20	CAS No.: 108-10-1	Substance: Methyl isobutyl ketone

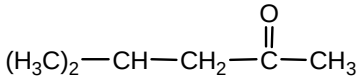
Chemical Substances Control Law Reference No.: 2-542 (Alkyl (C 1 - 16) methyl ketone)

PRTR Law Cabinet Order No.:

Structural Formula:

Molecular Formula: $C_6H_{12}O$

Molecular Weight: 100.16



1. General information

The aqueous solubility of this substance is 1.90 x 10^4 mg/L (25°C) and the partition coefficient (1-octanol/water) (log Kow) is 1.31. The vapor pressure is 19.9 mmHg (= 2.65 x 10^3 Pa) (25°C). This substance is determinated to be ready biodegradable. But the substance is thought to be one that does not have hydrolyzable groups.

It is mainly used for cellulose nitrate, synthetic resins, magnetic tapes, lacquer solvents, dewaxing solvents for petroleum products, deoiling agents, extraction agents of pyrethrin and penicillin, and also in pharmaceutical and electric plating industries. The production, exports, and imports in FY 2005 were 61,773, 21,427, and 130 tons, respectively.

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2. Exposure assessment

As methyl isobutyl ketone 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), no information on release and transfer quantities could 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 and water.

Based on previous data for the ambient air, the predicted maximum exposure concentration for inhalation exposure to human beings was approximately 2.6 μg/m^3. The expected maximum concentration in the indoor air was 150 μg/m^3. The highest estimated oral exposure level was calculated at approximately less than 0.068 μg/kg/day from the previous data on public freshwater bodies. The risk of exposure to this substance through food in environmental media is considered to be low.

The previous data of predicted environmental concentration (PEC), which indicates exposure to aquatic organisms for both freshwater and seawater bodies, was approximately less than 1.7 μg/L.

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3. Initial assessment of health risk

The substance is irritating to the eyes, the skin and respiratory tract. Swallowing the liquid may cause aspiration into lungs with the risk of chemical pneumonitis. Contact with the eyes and skin may cause their redness and pain. By inhalation or ingestion, it may cause cough, diarrhea, dizziness, headache, nausea, sore throat, unconsciousness, vomiting, weakness and loss of appetite. Additionally, by ingestion, it may cause abdominal pain. Toxic concentrations lowest(TCL_0) of 12－4,100 mg/m^3 for humans (irritation of the nose and eyes～anesthetic activity) have been reported.

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.

A no observed adverse effect level (NOAEL) of 50 mg/kg/day (increased GPT, increase in the relative weight of kidneys) was obtained for oral exposure from the medium- and long-term toxicity testing for rats. The NOAEL was divided by 10, because of the experimental period being short, and a value of 5 mg/kg/day was derived as the 'Non-toxic level*'. A lowest-observed-adverse-effect-level (LOAEL) for the inhalation, the LOAEL of 450 ppm (exacerbation of nephropathy in female rats, degeneration of liver tissue in mice) was obtained from the medium- and

long-term toxicity testing for rats and mice. The LOAEL was adjusted to 80 ppm taking into account the exposure situation . As this was a LOAEL, it was divided by 10, and a value of 8 ppm (33 mg/m^3) was derived as the 'Non-toxic level*' .

With regard to oral exposure, in case of intakes of freshwater in the public water bodies, the predicted maximum exposure was approximately less than 0.068 μg/kg/day. The margin of exposure (MOE) of exceeding 7,400 was derived from the 'Non-toxic level*' of 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 was estimated minor, even when the exposure through freshwater public water bodies 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 inhalation exposure to this substance in the ambient air, the predicted maximum exposure concentration was approximately 2.6 μg/m^3. Accordingly, from the 'Non-toxic level*' of 33 mg/m^3 and the predicted maximum exposure concentration, the MOE of exceeding 1,300 was determined in the same way. For the inhalation exposure to this substance in the indoor air, the predicted maximum exposure concentration was 150 μg/m^3. Accordingly, from the 'Non-toxic level*' of 33 mg/m^3 and the predicted maximum exposure concentration, the MOE of 22 was determined in the same way. Therefore, further action would not be required at present for assessment of its health risk from inhalation exposure to this substance in the ambient air. On the other hand, it would be required to collect information on inhalation exposure to this substance in the indoor air for its health risk assessment.

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*' 5 mg/kg/day	Rats	increased GPT, increase in the relative weight of kidneys	Drinking water	— μg/kg/day	MOE	—	×	○
				Freshwater	< 0.068 μg/kg/day	MOE	> 7,400	○	
Inhalation	'Non-toxic level*' 33 mg/m^3	Rats, Mice	exacerbation of nephropathy in female rats, degeneration of liver tissue in mice	Ambient air	2.6 μg/m^3	MOE	1,300	○	○
				Indoor air	150 μg/m^3	MOE	22	▲	▲

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.

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4. Initial assessment of ecological risk

With regard to acute toxicity, reliable information of a 48-hour median effective concentration (EC_{50}) growth inhibition value of 2,000,000 μg/L was found for the algae *Desmodesmus subspicatus*, a 24-hour median lethal concentration (LC_{50}) of 4,280,000 μg/L was found for the crustacea *Daphnia magna* (water flea), and a 96-hour LC_{50} of 537,000 μg/L was found for the fish *Pimephales promelas* (fathead minnow). Accordingly, an assessment factor of 100 was used, and a predicted no effect concentration (PNEC) of 5,400 μg/L was obtained based on the acute toxicity values. With regard to chronic toxicity, reliable information of a 35-38-day no observed effect concentration (NOEC) growth inhibition value of 57,000 μg/L was found for the fish *P. promelas*. Accordingly, an assessment factor of 100 was used, and a PNEC value of 570 μg/L was obtained based on chronic toxicity values. As the PNEC for the substance, a value of 570 μg/L obtained from the chronic toxicity for the fish was used.

The PEC/PNEC ratio was less than 0.003 for both freshwater bodies 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)		
Fish (fathead minnow)	Chronic	NOEC growth inhibition	100	570	Freshwater	<1.7	<0.003	○
					Seawater	<1.7	<0.003	

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5. Conclusions

	Conclusions		Judgment
Health risk	Oral exposure	No need for further work.	○
	Inhalation exposure	For the ambient air, further action would not be required at the moment. For the indoor air, it would be required to collect information.	▲
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

（○）: Though a risk characterization cannot be determined, there would be little necessity of collecting information.

（▲）: Further information collection would be required for risk characterization.