

Trichloronitromethane

MAK Value Documentation, addendum – Translation of the German version from 2023

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Keywords

trichloronitromethane; pesticide;
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Abstract

Trichloronitromethane (chloropicrin) [76-06-2] is used as a soil fumigant. It is no longer approved in the European Union. The previous MAK value documentation and addendum do not reflect the current data situation of the substance. The MAK Commission decided that a new evaluation is not of high priority. The MAK value and the other classifications are therefore suspended and the substance is listed in the Section IIc of the List of MAK and BAT Values for substances no longer evaluated.

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MAK value	see Section II c of the List of MAK and BAT Values
Peak limitation	–
Absorption through the skin	–
Sensitization	–
Carcinogenicity	–
Prenatal toxicity	–
Germ cell mutagenicity	–
BAT value	–
Synonyms	chloropicrin nitrochloroform nitrotrichloromethane
Chemical name (IUPAC)	trichloro(nitro)methane
CAS number	76-06-2
Molecular formula	CCl ₃ NO ₂
Molar mass	164.37 g/mol
Melting point	–64 °C (IFA 2022)
Boiling point	111.9 °C (IFA 2022)
Density at 20 °C	1.6448 g/cm ³ (IFA 2022)
Vapour pressure at 50 °C	32 hPa (IFA 2022)
log K _{OW}	2.09 (IFA 2022)
Solubility	2.27 g/l water (IFA 2022)
1 ppm ≙ 6.82 mg/m³	1 mg/m³ ≙ 0.147 ml/m³ (ppm)

This addendum was prepared because the published evaluation no longer reflects the data currently available for the MAK value and for the designation and classification of the substance.

Trichloronitromethane (chloropicrin) is used as a soil fumigant. In agriculture, the substance is injected into the soil prior to planting to control fungi, nematodes and diseases. It was used as a chemical weapon in World War I. Trichloronitromethane is severely irritating to the conjunctiva and cornea. The mechanism of action is presumably based on the reaction with biological thiols, which results in rapid dechlorination (Greim 2000, available in German only; Sparks et al. 1997). The MAK value of 0.1 ml/m³ (0.68 mg/m³) was determined to be below the odour and irritation threshold as early as 1961. In 2000, the substance was classified in Peak Limitation Category I with an excursion factor of 1 (Greim 2000; Henschler 1974, available in German only).

In the Pesticides Database of the European Union, the status of trichloronitromethane is listed as “not approved” (European Commission 2023). An application to approve trichloronitromethane according to Regulation (EC) No 1107/2009 concerning the placing of plant protection products on the market (European Parliament and European Council 2009) was withdrawn in January 2022 because it was not possible to dispel the concerns raised by the authority. Therefore, trichloronitromethane is not approved as an active substance according to Regulation (EC) No 1107/2009 (European Commission 2022 b). Trichloronitromethane is on the list of chemicals in Annex I Parts 1 and 2 of the PIC (Prior Informed Consent) Regulation (EU) No 649/2012 (European Commission 2022 a). Exporters are

thus required to submit notification of their intention to export this substance and receive explicit consent from the importing country prior to export.

In the Federal Republic of Germany, trichloronitromethane was approved for use from 1971 to 1976. The substance has been banned since 1980 (BVL 2010).

The previous evaluation does not reflect the currently available data. However, a re-evaluation of the substance is not a priority. Therefore, the MAK value and the peak limitation have been withdrawn and trichloronitromethane has been allocated to Section IIc of the List of MAK and BAT Values (DFG 2022). This section lists substances for which the previous MAK values, designations and classifications have been withdrawn and which are no longer being reviewed at present.

Notes

Competing interests

The established rules and measures of the Commission to avoid conflicts of interest (https://www.dfg.de/mak/conflicts_interest) ensure that the content and conclusions of the publication are strictly science-based.

References

- BVL (Bundesamt für Verbraucherschutz und Lebensmittelsicherheit) (2010) Berichte zu Pflanzenschutzmitteln 2009. Wirkstoffe in Pflanzenschutzmitteln – Zulassungshistorie und Regelungen der Pflanzenschutz-Anwendungsverordnung. Volume 5/1. Basel: Springer Basel AG. https://www.bvl.bund.de/SharedDocs/Downloads/04_Pflanzenschutzmittel/bericht_WirkstoffeInPSM_2009.pdf?__blob=publicationFile&v=3, accessed 18 May 2022
- DFG (Deutsche Forschungsgemeinschaft), editor (2022) List of MAK and BAT Values 2022. Maximum Concentrations and Biological Tolerance Values at the Workplace. Permanent Senate Commission for the Investigation of Health Hazards of Chemical Compounds in the Work Area, report 58. Düsseldorf: German Medical Science. https://doi.org/10.34865/mbwl_2022_eng
- European Commission (2022 a) Commission Delegated Regulation (EU) 2022/643 of 10 February 2022 amending Regulation (EU) No 649/2012 of the European Parliament and of the Council as regards the listing of pesticides, industrial chemicals, persistent organic pollutants and mercury and an update of customs codes. OJ L (118): 14–54
- European Commission (2022 b) Commission Implementing Regulation (EU) 2022/751 of 16 May 2022 concerning the non-approval of the active substance chloropicrin, in accordance with Regulation (EC) No 1107/2009 of the European Parliament and of the Council concerning the placing of plant protection products on the market. OJ L (138): 11–12
- European Commission (2023) Chloropicrin. EU Pesticides Database (v.2.2) active substances. <https://ec.europa.eu/food/plant/pesticides/eu-pesticides-database/start/screen/active-substances/details/1355>, accessed 18 Jan 2023
- European Parliament, European Council (2009) Regulation (EC) No 1107/2009 of the European Parliament and of the Council of 21 October 2009 concerning the placing of plant protection products on the market and repealing Council Directives 79/117/EEC and 91/414/EEC. OJ L (309): 1–50
- Greim H, editor (2000) Chlorpikrin. In: Gesundheitsschädliche Arbeitsstoffe, Toxikologisch-arbeitsmedizinische Begründung von MAK-Werten. 30th issue. Weinheim: Wiley-VCH. Also available from <https://doi.org/10.1002/3527600418.mb7606d0030>
- Henschler D, editor (1974) Chlorpikrin. In: Gesundheitsschädliche Arbeitsstoffe, Toxikologisch-arbeitsmedizinische Begründung von MAK-Werten. 3rd issue. Weinheim: VCH. Also available from <https://doi.org/10.1002/3527600418.mb7606d0003>
- IFA (Institut für Arbeitsschutz der Deutschen Gesetzlichen Unfallversicherung) (2022) Trichloronitromethane. GESTIS-Stoffdatenbank. <https://gestis.dguv.de/data?name=038360&lang=en>, accessed 19 May 2022
- Sparks SE, Quistad GB, Casida JE (1997) Chloropicrin: reactions with biological thiols and metabolism in mice. Chem Res Toxicol 10(9): 1001–1007. <https://doi.org/10.1021/tx9700477>