5	CAS No.: 882-33-7	Substance: Diphenyldisulfide

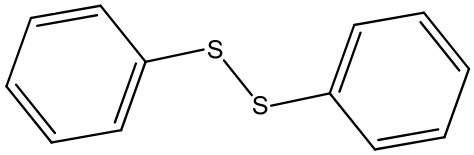
Chemical Substances Control Law Reference No.: 3-1124

PRTR Law Cabinet Order No.:

Molecular Formula: $C_{12}H_{10}S_2$

Molecular Weight: 218.34

Structural Formula:



1.General information

The aqueous solubility of this substance is 0.204 mg/L (20°C), the partition coefficient (1-octanol/water) (log K_{ow}) is 4.41, and the vapor pressure is 2.20×10^{-4} mmHg (=0.029 Pa) (25°C, extrapolated value). Further, this substance does not readily biodegrade (aerobic degradation) and it has been judged to not be highly bioaccumulative.

The main uses of this substance are as a sulfenylation reagent and a dehydrogenation/aromatization reagent for cyclohexanone compounds. The production and import quantity for fiscal 2016 was not disclosed because the number of reporting businesses was not more than two.

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2. Exposure assessment

Because this substance is not classified as a Class 1 Designated Chemical Substance under the PRTR Law, release and transfer quantities could not be obtained. Predictions of proportions distributed to individual media by use of a Mackay-type level III fugacity model indicate that if equal quantities were released to the atmosphere, water bodies, and soil, the proportion distributed to soil would be largest.

The maximum expected concentration of exposure to humans via inhalation, based on general environmental atmospheric data, was less than around 0.0019 μg/m^3.

Data for potable water, ground water, food and soil to assess oral exposure could not be obtained. Thereupon, assuming intake solely from public freshwater bodies, both the average exposure and maximum expected concentration of exposure were calculated to be around less than 0.000023 μg/kg/day. The risk of exposure to this substance by intake from an environmental medium via food is considered slight, as it is not highly bioaccumulative.

The predicted environmental concentration (PEC), which indicates exposure to aquatic organisms, was reported to be around less than 0.00057 μg/L for both public freshwater bodies and seawater.

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3. Initial assessment of health risk

No information was available on acute symptoms in humans. Emaciation, lateral position, hunchback position, decrease in locomotor activity, bradypnea and hypothermia were observed in rats after day 4 of single oral administration of the substance (n=6/group). Three animals out of six died from day 8 to day 10. The abnormal clinical signs disappeared by day 14 in the surviving animals.

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

The LOAEL of 1 mg/kg/day for oral exposure (based on hyaline droplets formation and basophilic changes in renal tubules), determined from toxicity tests in rats, was divided by a factor of 10 to account for extrapolation to chronic exposure and another factor of 10 to account for uncertainty in using a LOAEL. The calculated value of 0.01 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 ‘non-toxic level*’ for inhalation exposure could not be identified.

With regard to oral exposure, assuming the substance is absorbed via public freshwater bodies, the predicted maximum exposure level would be less than 0.000023 μg/kg/day, approximately. The MOE (Margin of Exposure) would exceed 43,000, when calculated from the predicted maximum exposure level and the ‘non-toxic level*’of 0.01 mg/kg/day, and subsequently divided by a factor of 10 to account for extrapolation from animals to humans. Since exposure to the substance in environmental media via food is presumed to be limited, including it in the calculation would not change the MOE significantly. Therefore, no further work would be required at present to assess the health risk of this substance via oral exposure.

With regard to inhalation exposure, owing to the lack of identified ‘non-toxic level*, the health risk could not be assessed. Assuming that 100% of the inhaled substance is absorbed, the ‘non-toxic level*’ for inhalation exposure, derived from the conversion of the ‘non-toxic level*’ for oral exposure, would be 0.03 mg/m^3. The MOE would exceed 1,600, when calculated from the predicted maximum exposure concentration in ambient air of less than 0.0019 μg/m^3, approximately, and the converted ‘non-toxic level*’ for inhalation exposure, and subsequently divided by a factor of 10 to account for extrapolation from animals to humans. Therefore, collection of further information would not be required to assess the health risk of this substance via inhalation 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*’ 0.01 mg/kg/day	Rats	Hyaline droplets formation and basophilic changes in renal tubules	Drinking water	- μg/kg/day	MOE	-	○
				Public freshwater bodies	<0.000023 μg/kg/day	MOE	>43,000	
Inhalation	‘Non-toxic level*’ - mg/m^3	-	-	Ambient air	<0.0019 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 72-d EC_{50} exceeding 19 μg/L for growth inhibition in the green alga *Pseudokirchneriella subcapitata*, a 48-h EC_{50} 8.5 μg/L for swimming inhibition in the crustacean *Daphnia magna*, and a 96-h LC_{50} 57.7 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 0.085 μg/L was obtained μg/L.

With regard to chronic toxicity, the following reliable data were obtained: a 72-h NOEC of 19 μg/L for growth inhibition in the green alga *P. subcapitata* and a 21-d NOEC of 7.9 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 0.079 μg/L was obtained.

The value of 0.079 μg/L obtained from the chronic toxicity to the crustacean was used as the PNEC for this substance.

The PEC/PNEC ratio is less than 0.007 for freshwater bodies and seawater; accordingly, further work is considered unnecessary at this time.

Hazard assessment (basis for PNEC)			Assessment coefficient	Predicted no effect concentration PNEC (μg/L)	Exposure assessment		PEC/ PNEC ratio	Assessment result
Species	Acute/ chronic	Endpoint			Water body	Predicted environmental concentration PEC (μg/L)		
Crustacean *Daphnia magna*	Chronic	NOEC reproductive inhibition	100	0.079	Freshwater	<0.00057	<0.007	○
					Seawater	<0.00057	<0.007	

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5. Conclusions

	Conclusions		Judgment
Health risk	Oral exposure	No need for further work.	○
	Inhalation exposure	No need for further work.	○
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

（▲）: Further efforts to collect data required based on comprehensive review of existing relevant data

（■）: Candidate for further work based on comprehensive review of existing data