3	CAS No.: 563-47-3	Substance: 3-Chloro-2-methyl-1-propene

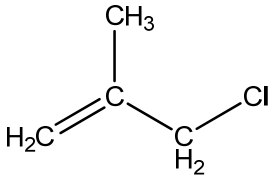
Chemical Substances Control Law Reference No.: 2-2367, 2-117 (Monochlorobutene)

PRTR Law Cabinet Order No.: 1-131

Molecular Formula: C_4H_7Cl

Molecular Weight: 90.55

Structural Formula:



1.General information

The aqueous solubility of this substance is 1.4×10^3 mg/L (25°C), the partition coefficient (1-octanol/water) (log K_{ow}) is 1.98, and the vapor pressure is 102 mmHg (=1.36×10^4 Pa) (20°C). The biodegradability (aerobic degradation) is characterized by a BOD degradation rate of 99% and this substance easily hydrolyzes. 2-Methallyl alcohol forms as a result of hydrolysis.

This substance is classified as a Class 1 Designated Chemical Substance under the PRTR Law. The main uses of this substance are as a raw material for acrylic fiber dyestuff modifiers, synthetic resins, and agricultural chemicals. The production and import quantity in fiscal 2017 was not disclosed because the number of reporting businesses was not more than two. The production and import quantity under the PRTR Law was more than 100 t.

---

2. Exposure assessment

Total release to the environment in fiscal 2017 under the PRTR Law was approximately 4.9 t and all releases were reported. All reported releases were to the atmosphere and approximately 0.89 t was transferred to waste material. The chemical industry was the sole source of reported releases. A multimedia model used to predict the proportions distributed to individual media in the environment indicates that in regions where the largest quantities were estimated to have been released to the environment overall or the atmosphere in particular, the predicted proportion distributed to the atmosphere was 98.7%.

The maximum expected concentration of exposure to humans via inhalation, based on general environmental atmospheric data, was around 0.025 μg/m^3. The mean annual value for the atmospheric concentration in fiscal 2017 was calculated by use of a plume-puff model on the basis of releases to the atmosphere reported under the PRTR Law; this model predicts a maximum level of 1.1 μg/m^3.

Data for potable water, ground water, public freshwater bodies, food, and soil to assess oral exposure could not be obtained. However, no releases to public freshwater bodies were reported in in fiscal 2017 under the PRTR Law; accordingly, this substance's concentration in public water bodies is thought to be low. The risk of exposure to this substance by intake from an environmental medium via food is considered slight, given the low bioaccumulation of the substance expected on the basis of its physicochemical properties.

Data for setting the predicted environmental concentration (PEC) could not be obtained for this substance. However, no releases to public freshwater bodies were reported in in fiscal 2017 under the PRTR Law; accordingly, this substance's concentration in public water bodies is thought to be low.

---

3. Initial assessment of health risk

This substance causes lachrymation and is irritating to the eyes, skin and respiratory tract. It may cause effects on the central nervous system. Exposure at high levels may lower consciousness. Inhalation of the substance causes cough, sore throat, headache and shortness of breath. Contact with the eyes or skin causes redness and pain.

As sufficient information on the carcinogenicity in humans was not available, it could not be determined whether the substance is carcinogenic to humans or not. However, significant and dose-dependent tumorigenesis in forestomach was observed in all dose-groups in the carcinogenesis study by oral administration in mice. Considering the above, assessment of the carcinogenic risk was deemed necessary as well, and initial assessment was conducted for both non-carcinogenic and carcinogenic effects.

The non-carcinogenic LOAEL of 75 mg/kg/day for oral exposure (based on forestomach basal cell hyperplasia and nephrosis), determined from toxicity tests in rats, was adjusted according to exposure conditions to obtain 54 mg/kg/day and subsequently divided by a factor of 10 to account for uncertainty in using a LOAEL. The calculated value of 5.4 mg/kg/day was deemed to be the lowest reliable dose and was identified as the 'non-toxic level' of the substance for oral exposure. The cancer slope factor for oral exposure of 0.14 $(mg/kg/day)^{-1}$ (based on forestomach tumors), determined from carcinogenicity tests in mice, was adopted assuming no threshold. The non-carcinogenic LOAELs for inhalation exposure of 50 ppm (based on decrease in the relative weight of kidneys and eosinophilic change in olfactory epithelium) and 50 ppm (based on suppression of body weight gain and eosinophilic change in respiratory epithelium), determined from toxicity tests in rats and mice respectively, were adjusted according to exposure conditions to obtain 8.9 ppm (33 mg/m^3), and subsequently divided by a factor of 10 to account for uncertainty in using a LOAEL. The calculated value of 3.3 mg/m^3 was deemed to be the lowest reliable concentration and was identified as the 'non-toxic level' of the substance for inhalation exposure. The unit risk for cancer assuming no threshold could not be identified.

With regard to oral exposure, owing to the lack of identified exposure levels, the health risk could not be assessed. The total release of the substance to the environment was reported to be approximately 4.9 t in FY 2017 under the PRTR Law. However, the release of the substance into public water bodies was reported to be 0 t, and predictions of the multimedia fugacity model indicated that the proportion distributed to water was little. Therefore, as a comprehensive judgment, collection of further information would not be required to assess the health risk of this substance via oral exposure.

