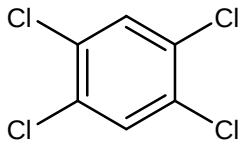
12	CAS No.: 95-94-3	Substance: 1,2,4,5-Tetrachlorobenzene

Chemical Substances Control Law Reference No.: 3-76 (poly(4–6)chlorobenzene)

PRTR Law Cabinet Order No.:

Molecular Formula: $C_6H_2Cl_4$ Structural Formula:

Molecular Weight: 215.89



1. General information

The aqueous solubility of this substance is 0.6 mg/1,000 g (25°C), the partition coefficient (1-octanol/water) (log K_{ow}) is 4.51, and the vapor pressure is 5.40×10^{-3} mmHg (=0.72 Pa) (25°C) (extrapolated value). Biodegradability (aerobic degradation) is characterized by a BOD degradation rate of 0%, and bioaccumulation is thought to be at a medium level. Furthermore, the substance does not have any hydrolyzable groups.

The main uses of this substance are as an intermediate for herbicide manufacture, a pesticide or water-resistant impregnant, and an electric insulator, as well as in packaging protection. Chlorobenzenes are formed via incomplete combustion and potentially discharged to the environment from waste incinerators.

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2. Exposure assessment

Because this substance is not classified as a Class 1 Designated Chemical Substance under the Law Concerning Reporting, etc. of Releases to the Environment of Specific Chemical Substances and Promoting Improvements in Their Management (PRTR Law), release and transfer quantities could not be obtained. Predictions of proportions distributed to individual media by using a Mackay-type level III fugacity model indicated that if equal quantities are released to the atmosphere, water bodies, and soil, the proportion distributed to soil is greater.

The maximum expected concentration of exposure to humans via inhalation, based on general environmental atmospheric data, was around 0.00016 μg/m^3. The maximum expected oral exposure was estimated to be around less than 0.00048 μg/kg/day on the basis of calculations from data for public freshwater bodies.

The risk of exposure to this substance by intake from an environmental medium via food is considered slight, based on estimates of oral exposure obtained by using estimated concentrations in fish species. The predicted environmental concentration (PEC), which indicates exposure to aquatic organisms, was around less than 0.012 μg/L for both public freshwater bodies and seawater.

3.Initial assessment of health risk

Inhalation exposure to this substance may cause coughing. A half of subjects for the testing of its smell perceived its odor at 0.0344 mg/m^3, while all of them recognized it at 0.053 mg/m^3, which they described musty, earthy and grassy.

As sufficient information was not available to evaluate carcinogenic potential of the substance, an initial assessment was conducted on the basis of information on its non-carcinogenic effects.

With regard to oral exposure to the substance, a NOAEL of 0.34 mg/kg/day (for kidney lesions) obtained from its mid-term and long-term toxicity tests on rats was divided by a factor of 10 due to their short test periods. 0.034 mg/kg/day was identified to be the reliable lowest dose of the substance as its ‘non-toxic level*’. With regard to inhalation exposure to the substance, its ‘non-toxic level*’ could not be established.

As for oral exposure to the substance, its maximum exposure concentration was predicted to be below 0.00048 μg/kg/day, when intakes of freshwater from public water bodies were assumed. The MOE would be

above 7,100 when calculated from its 'non-toxic level*' of 0.034 mg/kg/day and the maximum exposure concentration predicted from animal experiments, and then divided by a factor of 10 to convert animal data to human. As exposure to the substance in the environment through food intakes would be limited, the MOE would not change significantly even when this exposure was included. Therefore, no further action would be required at this moment to assess health risk from its oral exposure.

As for inhalation exposure to the substance, as its 'non-toxic level*' could not be established, its health risk could not be assessed. However, if 100% absorption were assumed, its 'non-toxic level*' for oral exposure would be converted to a 'non-toxic level*' of 0.11 mg/m^3 for inhalation exposure. The MOE would be 69,000 when calculated from this value and the predicted maximum exposure concentration of 0.00016 μg/m^3. Therefore, collection of further information would not be required to assess health risk from its inhalation exposure in the ambient air.

Toxicity				Exposure assessment			Result of risk assessment			Judgment
Exposure Path	Criteria for risk assessment	Animal	Criteria for diagnoses (endpoint)	Exposure medium	the maximum predicted exposure dose and concentration					
Oral	'Non-toxic level*' 0.034 mg/kg/day	Rat	Kidney lesions	Drinking water	— μg/kg/day		MOE	—	×	○
				Freshwater	< 0.0048 μg/kg/day		MOE	> 7,100	○	
Inhalation	'Non-toxic level*' — mg/m^3	—	—	Ambient air	0.00016 μg/m^3		MOE	—	×	(○)
				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 48-h EC_{50} of 640 μg/L for growth inhibition in the green alga *Pseudokirchneriella subcapitata*, and a 96-h LC_{50} of 320 μg/L for the fish species *Pimephales promelas* (fathead minnow). Accordingly, based on these acute toxicity values and an assessment factor of 1,000, a predicted no effect concentration (PNEC) of 0.32 μg/L was obtained.

With regard to chronic toxicity, a 28-d post-hatching NOEC of 90 μg/L for mortality in the fish species *Cyprinodon variegatus* (sheepshead minnow) was obtained as a reliable finding. Accordingly, based on this chronic toxicity value and an assessment factor of 100, a PNEC of 0.90 μg/L was obtained.

The value of 0.32 μg/L obtained from the acute toxicity to the fish species was used as the PNEC for this substance.

The PEC/PNEC ratio was less than 0.04 for both freshwater bodies and seawater. Accordingly, further work is considered unnecessary at this time.

Hazard assessment (basis for PNEC)			Assessment factor	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)			
Fish (fathead minnow)	Acute	LC_{50} mortality	1,000	0.32	Freshwater	<0.012	<0.04	○	○
					Seawater	<0.012	<0.04		

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5. Conclusions

	Conclusions		Judgment
Health risk	Oral exposure	No need for further work.	○
	Inhalation exposure	Although risk to human health could not be identified, collection of further information would not be required.	(○)
Ecological risk	No need of further work at present.		○

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

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

（○）: Though a risk characterization cannot be determined, there would be little necessity of collecting information.

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