**SIDIS INITIAL ASSESSMENT PROFILE**

<table>
<thead>
<tr>
<th>CAS No.</th>
<th>115-11-7</th>
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<tbody>
<tr>
<td>Chemical Name</td>
<td>Isobutylene</td>
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| Structural Formula | CH₃  
|                     | CH₂=C-CH₃ |

**SUMMARY CONCLUSIONS OF THE SIAR**

**Human Health**

Isobutylene has a low order of acute toxicity. As isobutylene is a gas at normal temperature and pressure, ingestion or dermal absorption of this material is unlikely. The 2-hour LC₅₀ of isobutylene in mice was 180,000 ppm (415 mg/L) and the 4-hour LC₅₀ in rats was 270,000 ppm (620 mg/L). Inhalation of isobutylene can produce central nervous system depression, anesthesia and/or asphyxiation. However, these effects are only seen at very high concentrations, i.e., approximately 20% or higher. Isobutylene is predicted to produce narcosis in humans at concentrations exceeding the lower explosive limit (LEL) of 18,000 ppm.

There are no data to evaluate the dermal or ocular irritation potential of isobutylene. However, should skin or eye contact occur to this chemical in its liquid state, tissue freezing, severe cold burn, and/or frostbite may result.

Repeated dose toxicity clearly demonstrated that isobutylene is not toxic to rodents at concentrations up to 8,000 ppm (18.4 mg/L) for 14 weeks. There was a minimal increase in right kidney weights of 4,000 and 8,000 ppm (9.18 and 18.4 mg/L, respectively) male rats and 8,000 ppm (18.4 mg/L) male mice and the relative (to body weight) right kidney weights of all exposed groups of male rats and 8,000 ppm (18.4 mg/L) male mice were greater than those of the chamber controls. The absolute liver weights of female rats exposed to 1,000 ppm and above, and the relative (to body weight) liver weights of all exposed groups of female rats were greater (up to 20%) than those of the chamber controls. However, the increases in absolute and relative (to body weight) liver weights did not occur in a concentration-related manner. The absolute and relative (to body weight) right kidney weights of all groups of exposed female mice were greater (up to 18%) than those of the chamber controls, but in general, were not exposure concentration related. There were no histopathologic effects associated with increased kidney or liver weights as a result of isobutylene exposure. There were no exposure-related gross lesions in the rats. Some minimal hypertrophy of goblet cells lining the nasopharyngeal duct in the most caudal section of the nasal cavity was observed in all groups of exposed male and female rats but not mice. There were no clinical findings or biologically significant effects on male or female reproductive organs attributed to isobutylene exposure in rats or mice. The NOAEL was 8,000 ppm (18.4 mg/L).

Although isobutylene produced an increase in follicular cell carcinomas of the thyroid in male rats exposed for 105 weeks, this was observed only at the highest exposure concentration (i.e., 8000 ppm) and did not occur in female rats nor male or female mice. Overall, the data suggest that isobutylene has a low carcinogenic potential. In addition, the follicular cell carcinomas in the thyroid were reported to be morphologically similar to spontaneously developing follicular cell carcinomas and there was no concurrent increase in the incidence of follicular cell hyperplasia or adenoma in male rats. It should also be noted that there was no evidence of any carcinogenic activity in female rats or mice up to 8000 ppm. Taken in concert, these data suggest that isobutylene has a low carcinogenic potential. The NOAEL was 2,000 ppm (4.5 mg/L).
Test data clearly demonstrate that isobutylene is not mutagenic in a battery of *in vitro* and *in vivo* mutagenicity studies. Isobutylene was not mutagenic when tested in reverse mutation assays conducted in *Salmonella typhimurium* and *Escherischia coli* either in the presence or absence of metabolic activation. Isobutylene did not increase the number of transformed foci in C3H/10T1/2 clone 8 mouse embryo fibroblast cells. There was no evidence of mutagenic activity in mouse lymphoma L5178Y cells either in the presence or absence of metabolic activation. In addition, isobutylene did not induce an increase in micronuclei formation in mouse bone marrow cells from animals exposed up to 10,000 ppm.

In a prenatal developmental toxicity study, inhalation exposure of pregnant Wistar rats to isobutylene on days 5 to 21 (inclusive) of gestation elicited no maternal toxicity at all tested concentrations up to 8,000 ppm. There was no effect of isobutylene on the number, growth or survival of the fetuses *in utero* and no adverse effects on fetal development. These findings, along with the with findings of no biologically significant effects on male or female reproductive organs attributed to isobutylene exposure in 14-week repeat dose inhalation studies in two rodent species, leads to a conclusion of low concern for reproductive toxicity.

