# Sodium hydroxide

| CAS number: | 1310-73-2 |
| --- | --- |
| Synonyms: | Caustic soda, lye |
| Chemical formula: | NaOH |
| Structural formula: | — |

 Workplace exposure standard (retained)

| TWA: | **—** |
| --- | --- |
| STEL: | **—** |
| Peak limitation: | **2 mg/m3** |
|  Notations: | **—** |
| IDLH: | **10 mg/m3** |
| **Sampling and analysis**: The recommended value is quantifiable through available sampling and analysis techniques.  |

## Recommendation and basis for workplace exposure standard

A peak limitation of 2 mg/m3 is recommended to protect for acute irritation of the eyes, skin and mucous membranes in exposed workers.

## Discussion and conclusions

Sodium hydroxide is a soluble, strong base, used in numerous industries such as pulp and paper, soap and detergents, cellophane and textiles, etching and electroplating.

The critical effects are identified as irritation of the eyes, skin and mucous membranes (ACGIH, 2001).

Much of the data from humans generally relates to accidental or suicidal ingestion with effects include necrosis, principally of the mouth, oesophagus, gastric mucosa, hypersalivation, emesis, cardiovascular collapse, tracheal obstruction and dyspnoea, retching and severe pain (ACGIH, 2018). The main effects of exposure are local irritation and corrosion. Very limited inhalation data are available with irritant effects of caustic mists encountered at 1 to 40 mg/m3, with 2 mg/m3 considered ‘noticeably but not excessively’ irritating (ACGIH, 2018).

The peak limitation of 2 mg/m3 as assigned by SWA, ACGIH (2018) and HCOTN (2000) is recommended to be retained and is generally protective of irritation to eyes, skin and mucous membranes in exposed workers.

## 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.

A skin notation is not recommended based on the available evidence.

# Appendix

### Primary sources with reports

| Source Year set Standard  |
| --- |
| SWA 1991 Peak limitation: 2 mg/m3 |
|  |
| ACGIH 2001 TLV-Ceiling: 2 mg/m3 |
| TLV-Ceiling recommended to minimise irritation to eyes, skin and mucous membranes in exposed workers. TLV is based on a concentration that produces a noticeable, but not excessive, ocular and upper respiratory tract irritation.Summary of data:Human data:* Numerous cases of accidental and suicidal poisonings
* Ingestion causes necrosis, principally of the mouth, oesophagus and gastric mucosa, hypersalivation, emesis, cardiovascular collapse, tracheal obstruction and dyspnoea, retching and severe pain
* Death occurs due to shock, infection of corroded tissue, pulmonary necrosis or asphyxia
* Report of one oesophageal carcinoma due to localised stricture following ingestion
* 2 mg/m3 considered ‘a concentration that is noticeably, but not excessively, irritant’:
* irritant effects of caustic mists encountered at 1–40 mg/m3, (no exposure or sampling times provided)
* Burning and redness of nose, throat or eyes reported in workers undertaking cleaning with airborne concentrations of 0.005–0.7 mg/m3:
* solvents also present up to 780 mg/m3 (no exposure or sampling times provided)
* Severe eye injury reported in workers exposed to high concentrations (as dust or liquid); no further information
* Application of 1 g equivalent to forearms of volunteers (15–180 min) caused dissolution of cells in outer layer of epidermis, progressing to oedema and destruction of epidermis in 60 mins.

Animal data:* Ingestion in dogs causes haemorrhagic gastritis and oesophageal strictures
* Oral intubation in rabbits:
* 4% solution caused mucosal and submucosal necrosis
* 12% solution eroded into muscle
* 28% solution caused perforation
* similar results in cats
* 5% aqueous solution applied to rabbit skin (4 h) caused severe necrosis
* Rats inhaling aerosols 30 min/d suffered pulmonary damage (concentrations not provided).

Insufficient data to recommend skin, SEN or carcinogenicity notations. |
| DFG 1999 Not assigned |
| MAK withdrawn as cannot identify exposure concentration where irritation will certainly not occur from available data.Summary of additional data:* Corrosive to skin and eyes
* Poorly documented reports of irritation to airways and eyes from exposure at 0.5 mg/m3
* No increased mortality from malignant and non-malignant diseases amongst 265 workers at factory producing chlorine, employed up to 30 y
* Negative in mutagenicity tests; clastogenic effects *in* vitro following increased pH of the culture medium with metabolic activation only
* ‘Few available tests’ indicate not genotoxic at physiological pH:
* local carcinogenic effects observed in humans following severe poisoning and animals after dermal application due to cell regeneration following tissue damage and scarring
* 48 h patch test in volunteers:
* no irritation from 1% aqueous solution but irritant skin reactions at ≥2%.
 |
| SCOEL NA NA |
| No report |
| OARS/AIHA NA NA |
| No report |
| HCOTN 2000 Ceiling limit: 2 mg/m3 |
| Summary of additional data:* Most dominant effect is local irritation and corrosion
* 10% solution corrosive in *in vitro* skin corrosion test
* TWA exposure levels of 265 workers survey (cited in DFG, 1999) estimated to be 0.5–2.0 mg/m3:
* medical aid was sought most for skin contact and least for inhalation
* 2 h exposure at 65 mg/m3 (nose only) or 250–3,200 mg/m3 (whole body) in young and adult rats:
* larynx target organ
* no effects on nasal turbinates, lungs, oesophagus or stomach
* no effects at 65 mg/m3
* 6/11 died at 3,200 mg/m3
* aerosols mainly consisted of Na2CO3
* LD50: 1,350 mg/kg (rabbits, dermal)
* Committee concluded insufficient information to comment on OEL.
 |

### Secondary source reports relied upon

| Source |  | Year | Additional information |
| --- | --- | --- | --- |
| US NIOSH |  | 1994 | * REL 2 mg/m3 ceiling
* IDLH 10 mg/m3.
 |

### 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 | — |
| EU Annex | NA |
| ECHA | — |
| ACGIH | — |
| DFG | — |
| SCOEL | NA |
| HCOTN | — |
| IARC | NA |
| US NIOSH | — |

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: |   |   |   |
| 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%: |   |   |   |
|   |   |   | **a skin notation is not warranted** |

### IDLH

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

## Additional information

| Molecular weight: | 39.99 |
| --- | --- |
| 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) Sodium hydroxide – MAK value documentation.

Health Council of the Netherlands (HCOTN) (2000) Sodium hydroxide. Health-based calculated occupational cancer risk values. The Hague: Health Council of the Netherlands; publication no. 2000/15OSH/015.

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

US National Institute for Occupational Safety and Health (NIOSH) (2011) NIOSH Skin Notation Profiles: Sodium Hydroxide (NaOH).