 2004). Accidental exposure to an unknown concentration of sulfuryl fluoride of two residents returning to their house following fumigation caused death from cardiopulmonary complications. Eye irritation, diffuse bronchi, nausea and itchy skin are reported in a separate case of accidental exposure (ACGIH, 2018). A NOAEC of 30 ppm for neurotoxicity and dental fluorosis is reported in rats in sub-chronic inhalation studies (ACGIH, 2018) and is consistent with a NOAEC of 20 ppm for the same endpoints reported in a chronic inhalation study (HCOTN, 2004). The available primary sources uniformly recommend a TWA equivalent of 5 ppm (ACGIH, 2018; HCOTN, 2004). ACGIH (2018) additionally recommends a TLV-STEL of 10 ppm. The derivation of these values is not detailed but is likely based on the NOAEC of 20 to 30 ppm in rats and the recommended maximum occupational exposure of 10 ppm from a study reported by ACGIH (2018).

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 TWA: 5 ppm (21 mg/m3); STEL: 10 ppm (42 mg/m3) | |
|  |
| ACGIH 2001 TLV-TWA: 5 ppm (21 mg/m3); TLV-STEL: 10 ppm (42 mg/m3) |
| TLV-TWA intended to protect for CNS depression and potential fluorosis.  TLV-STEL intended to protect for acute symptoms including nausea, vomiting, gastrointestinal distress, dyspnoea, cough and pulmonary and eye irritation.  Summary of information:  TLV-TWA and TLV-STEL based on weight of evidence including a NOAEC of 30 ppm for systemic effects in rats, limited occupational exposure data and a recommended OEL of 10 ppm from a study on the toxicological properties of fumigant chemicals (no further details on derivation provided).  Human data:   * Acute exposure can be fatal (no further details provided) * Lethal exposure of 2 residents returning to their house following fumigation: * male died following cardiopulmonary arrest after 24 h * female died following ventricular fibrillation and diffuse pulmonary infiltration after 6 d * Fumigators exposed at 5 ppm on average, range 0.9–8.7 ppm (no further details provided, also reported by HCOTN, 2004) * Conjunctival irritation, diffuse bronchi, nausea, vomiting, abdominal pain and itchy skin described in a separate case of accidental exposure: * serum fluoride elevated 1 d post-exposure (no further details provided) * No exposure-related differences in neurologic or psychologic parameters between exposed and non-exposed workers reported in a study (no further details provided) * Minor inhalational retention (no further details provided); appears as inorganic fluoride in circulation following absorption and is excreted via urine * Another study recommends 10 ppm as a maximum concentration during an 8 h shift 5 d/wk (no further details provided).   Animal data:   * LC50: 3,090–4,510 ppm (rats, 1 h), ≈1,000 ppm (rats, 4 h): * tonic convulsions, alveolar haemorrhage and pulmonary congestion ≥6,000 ppm * Reversible renal and pulmonary damage (not specified) at 20 ppm (mice, rats, guinea pigs, 7 h/d, 12 mo); no effects at 6 mo: * some evidence for fluorosis in mice, but not in other species * Elevated serum fluoride (rabbits), no signs of toxicity at 30 pm in sub-chronic inhalation study with dose group 30, 100 and 300 ppm (rats, rabbits, 6 h/d, 5 d/wk, 13 wk):   + mottled incisors at 100 and 300 ppm, signs of renal and pulmonary damage and inflammation of nasal tissue at 300 ppm (rats)   + nasal tissue damage and significantly elevated serum fluoride at 100 and 300 ppm (rabbits) * NOAEC of 30 ppm for neurologic and histopathologic changes reported in another sub-chronic inhalation study (rats, 6 h/d, 5 d/wk, 13 wk): * CNS depression and fluorosis at 100 and 300 ppm.   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 TWA: 5 ppm (20 mg/m3) |
| Summary of additional data:  Existing administrative OEL considered too high; HBROEL derived from NOAEC of 85 mg/m3 (20 ppm) for minor lung lesions in chronically exposed rats. An overall UF of 9 is applied to account for inter- and intraspecies differences and result rounded up to HBROEL of 10 mg/m3 (2.4 ppm).  Human data:   * Male hospitalised with nausea, vomiting, abdominal pain and itchy skin following exposure at unknown concentration assumed to be at least an average of 5 ppm for 4 h: * itchy throat, flatulence and difficulty reading after 4 d * full recovery after 9 d (also cited in ACGIH, 2018) * Fumigators (n=6) exposed at 5 ppm on average of 2 h (maximum 8.7 ppm) reported in case control study (also cited by ACGIH, 2018) * No increased risk of developing brain tumours in fumigation workers reported in case control study (no further details provided).   Animal data:   * Slight dental fluorosis at 20 ppm (males), kidney and lung damage at 80 ppm (males and females) in chronic inhalation studies with exposure groups 0, 5, 20 and 80 ppm (rats, 6 h/d, 5 d/wk, 12 and 24 mo):   + NOAEC of 20 ppm for lung and kidney damage (males/females) and 5 ppm for dental fluorosis (males)   + dental fluorosis in males at 20 ppm was “very slight” according to agency and was not used as a POD; severe fluorosis observed in both males and females at 80 ppm. * Non-mutagenic *in vitro* in bacteria or *in vivo* in micronucleus assay with inhalational exposure at 0–520 ppm (mice, no further experimental details provided). |

### Secondary source reports relied upon

| Source |  | Year | Additional information |
| --- | --- | --- | --- |
| US NIOSH |  | 1994 | * IDLH for sulfuryl fluoride is 200 ppm based on acute inhalation toxicity data in animals |

### 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 | — |
| NICNAS | NA |
| EU Annex | — |
| 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: | 102.06 |
| --- | --- |
| Conversion factors at 25°C and 101.3 kPa: | 1 ppm = 4.17 mg/m3; 1 mg/m3 = 0.240 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) Sulphuryl difluoride. Health-based calculated occupational cancer risk values. The Hague: Health Council of the Netherlands; publication no. 2000/15OSH/141.

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