21	CAS No.: 123-31-9	Substance: Hydroquinone

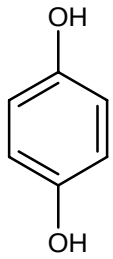
Chemical Substances Control Law Reference No.: 3-543 (as dihydroxybenzene)

PRTR Law Cabinet Order No.: 1-254

Molecular Formula: $C_6H_6O_2$

Molecular Weight: 110.11

Structural Formula:



1. General information

The aqueous solubility of this substance is 7.33×10^4 mg/L (25°C) and the partition coefficient (1-octanol / water) (log Kow) is 0.59. The vapor pressure is 6.70×10^{-4} mmHg (= 0.0893 Pa) (25°C, extrapolated value). Degradability (aerobic degradation) is considered to be good, but this substance does not have hydrolizable groups.

This substance is 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). It is considered to be used primarily as a developer of photograph, a chemical for rubber products, an intermediate of dyes, a reductant of organic synthesis (abrol), a raw material of metol and an inhibitor for polymerization of organic compounds. The quantity of production in FY2004 was 10,000 tons (estimated value), and the quantities of export and import in FY2004 were 0 ton and 928 tons, respectively (total of hydroquinone (quinol) and its salt forms in each value).

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2. Exposure assessment

Total release to the environment in FY2004 under the PRTR Law came to approximately 16 tons. Of this quantity, the amount reported came to 4.6 tons. Release to the public water bodies accounted for a large part of the reported release. The source of the reported release was only Chemical Industry.

When estimated releases outside notification are included, release to water bodies accounted for the greatest quantity of release to the environment. The distribution into each environment medium predicted by means of a multimedia model was 98.3% for water bodies in the case of the region where the estimated release quantity to the environment and public water bodies was considered to be the maximum. In the case of the region where the estimated release quantity to the atmosphere was considered to be the maximum, the distribution was 69.4% for water bodies and 22.6% for soil.

No predicted maximum exposure concentration for inhalation exposure to human beings could be established. The predicted maximum oral exposure was estimated to be less than 0.014 μg/kg/day. Because the 1-octanol/water partition coefficient (log Kow) is low and the bioconcentration is also predicted to be low, exposure from environmental media via the food chain is assumed to be low.

The predicted environmental concentration (PEC) that indicates exposure to aquatic organisms was estimated to be less than 0.36μg/L for both freshwater and seawater public water bodies.

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3. Initial assessment of health risk

This substance causes severe irritation of the eyes, and results in irritation of the skin and respiratory tract. Ingestion causes dizziness, headache, nausea, shortness of breath, convulsion, vomiting and ringing in the ears. Inhalation causes coughing and effort dyspnea. Contact with eyes may cause redness, pains, and blurred vision. Contact with skin causes redness. There are

reports that show LDLo of 29 mg/kg, TDLo of 170 mg/kg (coma, increase in beat, and cyanosis) and TCLo of 1% (allergic dermatitis) in human beings.

There was insufficient information regarding the carcinogenicity of the substance. For this reason, an initial assessment of the substance was conducted based on information of non-carcinogenic effects.

As the 'Non-toxic level', for oral, the NOAEL of 15 mg/kg/day (depression of body weight gain and tremor) was obtained from medium- and long-term toxicity testing for rats. Because of the short experimental periods, this value was divided by 10 to derived a value of 1.5 mg/kg/day as the 'Non-toxic level'. For inhalation exposure, the 'Non-toxic level' could not be estimated.

With regard to oral exposure, in case of intakes the freshwater public water bodies, the predicted maximum exposure was approximately less than 0.014 μg/kg/day. The MOE of exceeding 11,000 was derived from the 'Non-toxic level' of 1.5 mg/kg/day divided by the predicted maximum dose, and divided by 10, because the 'Non-toxic level' was established by means of animal testing. As the exposure to this substance through food intakes is estimated minor, even when the exposures through freshwater and food are combined, it would not greatly affect the MOE values. Accordingly, further action for assessment of its health risk from oral exposure to this substance would not be required at present.

For the inhalation, because its 'Non-toxic level' was not determined, and the exposure concentrations were not estimated, its health risk could not be identified. The expected release quantity of this substance to the environment was 16 tons, and 99% of it was released into water bodies. It is also estimated that almost all of it is distributed into the mediums other than the atmosphere. Accordingly, there would be low necessity of collecting information on inhalation exposure to this substance in the ambient air for its health risk assessment at present.

Information of toxicity				Exposure assessment		Result of risk assessment			Judgment
Exposure path	Criteria for risk assessment	Animal	Criteria for diagnoses (endpoint)	Exposure medium	Predicted maximum exposure quantity and concentration				
Oral	'Non toxic level' 1.5 mg/kg/day	Rats	depression of body weight gain and tremor	Drinking water	– μg/kg/day	MOE	–	×	○
				Freshwater	< 0.014 μg/kg/day	MOE	> 11,000	○	
Inhalation	'Non toxic level' – mg/m^3	–	–	Ambient air	– μg/m^3	MOE	–	×	×
				Indoor air	– μg/m^3	MOE	–	×	×

4. Initial assessment of ecological risk

With regard to acute toxicity, reliable information of a 24-hour LC_{50} value of 70 μg/L was found for the crustacea *Streptocephalus rubricaudatus*, a 96-hour LC_{50} value of 97 μg/L was found for the fish *Oncorhynchus mykiss* (rainbow trout), a 24-hour LC_{50} value of 240 μg/L was found for the other organism, *Brachionus calyciflorus* (rotifer). Accordingly, an assessment factor of 1,000 was used, a predicted no effect concentration (PNEC) of 0.070 μg/L was obtained based on the acute toxicity values. The PNEC value of this substance was 0.070μg/L because any knowledge of the chronic toxicity could not be obtained.

The PEC/PNEC ratio was less than 5 for both freshwater bodies and seawater bodies. Accordingly, the ecological risk cannot be determined at this time.

For this substance, the reliable toxic data have not been obtained in the algae, and there is thought to be required the ecological impact tests and the collection of information in this species. The water solubility and vapor pressure of this substance indicate that, in the environment, it may be distributed into water bodies. The measurement of the environmental concentration of this substance may be required after revision of the lowest limit of detection.

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)		
Crustacea (chirocephalidae)	Acute	LC_{50} Mortality	1,000	0.070	Freshwater	< 0.36	< 5	×
					Seawater	< 0.36	< 5	

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5. Conclusions

	Conclusions		Judgment
Health risk	Oral exposure	No need of further work.	○
	Inhalation exposure	Impossible of risk characterization. However, there is thought to be comparatively little need to collect information, etc.	×
Ecological risk	Impossible of risk characterization. There is thought to be need to improve the knowledge through the implementation of the ecological impact tests for mainly algae. In addition, there is thought to be need for examination of measures for environmental concentrations.		×

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

Non-toxic level *

・When a LOAEL is available, it is divided by 10 to obtain a level equivalent to NOAEL.

・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.