# Phenyl glycidyl ether (PGe)

| CAS number: | 122-60-1 |
| --- | --- |
| Synonyms: | 1,2-Epoxy-3-phenoxypropane, 2,3-epoxypropylphenylether, gamma-phenoxypropylene oxide, oxirane, PGE, phenoxymethyl, phenoxypropenoxid |
| Chemical formula: | C9H10O2 |
| Structural formula: | — |

Workplace exposure standard (retained)

| TWA: | **1 ppm (6.1 mg/m3)** |
| --- | --- |
| STEL: | — |
| Peak limitation: | — |
| Notations: | **Carc. 1B, Sk., DSEN** |
| IDLH: | **100 ppm** |
| **Sampling and analysis:** The recommended value is quantifiable through available sampling and analysis techniques. | |

## Recommendation and basis for workplace exposure standard

A TWA of 1 ppm (6.1 mg/m3) is recommended to protect for sensitisation and irritation of the respiratory tract in exposed workers. This TWA is also considered to minimise the potential for nasal cancer demonstrated in animals.

## Discussion and conclusions

Phenyl glycidyl ether (PGE) is used in curing agents and epoxy resins. It is an effective stabiliser of halogenated compounds and is used as a solvent for halogenated materials.

Critical effects of exposure include allergic reactions, dermatitis with manifestations of blisters and second-degree burns, respiratory tract irritation and skin sensitisation (ACGIH, 2018).

No inhalation studies are available in humans. No effects reported at 1 ppm on respiratory tract and skin irritation at 5 ppm in a ten-week study in rats. A NOAEC of 1.3 ppm for alopecia is reported in a 90-day inhalation study in rats; LOAEC of 5 ppm attributed to skin irritation effect of the chemical (ACGIH, 2018). Carcinogenic effects (nasal tumours) reported in a chronic inhalation study in rats with a NOAEC of 1 ppm and a LOAEC of 12 ppm (ECHA, 2019). There is no evidence of carcinogenicity in humans.

A TWA of 1 ppm (6.1 mg/m3) is recommended to be retained and is considered protective of respiratory tract and skin irritation observed in animals. The TWA is also considered to protect for nasal cancers observed in animals.

## Recommendation for notations

Classified as a category 1B carcinogen according to the Globally Harmonized System of Classification and Labelling of Chemicals (GHS).

Classified as a skin sensitiser and not a respiratory sensitiser according to the GHS.

A skin notation is recommended based on evidence suggesting potential dermal absorption and adverse systemic effects in animals.

# Appendix

### Primary sources with reports

| **Source Year set Standard** |
| --- |
| SWA 1991 TWA: 1 ppm (6.1 mg/m3) | |
|  |
| ACGIH 2014 TLV-TWA: 0.1 ppm (0.6 mg/m3) |
| TLV-TWA recommended to minimise the potential for testicular toxicity, nasal cancer and sensitisation.  Summary of data:  Human data:   * No reports of systemic intoxication * Irritation, allergic reactions (from prolonged or repeated contact) and skin sensitisation results from direct skin contact (no details of exposure reported): * occupational exposure caused dermatitis, with manifestations of blisters and second‑degree burns * Dermatitis cases reported in 13/20 workers exposed 2 mo/yr (1947-1956): * Signs of clinical sensitisation (including second degree burns, blisters, swelling of connective tissue and oedema) in one worker * Mean time to sensitisation in exposed workers 6.5 mo * Reported contact dermatitis in 20 workers at aircraft factory with symptoms ranging from slight erythema to strong vesicular lesions on upper extremities and face: * patch testing found 13/20 positive for epoxy-resin containing PGE * 2.6% of 360 patients exposed to plastics exhibited allergic patch test reactions * Reports of cross-sensitisation between allyl glycidyl ether, n-butyl glycidyl ether and PGE.   Animal data:   * Large doses caused death in experimental animals by CNS depression and respiratory muscle paralysis * LD50: 2,160–2,990 mg/kg bw (rabbits, dermal) * Application to shaved backs of rats caused haematopoietic depression: * also found in rabbits following topical application or iv injection and in dogs following iv injection * Exposure at 5–12 ppm (30–72 mg/m3), 5 d/wk for 10 wk in rats caused respiratory tract and skin irritation: * no effects at 1 ppm (6 mg/m3) * at 10 ppm, respiratory tract inflammation and signs of liver necrosis * 90-d inhalation chamber study in rats and dogs (exposure at 0, 1.3, 5 and 11.8 ppm, 6 h/d, 5 d/wk); no adverse effects in rats at 1.3 ppm, but alopecia observed beyond this dose, attributed to skin irritation effect of the chemical; no adverse effects in dogs at any exposure * Chronic inhalation study in male and female rats, exposed at 0, 1 or 12 ppm for 6 h/d, 5 d/wk for 24 mo; nasal tumours found in both sexes exposed at 12 ppm (NOAEC of 1 ppm) * Mutagenic in *S. typhimurium*, *E. coli* and *K. pneumoniae* * Uptakes of 13.5 mg/cm2/h in rats and 4.2 mg/cm2/h in rabbits following topical application (dose not provided).   Skin and DSEN notation assigned, insufficient data to recommend a TLV-STEL or RSEN notation. |
| DFG 1992 Not assigned |
| Summary of additional data:   * Genotoxic effects not seen in *in vivo* tests in mice and rats. |
| SCOEL NA NA |
| No report. |
| OARS/AIHA NA NA |
| No report. |
| HCOTN 2002 Not assigned |
| Summary of additional data:   * Insufficient data to provide evidence of carcinogenicity in humans; only 1 study in animals shows cause for concern * Committee concluded insufficiently investigated and recommended classification as suspected human carcinogen. |

