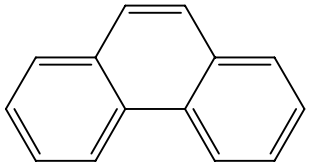
1 3	CAS No.: 85-01-8	Substance: Phenanthrene

Chemical Substances Control Law Reference No.: 4-635

PRTR Law Cabinet Order No.: 2-58

Molecular Formula: $C_{14}H_{10}$ Structural Formula:

Molecular Weight:178.23



1. General information

The aqueous solubility of this substance is 1.15 mg/L (25°C), and the partition coefficient (1-octanol / water) (log Kow) is 4.46. The vapor pressure is 1.12 x 10^{-4} mmHg (= 0.0149 Pa) (25°C). Degradability is thought to be good. The substance does not have hydrolyzable groups.

This substance is a Class 2 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). Its major uses have not been reported. Production and import quantities under the PRTR law are 1 ton.

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2. Exposure assessment

As phenanthrene is not 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. When predictions of distribution ratios by medium were made using the Mackay-Type Level III Fugacity Model, in the event of equal release to the atmosphere, water and soil, the distribution ratio was highest for soil.

The predicted maximum exposure concentration for inhalation exposure to human beings was approximately 0.022 μg/m^3. The predicted maximum oral exposure was estimated to be less than 0.4 μg/kg/day. Even when the exposure from groundwater and soil based on data for a limited region was taken into consideration, the predicted maximum exposure was less than 0.4 μg/kg/day.

The predicted environmental concentration (PEC) that indicates exposure to aquatic organisms was generally less than 0.012 μg/L for freshwater bodies and less than approximately 0.012 μg/L for seawater bodies.

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3. Initial assessment of health risk

Acute localized action of the substance is minor, but it may have a photosensitizing effect on the skin. It has been reported that rats provided with 150 mg/kg through intraperitoneal administration suffered congested livers and kidneys, as well as minor kidney atrophy and increased GPT and GGT after 24 and 72 hours.

The information on the toxicity of this substance is meager, and it is not possible to evaluate the no observed adverse effect level (NOAEL), etc. from that data currently possessed. It was also not possible to make a judgment as to whether it causes cancer in humans. However, as there have been cases of risk evaluation being implemented in accordance with the carbon fraction for aromatic hydrocarbons, an initial assessment of the substance was conducted based on information of non-carcinogenic effects for reference.

As the 'Non-toxic level' was observed, used to estimate the margin of exposure (MOE), a no observed adverse effect level (NOAEL) of 75 mg/kg/day (reduction of kidney weight, etc.) for pyrene (from among the substances with a carbon fraction of C_{14} - C_{16} which is close to that of this substance) was used for oral exposure. As the test period was short, this value was divided by 10 to establish a reference value of 7.5 mg/kg/day. In the case of inhalation exposure, the NOAEL of 160 mg/m^3 (increase of liver and kidney weight) for a mixture with C_9 was used.

With regard to oral exposure, when intake of freshwater from public water bodies and food was postulated, the

maximum predicted exposure was less than 0.4 μg/kg/day. As the 'Non-toxic level' of 7.5 mg/kg/day established for reference purposes and the maximum predicted exposure were established by means of animal testing, the value was divided by 10 to derive an MOE exceeding 1,900. Accordingly, while the health risk from oral exposure to this substance could not be determined, there is thought to be little need to gather information, etc. on oral exposure in order to evaluate the health risk.

With regard to inhalation exposure, the predicted maximum exposure concentration in ambient air was estimated at 0.022 μg/m^3. Judging from the 'Non-toxic level' of 160 mg/m^3 established for reference purposes and the predicted maximum exposure concentration, the MOE derived in the same manner was 730,000. Accordingly, although the health risk from inhalation exposure to this substance in ambient air could not be determined, there is thought to be little need to gather information, etc. on inhalation exposure in order to evaluate the health risk.

Knowledge of toxicity				Exposure assessment		Result of risk assessment			Judgment
Exposure path	Guidelines for risk assessment	Animal	Impact assessment guideline (endpoint)	Exposure medium	Predicted maximum exposure quantity and concentration				
Oral	No observed adverse effect level — mg/kg/day	—	—	Drinking water / food	— μg/kg/day	MOE	—	×	×
				Fresh water / food	< 0.4 μg/kg/day	MOE	—	×	
Inhalation	No observed adverse effect level — mg/m^3	—	—	Ambient air	0.022 μg/m^3	MOE	—	×	×
				Indoor air	— μg/m^3	MOE	—	×	×

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4. Initial assessment of ecological risk

With regard to acute toxicity, reliable information of a 72-hour EC_{50} growth inhibition value of 180 μg/L was found for the algae *Pseudokirchneriella subcapitata*, a 48-hour EC_{50} immobilization value of 350 μg/L was found for the crustacea *Daphnia pulex* (water flea), and a 96-hour LC_{50} value of 478 μg/L was found for the fish *Cyprinodon variegatus* (sheepshead minnow). Accordingly, an assessment factor of 100 was used, and a predicted no effect concentration (PNEC) of 1.8 μg/L was obtained based on the acute toxicity values. With regard to chronic toxicity, reliable information of a 72-hour no observed effect concentration (NOEC) growth inhibition value of 92 μg/L was found for the algae *P. subcapitata*, a 21-day NOEC reproduction value of 31 μg/L was found for the crustacea *D. magna*, and a 60-day NOEC growth inhibition value of 38 μg/L was found for the fish *Oncorhynchus mykiss* (rainbow trout). Accordingly, an assessment factor of 10 was used, and a PNEC value of 3.1 μg/L was obtained based on the chronic toxicity values. As the PNEC for the substance, a value of 1.8 μg/L obtained from the acute toxicity for the algae was used.

The PEC/PNEC ratio was less than 0.007 for both freshwater and seawater bodies. Accordingly, further work is thought to be unnecessary at this time.

Hazard assessment (basis for PNEC)			Assessment factor	Predicted no effect concentration PNEC (μg/L)	Exposure assessment		PEC/PNEC ratio	Result of assessment
Species	Acute / chronic	Endpoint			Water body	Predicted environmental concentration PEC (μg/L)		
Algae	Acute	EC_{50} growth inhibition	100	1.8	Freshwater	< 0.012	< 0.007	○
					Seawater	< 0.012	< 0.007	

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5. Conclusions

		Conclusions	Judgment
Health risk	Oral exposure	Risk cannot be determined. However, there is thought to be comparatively little need to collect information, etc.	×
	Inhalation exposure	Risk cannot be determined. However, there is thought to be comparatively little need to collect information, etc.	×
Ecological risk	No need of further work.		○

［Risk judgments］○: No need of further work ▲: Requiring information collection
■: Candidates for further work ×: Impossible of risk characterization