| 12 | CAS No.: 67-68-5 | Substance: Dimethylsulfoxide |
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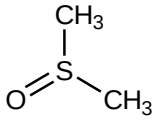
Chemical Substances Control Law Reference No.: 2-1553

PRTR Law Cabinet Order No.:

Molecular Formula: $C_2H_6OS$

Molecular Weight: 78.13

Structural Formula:



**1. General information**

This substance is freely miscible with water, the partition coefficient (1-octanol/water) (log $K_{ow}$) is –1.35, and the vapor pressure is 0.63 mmHg (=84Pa) (25°C). The biodegradability (aerobic degradation) is characterized by a BOD degradation rate of 3.1%, and bioaccumulation is thought to be nonexistent or low. The substance does not have any hydrolyzable groups in the environment.

The main applications of this substance are in the synthesis of acrylic fiber, pharmaceuticals, and pesticides, as a solvent for dyestuffs and pigments, as a release agent and detergent, and in membrane processing. The production (shipments) and import quantity in fiscal 2004 was 1,000 to <10,000 t.

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**2. Exposure assessment**

Because this substance 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. Predictions of distribution by medium using a Mackay-type level III fugacity model indicated that if equal quantities were released to the atmosphere, water bodies, and soil, the proportions distributed to water bodies and soil would be higher.

Data for setting the predicted maximum exposure to humans via inhalation could not be obtained. The predicted maximum oral exposure was estimated to be less than around 2.4 μg/kg/day based on calculations from data for groundwater. The risk of exposure to this substance by intake from an environmental medium via food is considered slight.

The predicted environmental concentration (PEC), which indicates exposure to aquatic organisms, was less than around 60 μg/L for public freshwater bodies and was around 310 μg/L for seawater.

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**3. Initial assessment of health risk**

This substance is irritating to eyes and skin and may cause diminished consciousness when exposed at high concentrations. When inhaled, it will cause headache and nausea. When orally taken, nausea, vomiting and lethargy will occur. When eyes contact with this substance, it will cause redness and blurred vision. When it adheres to skin, skin will dry up, and its absorption into skin may lead to nausea. Since this substance facilitates absorption of other substances by skin, special attention is required when there is other hazardous substance together with this substance.

Sufficient information could not be obtained on its carcinogenicity, and its initial assessment was conducted on the basis of data on its non-carcinogenic effects.

As for its oral exposure, its lowest-observed-adverse-effect-level (LOAEL) of 1,100 mg/kg/day (for the suppressed body weight increases) was obtained for oral exposure from its mid-term and long-term toxicity tests for rats. It was then adjusted for exposure conditions to provide 786 mg/kg/day. This was divided by 10, as is always the case with LOAEL, to produce 79 mg/kg/day as its ‘non-toxic level.*’

As for its inhalation exposure, its no-observed-adverse-effect-level (NOAEL) of 954 mg/$m^3$ (for the degeneration of mucous membrane of the nasal cavity) was obtained for inhalation exposure from its repeated toxicity tests for rats. It

was then adjusted for exposure conditions to provide 240 mg/m$^3$. This was divided by 10 due to their short test periods to produce 24 mg/m$^3$ as its 'non-toxic level*'.

As for its oral exposure, the predicted maximum exposure was estimated to be less than around 2.4 μg/kg/day, when intakes of groundwater were assumed. Its margin of exposure (MOE) would be more than 3,300 when calculated from its 'non-toxic level*' of 79 mg/kg/day and the predicted maximum exposure, and then divided by 10 due to the fact that 'non-toxic level*' was obtained from animal experiments. Since risk associated with exposure to this substance through food intakes from the environment is presumed to be minimal, this exposure will not increase MOE significantly, and no further action will be required at the moment to assess health risk from oral exposure to this substance.

As for inhalation exposure to this substance, lack of information on its exposure concentration did not allow assessment of its health risk. Production of this substance is relatively large. Its half-life in the atmosphere is 1.0 to 10 hrs. Almost all of this substance is presumed to distribute in media other than ambient air after its release to the atmosphere. Collection of information on its inhalation exposure to assess health risk associated with exposure to it in the ambient air would not be required.

| 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*' 79 mg/kg/day | Rats | Inhibited weight increase | Drinking water | – μg/kg/day | MOE | – | × | ○ |
| | | | | Groundwater | < 2.4 μg/kg/day | MOE | > 3,300 | ○ | |
| Inhalation | 'Non-toxic level*' 24 mg/m$^3$ | Rats | Degeneration of mucous membrane of the nasal cavity | 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 level equivalent to NOAEL.
- When an adverse effect level is available for the short-term exposure, 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 24-h median lethal concentration ($LC_{50}$) of 6,830,000 μg/L for the crustacean *Artemia salina* (brine shrimp); a 96-h $LC_{50}$ of 34,000,000 μg/L for the fish species *Pimephales promelas* (fathead minnow); and a 48-h half maximal inhibitory concentration ($IC_{50}$) of over 11,000,000 μg/L was obtained for population growth of the unicellular organisms *Paramecium caudatum* and *Paramecium trichium*. Accordingly, based on these acute toxicity values and an assessment factor of 1,000, a predicted no effect concentration (PNEC) of 6,800 μg/L was obtained. No data is available regarding chronic toxicity, and on this account, 6,800 μg/L obtained from the acute toxicity to the crustacean was adopted as the PNEC for this substance.

The PEC/PNEC ratio was less than 0.009 for freshwater bodies and was 0.05 for seawater. 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) | | |
| Crustacean (brine shrimp) | Acute | $LC_{50}$ Mortality | 1,000 | 6,800 | Freshwater | <60 | <0.009 | ○ |
| | | | | | Seawater | 310 | 0.05 | |

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**5. Conclusions**

| | Conclusions | | Judgment |
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| Health risk | Oral exposure | No need for further work. | ○ |
| | Inhalation exposure | Though a risk characterization cannot be determined, there would be little necessity of collecting 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.