With regard to inhalation exposure, the predicted maximum exposure concentration in ambient air was 0.025 $\mu g/m^3$, approximately. The MOE (Margin of Exposure) would be 2,600, when calculated from the predicted maximum exposure concentration and the 'non-toxic level' of 3.3 mg/m^3, and subsequently divided by a factor of 10 to account for extrapolation from animals to humans, and by another factor of 5 to take into consideration the carcinogenicity in animals. This would lead to the health risk judgment that no further work would be required at present. However, the MOE for reference would be 60, when calculated from the concentration in ambient air of 1.1 $\mu g/m^3$. This concentration was estimated as the maximum concentration (annual mean) in ambient air near the operators releasing large amount of this substance based on the releases to air reported in FY 2017 under the PRTR Law. Therefore, as a comprehensive judgment, collection of information would be required to assess the health risk of this substance via inhalation in ambient air, starting from data on concentrations in ambient air near the operators releasing large amount of this substance.

Toxicity				Exposure assessment		MOE & Excess incidence rate		Comprehensive judgment
Exposure Path	Criteria for risk assessment	Animal	Criteria for diagnoses (endpoint)	Exposure medium	Predicted maximum exposure dose and concentration			
Oral	'Non-toxic level' 5.4 mg/kg/day	Rats	Forestomach basal cell hyperplasia and nephrosis.	Drinking water	- μg/kg/day	MOE	-	○
						Excess incidence rate	-	
	Slope factor 0.14 $(mg/kg/day)^{-1}$	Mice	Forestomach tumors	Groundwater	- μg/kg/day	MOE	-	
						Excess incidence rate	-	
Inhalation	'Non-toxic level' 3.3 mg/m^3	Rats Mice	Decrease in the relative weight of kidney etc. Suppressed weight gain etc.	Ambient air	0.025 $\mu g/m^3$	MOE	2,600	▲
					-	Excess incidence rate	-	
	Unit risk - $(\mu g/m3)^{-1}$	-	-	Indoor air	- $\mu g/m^3$	MOE	-	×
						Excess incidence rate	-	

Non-toxic level *

- When a LOAEL is available, it is divided by 10 to obtain a NOAEL-equivalent level.
- When an adverse effect level for the short-term exposure is available, it is divided by 10 to obtain a level equivalent to an adverse effect level for the long-term exposure.

---

4. Initial assessment of ecological risk

Reliable acute and chronic toxicity data for algal, crustacean, and fish species for conducting an initial assessment of ecological risk could not be obtained, and the PNEC could not be set. An acute toxicity value of 10,000 μg/L was obtained for another species and if an assessment factor of 1000 is tentatively applied to this reliable datum for a single biome. A predicted no effect concentration (PNEC) reference value of 10 μg/L is obtained.

Data for setting a predicted environmental concentration (PEC) and a PNEC could not be obtained for this substance. Accordingly, an assessment of ecological risk could not be made.

Toxicity data for algae, crustacean and fish species that could be used in an initial assessment of this substance could not be obtained. Accordingly, toxicity was estimated for reference using QSARs for algal, crustacean, and fish species. Of the values predicted by QSAR obtained from QSAR formulae with R^2 of 0.70 or higher and n or 5 or more, the lowest value for acute toxicity toward crustaceans is 2200 μg/L, which is a lower value than the 10,000 μg/L obtained for another species. In addition, the chronic toxicity toward crustaceans was 89 μg/L. While a value for algae could not be predicted based on QSAR, one should take into consideration that chronic toxicity value of 5.9 μg/L of the reference substance used in building the QSAR formula.

Regarding exposure assessment, no releases to public water bodies were reported for fiscal 2017 under the PRTR Law, and with measured water quality data for Japan's public water bodies being unobtainable, the existence of this substance in water is unclear. However, a multimedia model that assumes releases to the atmosphere of 4.8 t predicts that the proportion distributed to water bodies would be low.

Based on the above findings, while high toxicity towards aquatic organisms is inferred to be possible, no releases to public water bodies were reported for fiscal 2017 under the PRTR Law and furthermore, even if releases of this substance to the atmosphere are distributed to water bodies, it highly unlikely that the PEC/PNEC ratio (reference value) will be higher than 0.1. Accordingly, based on a comprehensive review of the above findings, there is little need to collect new data regarding this substance.

Hazard assessment (basis for PNEC)			Assessment coefficient	Predicted no effect concentration PNEC (μg/L)	Exposure assessment		PEC/ PNEC ratio	Comprehensive judgment
Species	Acute/ chronic	Endpoint			Water body	Predicted environmental concentration PEC (μg/L)		
—	—	—	—	—	Freshwater	—	—	○
					Seawater	—	—	

---

5. Conclusions

	Conclusions		Judgment
Health risk	Oral exposure	No need for further work.	○
	Inhalation exposure	Requiring information collection.	▲
Ecological risk	No need for further work.		○

［Risk judgments］○: No need for further work ▲: Requiring information collection
■: Candidates for further work ×: Impossibility of risk characterization