6	CAS No: 56-23-5	Substance: Tetrachloromethane

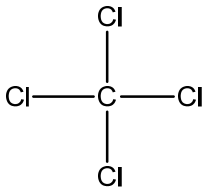
Chemical Substances Control Law Reference No.: 2-38

PRTR Law Cabinet Order No.: 1-149

Molecular Formula: CCl_4

Molecular Weight: 153.82

Structural Formula:



1. General information

The aqueous solubility of this substance is 650 mg/1,000 g (25°C), the partition coefficient (1-octanol/water) (log K_{ow}) is 2.83, and the vapor pressure is 114 mmHg (=1.52×10^4 Pa) (25°C). Biodegradability (aerobic degradation) is characterized by a BOD degradation rate of 0% and bioaccumulation is judged to be non-existent or low.

This substance is designated as a specified substance under the Law Concerning the Protection of the Ozone Layer through the Regulation of Specified Substances and Other Measures, a Class 2 Monitoring Chemical Substance under the Chemical Substances Control Law, and a Class 1 Designated Chemical Substance under the PRTR Law.

The main uses of this substance are as a raw material for other chlorocarbons, as an agricultural chemical raw material, as a fluorine-based gas raw material, and as a reagent. The production and import quantity in fiscal 2014 was 6,851 t. The production and import category under the PRTR Law is more than 100 t.

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2. Exposure assessment

Total release to the environment in fiscal 2014 under the PRTR Law was 5.9 t, and all releases were reported. The major destination of reported releases was the atmosphere. In addition, 0.0001 t was transferred to sewage and approximately 290 t to waste materials. Industries with large reported releases were the chemical industry for the atmosphere, and the sewage industry for public water bodies. However, releases from facilities subject to special conditions (mining, general waste disposal, industrial waste disposal, sewage, etc.) are sometimes derived on the basis of the lower limit of quantitation values, and therefore, attention must be paid to the fact that there are cases of overestimation.

A multi-media 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 99.7%. Where the largest quantities were estimated to have been released to public water bodies, the predicted proportion distributed to the atmosphere was 99.5%.

The maximum expected concentration of exposure to humans via inhalation, based on general environmental atmospheric data, was around 0.85 μg/m^3. Further, past data for indoor air indicated a maximum of around 1.9 μg/m^3. The mean annual value for the atmospheric concentration was calculated by using a plume-puff model on the basis of releases to the atmosphere in fiscal 2014 reported under the PRTR Law; this model predicted a maximum level of 1.1 μg/m^3.

The predicted environmental concentration (PEC), which indicates exposure to aquatic organisms, is 0.35 μg/L for public freshwater bodies, and less than 0.5 μg/L for seawater. When releases to public freshwater bodies in fiscal 2014 reported according to the PRTR Law were divided by the ordinary water discharge of the national

river channel structure database, estimating the concentration in rivers by taking into consideration only dilution gave a maximum value of 0.00014 μg/L (however, this excludes releases from factories that considered to calculate releases based on minimum determination limits).

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3. Initial assessment of health risk

This substance causes effects on the liver, kidneys and central nervous system, and may result in unconsciousness. Inhalation exposure to the substance causes dizziness, drowsiness, headache, nausea and vomiting. Oral exposure causes abdominal pain and diarrhea in addition to the same symptoms as inhalation. The substance is irritating to the eyes, and causes redness and pain. Contact with the skin causes redness and pain. The substance on the skin may be absorbed to cause dizziness and drowsiness.

As sufficient information on the carcinogenicity of the substance was not available, the initial assessment was conducted on the basis of information on the non-carcinogenic effects. However, the carcinogenicity was taken into consideration for this risk assessment, because there is sufficient evidence in experimental animals for the carcinogenicity of this substance.

The lowest reliable NOAEL based on the non-carcinogenic effects of 5 ppm was determined from toxicity tests in rats and mice. However, it would be appropriate to use the LOAEL of 5 ppm based on the carcinogenic effects for the conservative assessment, considering the significantly increased incidence of hepatocellular adenomas in female rats exposed to 5 ppm of the substance. The LOAEL of 5 ppm for inhalation exposure was adjusted according to exposure conditions to obtain 0.89 ppm (5.6 mg/m^3) and subsequently divided by a factor of 10 to account for uncertainty in using a LOAEL. The calculated value of 0.56 mg/m^3 was identified as the 'non-toxic level*' of the substance for inhalation exposure.

