# Allyl Glycidyl Ether (AGE)

| CAS number: | 106-92-3 |
| --- | --- |
| Synonyms: | 2-(prop-2-enoxymethyl)oxirane: AGE:  glycidyl allyl ether |
| Chemical formula: | C6H10O2 |
| Structural formula: |  |

Workplace exposure standard (interim)

| TWA: | **0.1 ppm (0.5 mg/m3)** |
| --- | --- |
| STEL: | **—** |
| Peak limitation: | **—** |
| Notations: | **Carc. 2, Sk., DSEN** |
| IDLH: | **—** |
| Sampling and analysis: | There is uncertainty regarding quantification of the recommended value with currently available sampling and/or analysis techniques. |

## Recommendation and basis for workplace exposure standard

An interim TWA of 0.1 ppm (0.5 mg/m3) is recommended to protect for cancers in exposed workers. This TWA is also expected to minimise the potential for ocular, dermal and upper respiratory tract irritation and contact dermatitis in exposed workers.

AGE is characterised as a non-threshold based genotoxic carcinogen and the recommended TWA is associated with a minimal cancer risk. Neither a cancer slope factor or inhalation unit risk factor is available and it is recommended that a priority review be undertaken at the next scheduled review.

## Discussion and conclusions

AGE is an organic compound used in adhesives and sealants and as a monomer for polymerisation reactions. It has returned positive results from adequately conducted mutagenicity and genotoxicity tests and has shown carcinogenic effects in animals. However, there are no carcinogenic data from human studies. AGE is an irritant of the eyes and upper respiratory system in animals and humans and is considered a dermal sensitiser (ACGIH, 2018; NICNAS, 2017; DFG, 2003).

AGE is characterised as a non-threshold based genotoxic carcinogen. Currently (DFG, 2003). No suitable exposure-response functions are available to derive a risk-based value in relation to carcinogenicity. Therefore, an interim TWA of 0.1 ppm (0.5 mg/m3) has been recommended.

The interim TWA is derived from a sub-chronic inhalation study in mice that reported upper respiratory tract irritation at 1 ppm and an interspecies uncertainty factor of 10.

## Recommendation for notations

Classified as a category 2 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 as evidence indicates skin absorption results in systemic effects.

# Appendix

### Primary sources with reports

| Source Year set Standard |
| --- |
| SWA 1991 TWA: 5 ppm (23 mg/m3); STEL: 10 ppm (47 mg/m3) | |
|  |
| ACGIH 2001 TLV-TWA: 1 ppm (4.7 mg/m3) |
| TLV-TWA recommended to minimise the potential for ocular, dermal and upper respiratory tract irritation and contact dermatitis in exposed workers.  Summary of data:  Human data:   * Worker reported dermatitis consisting of itching, swelling and blister formation following exposure to vapour and/or liquid * Patch-testing confirmed clinical sensitisation * 250 ppm (1,144 mg/m3) ≡ LC50:270 ppm (mouse, 4 h) listed as ‘irritating concentration’.   Animal data:   * 5 ppm (6 h/d, 5 d/wk for 102–103 wk) in rodents: squamous metaplasia, inflammation, respiratory epithelial and basal cell hyperplasia, olfactory epithelial degeneration and dysplasia * LC50: 270 ppm (mouse, 4 h) * RD50: 5.7 ppm (mouse, 15 min) * Carcinogenicity: US NTP concluded equivocal evidence in male rats and female mice; some evidence in male mice * Direct-acting, base-pair substitution mutagen in *Salmonella typhimurium* and increased frequency of chromosomal aberrations and sister-chromatid exchanges using cultured Chinese hamster ovary cells. |
| DFG 1996/2003 NA |
| Genotoxic with weak carcinogenic effects in animals and clear genotoxic mechanisms; therefore MAK cannot be established.  Summary of additional data:   * Inhalation study: upper respiratory tract irritation in rats (4 ppm) and mice (1 ppm); 6 h/d,   5 d/wk, 13 wk   * 500 mg/kg dermal application killed all dosed rabbits in 1 wk and 1,000 mg/kg killed all dosed rabbits overnight. |
| SCOEL NA NA |
| No report |
| OARS/AIHA NA NA |
| No report |
| HCOTN NA NA |
| No report |

### Secondary source reports relied upon

| Source |  | Year | Additional information |
| --- | --- | --- | --- |
| NICNAS |  | 2015 | * Positive mutagenicity in *Salmonella typhimurium* strains * Positive mutagenicity in *Escherichia coli* * Positive genotoxicity, micronucleus assay in male mice, intraperitoneal injections and sex-linked recessive lethal mutations and loss of ring X-chromosome in *Drosophila melanogaster* * Mice exposed to 100 ppm in a 2 yr inhalation study developed tumours in the nasal passages (epithelial adenocarcinomas, papillary adenomas, harderian gland adenomas, and squamous cell carcinomas) * Critical health effects include systemic long-term effects (carcinogenicity, mutagenicity, and reproductive toxicity), systemic acute effects (oral and inhalation exposure) and local effects (skin sensitisation, skin and respiratory irritation, and possibly serious eye damage). |

### Carcinogenicity — non-threshold based genotoxic carcinogens

| Is the chemical mutagenic? | Yes |
| --- | --- |
| Is the chemical carcinogenic with a mutagenic mechanism of action? | Yes |
| **The chemical is a non-threshold based genotoxic carcinogen.** |  |
| Is a cancer slope factor or inhalation unit risk value available? | No |

## Notations

| Source | Notations |
| --- | --- |
| SWA | Carc. 2; Skin; Sen |
| HCIS | Carcinogenicity – category 2; Skin sensitisation – category 1 |
| NICNAS | Carc. Cat. 3 |
| EU Annex | Carcinogenicity – category 2; Skin sensitisation – category 1 |
| ECHA | NA |
| ACGIH | Carcinogenicity – A4 |
| DFG | Carcinogenicity – 2; Sh (dermal sensitiser); H(skin) |
| SCOEL | NA |
| HCOTN | NA |
| IARC | NA |
| US NIOSH | SK:SEN |

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: | yes | 3.00 |  | | Dermal repeat-dose NOAEL ≤200 mg/kg: |  |  |  | | Dermal LD50/Inhalation LD50 <10: |  |  |  | | *In vivo* dermal absorption rate >10%: |  |  |  | | Estimated dermal exposure at WES >10%: |  |  |  | |  |  | 3 | **a skin notation is warranted** | |

### IDLH

| Is there a suitable IDLH value available? | No, the chemical is a genotoxic carcinogen |
| --- | --- |

## Additional information

| Molecular weight: | 114.15 |
| --- | --- |
| 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) (1996) Allyl glycidyl ether – MAK value documentation.

Deutsche Forschungsgemeinschaft (DFG) (2003) Allyl glycidyl ether – MAK value documentation.

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).

National Industrial Chemicals Notification and Assessment Scheme (NICNAS) (2015) Aliphatic and allyl glycidyl ethers: Human health tier II assessment – IMAP report

US National Institute for Occupational Safety and Health (NIOSH) (2014) Skin Notation Profiles: Allyl Glycidyl Ether