**Environment**

Isobutylene is a flammable gas with a reported vapour pressure of 2,9732 hPa (25 °C); a water solubility of 263 mg/l (25 °C), a log K_{ow} of 2.34, a melting point of –140.4°C, a boiling point of –6.9°C and a density of 0.588 g/cm³ (25°C).

Results of distribution modelling show that isobutylene will partition primarily to the air compartment (99.99%), with a negligible amount partitioning to water (0.01%). In spite of its water solubility, wet deposition of isobutylene is not likely to play a significant role in its atmospheric fate because of rapid photodegradation. Volatilisation to the air will contribute to the rapid loss of isobutylene from aqueous and terrestrial habitats. In the air, isobutylene has the potential to rapidly degrade through indirect photolytic processes mediated primarily by hydroxyl radicals and ozone with calculated degradation half-lives ranging from approximately 2 to 8 and 25 hours, respectively, depending on hydroxyl radical and ozone concentrations. Aqueous photolysis and hydrolysis will not contribute to the transformation of isobutylene in aquatic environments because it is either poorly or not susceptible to these reactions.

The photochemical ozone creation potential index for isobutylene has been reported to range from 62.7 to 70.3. Because of the relatively short half-life of isobutylene in the atmosphere and the low environmental concentrations typically found, its contribution to potential global warming can be considered minor. The ozone depletion potential of this substance is negligible.

Isobutylene concentrations have been reported to range in urban air samples ranging from 1 to 10 ppb.

Although the biodegradability of isobutylene has not been evaluated, studies have demonstrated that 1-butene can be degraded by bacteria isolated from soil and surface water samples. The results from these studies suggest that isobutylene may also be subject to microbial degradation because of the similarity between these two aliphatic alkenes. However, biodegradation is unlikely to contribute to the overall degradation of isobutylene in the environment because it is a gas. Isobutylene is not expected to sorb significantly to organic matter in soil, sediment, and wastewater solids based on a log K_{oc} of 1.55.

Due to the fact that isobutylene is a gas at ambient temperature and pressure and is expected to partition predominantly to the atmosphere, no aquatic toxicity testing has been conducted. The ECOSAR model was used to predict aquatic toxicity using the equation for neutral organics, a reliable estimation method for this class of substance. Calculated acute toxicity values for fish and invertebrates are 19.9 and 21.9 mg/L, respectively. For algae, the calculated 96-hr EC50 is 13.9 mg/L. Chronic toxicity values of 2.7, 1.3, and 1.7 mg/L are calculated for fish (based on survival/growth), invertebrates (based on survival/reproduction), and algae (based on growth), respectively. Isobutylene has a low potential to bioaccumulate in aquatic species based on a calculated bioconcentration factor of 12.6.

A calculated 14-day LC50 value of 271.2 mg/kg soil has been calculated for an earthworm.
Exposure

Worldwide isobutylene production from all sources exceeds 10,000 kilotonnes/year. Approximate production volumes are reported for Japan, 1,000 kilotonnes/year, Western Europe, 995 kilotonnes/year, and the United States, 8,300 kilotonnes/year. Isobutylene is a component of natural gas and crude oil and is used as a chemical intermediate. Although isobutylene has been identified in natural environments, this has traditionally been associated with losses from petrogenic sources resulting from offgassing or venting. Anthropogenic sources of isobutylene can result from combustion of fossil fuels and losses from gas plants and refineries.

Exposure to isobutylene may occur at workplaces where it is manufactured. Based on physical properties, the primary workplace exposure would be by inhalation. No consumer exposure is foreseen because there are no direct sales to consumers.

RECOMMENDATION

The chemical is currently of low priority for further work.

RATIONALE FOR THE RECOMMENDATION AND NATURE OF FURTHER WORK RECOMMENDED

Human Health:
The chemical may possess properties indicating a hazard for human health (carcinogenicity, although it is unknown if the findings related to carcinogenicity are of relevance to humans). Based on data presented by the sponsor country, exposure to human is anticipated to be low, and therefore, this chemical is currently of low priority for further work. Countries may desire to investigate any exposure scenarios that were not presented by Sponsor Countries.

Environment:
The chemical possesses properties suggesting a hazard for the environment. Although this does not warrant further work (as it is related to acute aquatic toxicity which may become evident only at very high exposure levels), it should nevertheless be noted by chemical safety professionals and other users.