CYANOACRYLATES (ETHYL & METHYL)

CAS number: 7085-85-0 (ethyl 2-cyanoacrylate)
137-05-3 (methyl 2-cyanoacrylate)

Synonyms: Ethyl 2-cyanoacrylate: 2-cyanoacrylic acid, ethyl ester, 2-cyano-2-propenoic acid, ethyl ester, ECA

Methyl 2-cyanoacrylate: 2-cyanoacrylic acid, methyl ester, 2-cyano-2-propenoic acid, methyl ester, MCA

Chemical formula: $C_6H_7NO_2$ (ethyl 2-cyanoacrylate)
$C_5H_5NO_2$ (methyl 2-cyanoacrylate)

Structural formula: —

Workplace exposure standard (new)

TWA: **0.2 ppm (1 mg/m^3)**

STEL: **1 ppm (5.1 mg/m^3)**

Peak limitation: **—**

Notations: **Sk.**

IDLH: **—**

Sampling and analysis: The recommended value is quantifiable through available sampling and analysis techniques.

Recommendation and basis for workplace exposure standard

A TWA of 0.2 ppm (1 mg/m^3) is recommended to protect for irritation of the eyes, nose and upper airways in exposed workers.

A STEL of 1 ppm (5.1 mg/m^3) is recommended to protect for irritation of the eyes, nose and upper airways in acute exposures.

Discussion and conclusions

Ethyl 2-cyanoacrylate (ECA) and methyl 2-cyanoacrylate (MCA) are used as adhesives in the high-bond-strength, fast-acting household superglues. Approximately 90% of the commercial volume is ECA, with continuing decrease in MCA volume. Critical effects include irritation of the eyes and upper respiratory system.

A NOAEC of 1 ppm (MCA) for short term exposure was reported with exposure at 2 to 3 ppm for two hours producing nasal irritation in human subjects. Workers exposed to ECA at 0.31 ppm (1.6 mg/m^3) reported wheezing and whistling breath, shortness of breath, chest tightness and irritation of the eyes, nose and throat. There was no evidence of pulmonary obstruction in workers exposed to mean exposures of 0.2 ppm and peaks of 1.5 ppm over 17 years reported in an epidemiological study (ACGIH, 2018). Evidence also suggest the possibility of local damage by exposure to MCA at concentrations at or above 3 ppm and eye irritation beginning at 5 ppm (DFG, 2002).

The TWA of 0.2 ppm derived by ACGIH (2018) is recommended based on the epidemiological study showing no pulmonary effects at mean exposures of 0.2 ppm. This TWA is suitably protective of irritation and pulmonary obstruction in exposed workers. Based on the short-term exposure study with a NOAEC of 1 ppm in humans, the STEL of 1 ppm derived by ACGIH (2018) is recommended to protect for acute irritant effects in exposed workers (ACGIH, 2018).

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. It is recommended that a review of dermal and respiratory sensitisation be undertaken at the next scheduled as human studies indicate sensitivity and systemic effects.

A skin notation is recommended based on evidence suggesting potential dermal absorption and contact dermatitis in humans.

APPENDIX

Primary sources with reports

Source	Year set	Standard
SWA	***NA***	***NA***
ACGIH	***2018***	***TLV-TWA: 0.2 ppm (1 mg/m^3); TLV-STEL: 1 ppm (5.1 mg/m^3)***

TLV-TWA and TLV-STEL recommended for both ECA and MCA to minimise the potential for irritation of the eyes and the nasal and pharyngeal mucosa.

Summary of data:

Human data:

- NOAEL of 1 ppm for short term exposure was symptom free
  - 2–3 ppm for 2 h MCA produced nasal irritation in humans
- Epidemiological study: 8 h average of 0.90 ppm ECA (4.6 mg/m^3); associated with acute mucosal irritation and possible pulmonary sensitisation
- Epidemiological study: 0.31 ppm ECA (1.6 mg/m^3); workers reported wheezing and whistling breath, shortness of breath, chest tightness, irritation to eyes, nose and throat
- Worker exposures to ECA at 0.04 ppm were below the level of causing effects (i.e. NOAEC)
- An epidemiologic study of 450 workers (ECA and MCA) over 17 yr with geometric mean exposures of 0.2 ppm and peaks of 1.5 ppm; no evidence of pulmonary obstruction (asthma); peak exposures associated with ocular and nasal irritation i.e. NOAEC 0.2 ppm, LOAEC 1.5 ppm
- Numerous reports on ECA and MCA adhesives produced both allergic contact dermatitis with DSEN and RSEN notations recommended
- Reported odour threshold between 1–3 ppm.

Animal data:

- Limited toxicological studies in animals
- RD_{50}: MCA 1.4 ppm
- LD_{50}: 1,600 mg/kg (rats, dermal), as MCA.
- Rats exposed at 31.3 ppm MCA 6 h/d, 5 d/wk for 12 exposures; no nasal or tracheal lesions were seen and no detectable systemic toxicity was observed; no changes were seen in rats similarly exposed at 3.1 ppm.

TLV-TWA based on NOAEC of 0.2 ppm and TLV-STEL of 1 ppm based on the LOAEC in humans of 1.5 ppm.

DFG	***2002***	***MAK: 2 ppm (8 mg/m^3)***

Additional data:

- MAK established for MCA to protect for acute irritation
- ECA not yet established due to insufficient information
- Evidence suggest indications for local damage possibilities at MCA concentrations ≥3 ppm; eye irritation at 5 ppm; 2 h exposure; no further information
- Limited information from inhalation animal experiments.

Source	Year set	Standard
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
ECHA	✓	2018	• Epidemiological study: Workers routinely exposed to peak concentrations of at least 1.5 ppm/d MCA or ECA and those exposed to a short-term average concentration of about 0.5 ppm or less are not at increased risk of developing pulmonary obstruction compared to those unexposed.

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	NA
HCIS	—
NICNAS	NA
EU Annex	NA
ECHA	—
ACGIH	DSEN, RSEN
DFG	NA
SCOEL	NA
HCOTN	NA
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	
Conclusion:	
Adverse effects in human case study:	yes
Dermal LD_{50} ≤1000 mg/kg:	
Dermal repeat-dose NOAEL ≤200 mg/kg:	
Dermal LD_{50}/Inhalation LD_{50} <10:	
In vivo dermal absorption rate >10%:	
Estimated dermal exposure at WES >10%:	
	a skin notation is warranted

IDLH

Is there a suitable IDLH value available?	No

Additional information

Molecular weight:	125.13 (ECA) 111.1 (MCA)
Conversion factors at 25°C and 101.3 kPa:	1 ppm = Number mg/m^3; 1 mg/m^3 = Click or tap here to enter text. 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* on the ACGIH website.

Deutsche Forschungsgemeinschaft (DFG) (1999) Methyl 2-cyanoacrylate and Ethyl 2-cyanoacrylate– MAK value documentation.

Deutsche Forschungsgemeinschaft (DFG) (2002) Cyanacrylsäuremethylester– MAK value documentation.

European Chemicals Agency (ECHA) (2019) Ethyl Cyanoacrylate – REACH assessment.