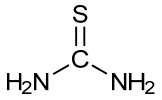
9	CAS No: 62-56-6	Substance: Thiourea

Chemical Substances Control Law Reference No.: 2-1733

PRTR Law Cabinet Order: 1-245

Molecular Formula: CH_4N_2S Structural Formula:

Molecular Weight: 76.12



1. General information

The aqueous solubility of this substance is 1.06×10^5 mg/1,000 g (20°C), the partition coefficient (1-octanol/water) (log K_{ow}) is -1.02, and the vapor pressure is 7.49×10^{-8} mmHg (= 9.98×10^{-6} Pa) (20°C). Biodegradability (aerobic degradation) is characterized by a BOD degradation rate of 2.6% and bioaccumulation is judged to be non-existent or low. The substance does not have any hydrolyzable groups.

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). This substance is most commonly used as a raw material for urethane resins. It is also used as a raw material for various products based on organic compounds such as pharmaceuticals, dyestuffs, surfactants, rodenticides, rust inhibitors, and synthetic rubber additives. The production and import quantity in fiscal 2012 was 4,176 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 2012 under the PRTR Law was approximately 170 t, of which approximately 150 t or 91% of overall releases were reported. The major destination of reported releases was public water bodies. In addition, approximately 300 t was transferred to waste materials and approximately 3.6 t was transferred to sewage. Industry types with large reported releases were the chemical industry alone for the atmosphere and the chemical industry for public water bodies. The largest release among releases to the environment including those unreported was to 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 public water bodies in particular, the predicted proportion distributed to water bodies was 96.9%. In regions where the largest estimated releases were to the atmosphere, the predicted proportion distributed to water bodies was also 96.9%.

The maximum expected concentration of exposure to humans via inhalation could not be obtained. The mean annual value for atmospheric concentration in fiscal 2012 was calculated by using a plume-puff model on the basis of releases to the atmosphere reported according to the PRTR Law; this model predicted a maximum level of 0.00030 μg/m^3. The maximum expected oral exposure was estimated to be around 12 μg/kg/day on the basis of calculations from data for public freshwater bodies. However, the maximum expected oral exposure calculated by using public freshwater body data (900 μg/L) for a limited survey area was 36 μg/kg/day. Furthermore, when releases to public freshwater bodies in fiscal 2012 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 2400 μg/L. Using this estimated concentration for rivers to calculate oral exposure gave 96 μg/kg/day. The exposure level to this substance by intake from an environmental medium via food is considered relatively slight, based on its low bioaccumulation.

The predicted environmental concentration (PEC), which indicates exposure to aquatic organisms, was around

310 μg/L for public freshwater bodies and around less than 0.14 μg/L for seawater. However, there is a report of a maximum of 900 μg/L for public freshwater bodies and seawater, albeit in an environmental survey of a limited area. When releases to public freshwater bodies in fiscal 2012 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 2400 μg/L.

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3. Initial assessment of health risk

This substance causes irritation to the eyes. Coughing may occur when inhaled. Contact of the substance with the eyes may cause redness.

As sufficient information was not available regarding the carcinogenicity of the substance, the initial assessment was conducted on the basis of information on its non-carcinogenic effects.

With regard to the oral exposure to the substance, the NOAEL of 12.5 mg/kg/day (based on follicular hyperplasia of thyroid gland), obtained for mid-term and long-term toxicity tests on rats, was considered to be the reliable lowest dose of the substance and was identified as its 'non-toxic level*'. As for the inhalation exposure to the substance, the 'non-toxic level*' could not be established.

Regarding the oral exposure to the substance, the predicted maximum exposure was approximately 12 μg/kg/day, assuming water from public water bodies and freshwater was ingested. The MOE (Margin of Exposure) of 100 was derived from the substance's 'non-toxic level*' of 12.5 mg/kg/day and the predicted maximum exposure concentration and after the division by a factor of 10 to convert animal data to human data. Meanwhile, the MOE of 35 was derived from the oral exposure concentration of 36μg/kg/day, calculated from data on public water bodies and freshwater in limited areas. In addition, the MOE of 13 was derived from the maximum exposure level of 96 μg/kg/day, calculated itself from concentrations in effluents from high discharging plants, according to the reported emissions in public water bodies and freshwater reported in FY 2012 under the PRTR Law. As the exposure to the substance in the environment through diet is limited, the MOE would not change significantly even when this exposure is included. Therefore, collection of further information would be required to assess the health risk for oral exposure to this substance.

Concerning the inhalation exposure to the substance, the absence of information on exposure concentrations in ambient air did not allow the health risk assessment. In addition, assuming a 100 % absorption, and converting the 'non-toxic level*' for oral exposure to the inhalation one, the 'non-toxic level*' would be 42 mg/m^3. The maximum concentration in ambient air in the high discharging plants area was estimated to be 0.00030 μg/m^3 (annual mean), calculated from the emissions reported in FY 2012 under the PRTR Law. The MOE of 14,000,000 was derived from this level and after the division by a factor of 10 to convert animal data to human data. Therefore, collection of further information would not be required to assess the health risk for the inhalation exposure to this substance in 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*' 12.5 mg/kg/day	Rat	Follicular hyperplasia of thyroid gland	Drinking water	– μg/kg/day	MOE	–	×	(▲)
				Freshwater	12 μg/kg/day	MOE	100	○	
Inhalation	'Non-toxic level*' – mg/m^3	–	–	Ambient air	– 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 96-h EC_{50} of 6,800 μg/L for growth inhibition in the green alga *Desmodesmus subspicatus*, a 48-h EC_{50} of 16,000 μg/L for swimming inhibition in the crustacean *Daphnia magna*, a 96-h LC_{50} exceeding 110,000 μg/L for the fish species *Oryzias latipes* (medaka), and a 48-h EC_{50} exceeding 50,000 μg/L for behavioral inhibition in the mollusk *Dreissena polymorpha* (zebra mussel). Accordingly, based on these acute toxicity values and an assessment factor of 100, a predicted no effect concentration (PNEC) of 68 μg/L was obtained.

With regard to chronic toxicity, the following reliable data were obtained: a 72-h NOEC of 32,000 μg/L for growth inhibition in the green alga *Pseudokirchneriella subcapitata*, and a 21-d NOEC of 1,800 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 18 μg/L was obtained.

The value of 18 μg/L obtained from the chronic toxicity to the crustacean was used as the PNEC for this substance.

The PEC/PNEC ratio is 17 for freshwater bodies and less than 0.008 for seawater; accordingly, the substance is considered as a candidate for further work.

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	End point			Water body	Predicted environmental concentration PEC (μg/L)			
Crustacean *Daphnia magna*	Chronic	NOEC reproductive inhibition	100	18	Freshwater	310	17	■	■
					Seawater	<0.14	<0.008		

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5. Conclusions

	Conclusions		Judgment
Health risk	Oral exposure	Further information collection would be required for risk characterization.	(▲)
	Inhalation exposure	Although risk to human health could not be confirmed, collection of further information would not be required.	(○)
Ecological risk	Candidates for further work.		■

［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.