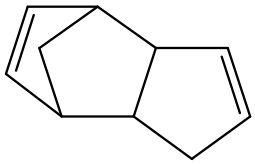
11	CAS No.: 77-73-6	Substance: Dicyclopentadiene

Chemical Substances Control Law Reference No.: 4-634

PRTR Law Cabinet Order No.: 1-190

Molecular Formula: $C_{10}H_{12}$ Structural Formula:

Molecular Weight: 132.20



1. General information

The aqueous solubility of this substance is 20 mg/L (25°C), the partition coefficient (1-octanol/water) (log K_{ow}) is 2.78 (25°C), and the vapor pressure is 1.40 mmHg (=186 Pa) (20°C). Biodegradability (aerobic degradation) is characterized by a BOD degradation rate of 0%, and bioaccumulation is judged to be non-existent or low. Furthermore, hydrolyzability is characterized by stability for 5 d (25°C).

This substance is designated as a Priority Assessment Chemical Substance and 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). The main uses of this substance are as a raw material for EP rubber, unsaturated polyester resin, himic anhydride, and reaction injection molding resins. The production and import quantity in fiscal 2010 was 73,717 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 2010 under the PRTR Law was approximately 8.7 t, and all releases were reported. The major destination of reported releases was the atmosphere. In addition, 250 t was transferred to waste materials, and 0.008 t to sewage. Industry types with large reported releases were the chemical industry for the atmosphere, and the chemical industry alone for public water bodies. A multi-media model used to predict the proportions distributed to individual media in the environment indicated that in regions where the largest quantities were estimated to have been released to the environment overall or to the atmosphere in particular, the predicted proportion distributed to the atmosphere was 97.4%. In regions where the largest estimated releases were to public water bodies, the predicted proportion distributed to the atmosphere was 98.0%.

The maximum expected concentration of exposure to humans via inhalation, based on general environmental atmospheric data, was around less than 0.0025 μg/m^3. However, the mean annual value for atmospheric concentration in fiscal 2010 was calculated by using a plume-puff model on the basis of reported releases to the atmosphere according to the PRTR Law; this model predicted a maximum level of 0.68 μg/m^3.

The maximum expected concentration of exposure to humans via inhalation could not be obtained. However, a value of around less than 0.0004 μg/kg/day was calculated from past groundwater data. When reported releases to public freshwater bodies in fiscal 2010 according to the PRTR Law were divided by the ordinary water discharge of the national river channel structure database, estimating the concentration in rivers while taking into consideration only dilution gave a maximum value of 0.0013 μg/L. Using this estimated concentration for rivers to calculate oral exposure gave 0.000052 μg/kg/day. 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, could not be obtained. However, past data for public water bodies indicate less than 0.01 μg/L for freshwater bodies and around less than 0.01 μg/L for seawater. The maximum river concentration was estimated to be 0.0013 μg/L from reported releases to public freshwater bodies under the PRTR Law.

3.Initial assessment of health risk

This substance may causes irritation to eyes, skin and respiratory tract. Contact of the substance with eyes and skin may cause redness and pain. Inhalation exposure to the substance may cause coughing, sore throat and headache, while its oral exposure may cause abdominal pain and nausea. Its TCLo for human has been reported to be 16 mg/m^3 (for headache).

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 4 mg/kg/day (for adrenal degeneration) 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. 0.4 mg/kg/day identified to be the reliable lowest dose of the substance as its 'non-toxic level*'. With regard to inhalation exposure to the substance, a NOAEL of 28 mg/m^3 (for increased relative kidney weight) and a NOAEL of 28 mg/m^3 (for decreased survival rates) obtained from its mid-term and long-term toxicity tests on mice was adjusted for their durations to provide 5 mg/m^3 for its intermittent to continuous exposure, and this was further divided by a factor of 10 due to their short test periods. 0.5 mg/m^3 was identified to be the reliable lowest dose of the substance as its 'non-toxic level*'.

As for oral exposure to the substance, as its exposure concentrations were not known, its health risk could not be assessed. In addition, for oral exposure to the substance, its maximum exposure concentration was estimated to be below 0.0004 μg/kg/day from historical data (reported in 1999) on its exposure through groundwater. The MOE would be above 100,000 when calculated from this value and the substance's 'non-toxic level*' of 0.4 mg/kg/day from animal experiments divided by a factor of 10 to convert animal data to human. The maximum exposure was then calculated to be 0.000052 μg/kg/day from concentrations of the substance in river water with effluents from operators discharging high concentrations of the substance, reported in FY 2010 under the PRTR Law. The MOE would be 770,000 when calculated from this value. 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, collection of further information would not be required to assess health risk from its oral exposure.

With regard to inhalation exposure to the substance, its maximum exposure concentration in the ambient air was predicted to be below 0.0025 μg/m^3. The MOE would be above 20,000 when calculated from its 'non-toxic level*' of 0.5 mg/m^3 and its maximum exposure concentration predicted from animal experiments, and divided by a factor of 10 to convert animal data to human. The maximum (annual mean) concentration in the ambient air near operators with its emissions in high concentrations was calculated to be 0.68 μg/m^3 from its emissions reported in FY 2010 under the PRTR Law. The MOE would be 74 when calculated from this value as its reference. Therefore, collection of further information would 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	Predicted maximum exposure dose and concentration				
Oral	'Non-toxic level*' 0.4 mg/kg/day	Rat	Adrenal degeneration	Drinking water	— μg/kg/day	MOE	—	×	(○)
				Freshwater	— μg/kg/day	MOE	—	×	
Inhalation	'Non-toxic level*' 0.5 mg/m^3	Rat Mouse	Increased relative kidney weight Decreased survival rates	Ambient air	<0.0025 μg/m^3	MOE	> 200,000	○	(▲)
				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 4,200 μg/L for swimming inhibition in the crustacean *Daphnia pulex*, and a 96-h LC_{50} of 4,300 μg/L for the fish species *Oryzias latipes* (medaka). Accordingly, based on these acute toxicity values and an assessment factor of 1,000, a predicted no effect concentration (PNEC) of 4.2 μg/L was obtained.

With regard to chronic toxicity, a 21-d NOEC of 3,200 μg/L for reproductive inhibition in the crustacean *Daphnia magna* was obtained as a reliable data. Accordingly, based on this chronic toxicity value and an assessment factor of 100, a predicted no effect concentration (PNEC) of 32 μg/L was obtained.

The value of 4.2 μg/L obtained from the acute toxicity to the crustacean was used as the PNEC for this substance.

The risk of this substance could not be judged because the predicted environmental concentration (PEC) could not be obtained. However, past data yielded values of less than 0.01 μg/L for freshwater bodies and around less than 0.01 μg/L for seawater. The ratios of these concentrations to the PNEC are less than 0.1. In addition, the maximum river concentration was estimated to be 0.0013 μg/L from reported releases under the PRTR Law, and the ratio of this value to PNEC is less than 0.1. Accordingly, further work on this substance 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)			
Crustacean *Daphnia pulex*	Acute	EC_{50} immobilization	1,000	4.2	Freshwater	－	－	×	○
					Seawater	－	－		

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5. Conclusions

	Conclusions		Judgment
Health risk	Oral exposure	Although risk to human health could not be identified, collection of further information would not be required.	(○)
	Inhalation exposure	Collection of further information would 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.