With regard to inhalation exposure, the predicted maximum exposure concentration in ambient air was 0.85 μg/m^3, approximately. The MOE (Margin of Exposure) would be 13, when calculated from the predicted maximum exposure concentration and the 'non-toxic level*'of 0.56 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. In addition, the maximum concentration (annual mean) in ambient air near the operators releasing large amount of the substance was estimated to be 1.1 μg/m^3 approximately, based on the releases reported in FY 2014 under the PRTR Law. The MOE would be 10, when calculated from this concentration. In indoor air, the maximum concentration reported in 2004 was 1.9 μg/m^3. The MOE would be 6, when calculated from this concentration. Therefore, collection of information on the health risk of this substance via inhalation in ambient air would be required , and collection of further information would also be required to assess the health risk via inhalation in indoor air.

Toxicity					Exposure assessment			Result of risk assessment			Judgment
Exposure Path	Criteria for risk assessment		Animal	Criteria for diagnoses (endpoint)	Exposure medium	Predicted maximum exposure dose and concentration					
Oral	'Non-toxic level*'	(—) mg/kg/day	(—)	(—)	Drinking water	(—)	μg/kg/day	MOE	(—)	(—)	(—)
					Public Freshwater bodies	(—)	μg/kg/day	MOE	(—)	(—)	
Inhalation	'Non-toxic level*'	0.56 mg/m^3	Mice	Hepatocellular adenomas	Ambient air	0.85	μg/m^3	MOE	13	▲	▲
					Indoor air	—	μg/m^3	MOE	—	×	(▲)

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.

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4. Initial assessment of ecological risk

With regard to acute toxicity, the following reliable data were obtained: a 72-h EC_{50} of 246 μg/L for growth inhibition in the green algae *Chlamydomonas reinhardtii*, a 48-h EC_{50} of 8,090 μg/L for immobilization in the crustacean *Daphnia magna*, and a 96-h LC_{50} of 7,610 μg/L for the fish species *Oryzias latipes* (medaka). Accordingly, based on these acute toxicity values and an assessment factor of 100, a predicted no effect concentration (PNEC) of 2.4 μg/L was obtained.

With regard to chronic toxicity, the following reliable data were obtained: a 72-h NOEC of 121 μg/L for growth inhibition in the green algae *P. subcapitata*, and a 21-d NOEC of 494 μg/L for reproductive inhibition in the crustacean *D. magna*. Accordingly, based on these chronic toxicity values and an assessment factor of 100, a PNEC of 1.2 μg/L was obtained.

The value of 1.2 μg/L obtained from the chronic toxicity to the algae was used as the PNEC for this substance.

The PEC/PNEC ratio is less than 0.3 for for freshwater bodies and less than 0.4 for seawater. Accordingly, efforts to collect data are needed. The lower detection limit for this substance in freshwater is 2 μg/L according to one data source; accordingly, efforts are needed to improve the sensitivity of environmental concentration measurements and understand PRTR data trends. Further, when releases to public freshwater bodies in fiscal 2014 reported according to the PRTR Law were divided by the ordinary water discharge of the national river channel structure database, estimating the concentration in rivers by taking into consideration only dilution gave a maximum value of 0.00014 μg/L.

Hazard Assessment（Basis for PNEC）			Assessment Coefficient	Predicted no effect concentration PNEC (μg/L)	Exposure Assessment		PEC/PNEC ratio	Judgment based on PEC/PNEC ratio	Assessment result
Species	Acute/ chronic	Endpoint			Water body	Predicted environmental concentration PEC (μg/L)			
Green algae	Chronic	NOEC growth inhibition	100	1.2	Freshwater	0.35	0.3	▲	▲
					Seawater	<0.5	<0.4		

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5. Conclusions

	Conclusions		Judgment
Health risk	Oral exposure	It was not the object of evaluation.	(—)
	Inhalation exposure (atmosphere)	Requiring information collection.	▲
	Inhalation exposure (room air)	Collection of further information would be required.	(▲)
Ecological risk	Requiring information collection.		▲

［Risk judgments］ ○: No need for further work ▲: Requiring information collection

■: Candidates for further work ×: Impossibility of risk characterization

（○）: Although risk to human health could not be confirmed, collection of further information would not be required.

（▲）: Further information collection would be required for risk characterization.

（－）: It was not the object of evaluation.