### Secondary source reports relied upon

| **Source** |  | **Year** | **Additional information** |
| --- | --- | --- | --- |
| NICNAS |  | 2013 | * LD50: 3,850 mg/kg (rats, oral); 1,400 mg/kg (mice, oral); general depressed activity, changes in motor activity and ataxia * Not considered a reproductive or developmental toxin. |
| IARC |  | 1999 | * Sufficient evidence in experimental animals to indicate carcinogenicity; classified as *possibly carcinogenic to humans* (Group 2 B) * No additional information. |
| ECHA |  | 2019 | * NOAEC = 1 ppm (24 mo, rat inhalation study referred to in ACGIH, 2014). |
| US NIOSH |  | 1994 | * REL= 1 ppm (6 mg/m3) 15-min ceiling; PEL= 10 ppm. |

### Carcinogenicity — non-threshold based genotoxic carcinogens

| Is the chemical mutagenic? | Yes |
| --- | --- |
| 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 | Sen |
| HCIS | Carcinogenicity – category 1B, Skin sensitisation – category 1 |
| NICNAS | Carc. Cat. 2, Sensitiser |
| EU Annex | Carcinogenicity – category 1B, Skin sensitisation – category 1 |
| ECHA | Carcinogenicity – category 1B |
| ACGIH | Carcinogenicity – A3, Skin, DSEN |
| DFG | Carcinogenicity – 2, H (skin), Sh (dermal sensitiser) |
| SCOEL | NA |
| HCOTN | NA |
| IARC | Carcinogenicity – Group 2B |
| 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: | yes | 4.00 |  |
| Dermal LD50 ≤1000 mg/kg: | no |  |  |
| Dermal repeat-dose NOAEL ≤200 mg/kg: |  |  |  |
| Dermal LD50/Inhalation LD50 <10: |  |  |  |
| *In vivo* dermal absorption rate >10%: |  |  |  |
| Estimated dermal exposure at WES >10%: | yes | 2.00 |  |
|  |  | 2 | **a skin notation is warranted** |

### IDLH

| Is there a suitable IDLH value available? | Yes |
| --- | --- |

## Additional information

| Molecular weight: | 150.17 |
| --- | --- |
| 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) (1992) Phenyl glycidyl ether – MAK value documentation.

European Chemicals Agency Regulation (ECHA) No 1907/2006 of the European Parliament and of the Council of 18 December 2006 concerning the Registration, Evaluation, Authorisation and Restriction of Chemicals (REACH).

Health Council of the Netherlands (HCOTN) (2002) Phenyl glycidyl ether. Evaluation of the carcinogenicity and genotoxicity. The Hague: Health Council of the Netherlands; publication no. 2002/06OSH.

International Agency for Research on Cancer (IARC) (1999) Volume 71, re-evaluation of some organic chemicals, hydrazine and hydrogen peroxide. IARC Monographs on the evaluation of the carcinogenic risk to humans.

National Industrial Chemicals Notification and Assessment Scheme (NICNAS) (2013) Oxirane, (phenoxymethyl): Human health tier II assessment – IMAP report.

Tenth Adaptation to Technical Progress Commission Regulation (EU) No 2017/776 amending, for the purposes of its adaptation to technical and scientific progress, Regulation (EC) No 1272/2008 of the European Parliament and of the Council on classification, labelling and packaging of substances and mixtures (the CLP Regulation).

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