SIDS INITIAL ASSESSMENT PROFILE



SUMMARY CONCLUSIONS OF THE SIAR

A close homologue 2-hydroxyethyl methacrylate (CAS 868-77-9) was evaluated in SIAM13 and published.

Methacrylic acid, monoester with propane-1, 2-diol consists of two isomers. Typical composition of marketed substance is 20-30 % of 2-propenoic acid, 2-methyl, 2-hydroxy-1-methylethylester and 70-80 % of 2-propenoic acid, 2-methyl, 2-hydroxypropylester. CAS number 27813-02-1 is given to the mixture.

CAS 923-26-2 was assigned for a chemical "2-propenoic acid, 2-methyl-, 2-hydroxypropyl ester (I)". When the chemical is produced industrially or by usual laboratory synthetic method like reaction between methacrylic acid and propylene oxide or methacrylic acid esterification of 1,2 propanediol, the product is normally a mixture of (I) and the isomer "2-propenoic acid, 2-methyl-, 2-hydroxy-1-methylethyl ester (II)" for which CAS 4664-49-7 is assigned. Another CAS number 27813-02-1 has been assigned for this isomer mixture named more generically "methacrylic acid, monoester with propane-2, 2-diole (III)". (III) contains 70-80 % of (I) and thus some times referred as "methacrylic acid 2-hydroxypropanol ester" or other synonyms of (I) and quoted as CAS 923-26-2. Actually, the purification of the two isomers requires extensive effort and it is supposed no such effort has been taken during data collection otherwise noted. The information collected was made for the CAS number of (III) or (I) however it is reasonable to consider that data is conducted with commercially available substance which is (III).

Human Health

Methacrylic acid, monoester with propane-1, 2-diol is absorbed from the skin. Dermal absorption was studied in male rats for 8 hours with ¹⁴C. Fifty-six per cent of dosage evaporated from the application site. The amount absorbed was determined to be 29 % of the radioactivity. Radioactivity was observed in the skin (7 %), carcass (2 %), urine (1 %) and faeces (< 1 %) and as volatile organics (< 1 %). This substance is hydrolyzed to methacrylic acid and 1, 2-propanediol at pH 6.5 and 37 °C catalyzed by an unspecific esterase *in vitro*.

The oral LD_{50} is 2000 mg/kg bw and higher in rats, intraperitoneal LD_{50} is between 500 - 1000 mg/kg bw in rats, and dermal LD_{50} is 5000 mg/kg bw and higher in rabbits. No acute inhalation studies were found.

This substance is considered to be slightly irritating to the skin and irritating to the eyes of animals. Slight sensitizing potential was demonstrated in guinea pigs in two of four maximization studies. The sensitizing potential was not clearly demonstrated in humans, however cross-sensitization may occur in individuals with prior exposure to other acrylates or methacrylates. Many workers related to dentistry suffered from allergic contact dermatitis; however, the agent that caused sensitisation was not identified, nor was it possible to distinguish between concomitant sensitization and cross reactivity.

A combined oral repeated dose toxicity study with the reproductive/developmental toxicity screening test [OECD TG 422] (0, 30, 100, 300, 1000 mg/kg bw/day) was conducted using SD rats. In males, death in two of the 12 animals, salivation, decreases in locomotor activity, and ptosis were observed at 1000 mg/kg bw/day. At this dose,

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decrease in hematocrit and increase in the relative liver weights were observed. In females, death in one of the 12 animals, salivation, decreases in locomotor activity, and ptosis were observed in 1000 mg/kg bw/day. At 30, 100, and 300 mg/kg bw/day in both sexes, there was no toxicological change in any parameters. The NOAELs for the oral repeated dose toxicity are considered to be 300 mg/kg bw/day for both sexes. No repeat dose dermal or reliable inhalation studies were available.

One *in vitro* reverse mutation study in bacteria [OECD TG 471 and 472] was negative. Another *in vitro* study, chromosomal aberration test [OECD TG 473] was positive with and without metabolic activation. In *in vivo* micronucleus assay to MTD (maximum tolerance dose) [OECD TG 474] by gavage, no evidence of genotoxicity was observed. These data indicate that this substance is not mutagenic *in vivo*.

There is no available carcinogenicity study.

In the above mentioned combined oral repeated dose toxicity study with the reproductive/developmental toxicity screening test [OECD TG 422] (0, 30, 100, 300, 1000 mg/kg bw/day) using SD rats, no adverse effects were observed in any reproductive or developmental parameters. The NOAEL for the reproductive/developmental toxicity is considered to be 1000 mg/kg bw/day.

Environment

Methacrylic acid, monoester with propane-1, 2-diol is a colorless liquid with slight ester-like odor. Water solubility is 130 g/L (25 °C). The hydrolysis depends on pH ($t_{1/2}$ at pH 7 and 9 are 73.3 days and 38.2 hours at 40 °C, not significant at acid pH). The primary hydrolysis products are methacrylic acid and propylene glycol. Both of the hydrolysis products were evaluated for the toxicological properties in SIAM 11, and published in Jan. 2003 and Jul. 2004. Melting point, boiling point, logKow and vapour pressure are -89 °C, ca. 240 °C, 0.97 and ca. 0.1 hPa (20 °C), respectively. Indirect photo-oxidation by hydroxyl radicals in the atmosphere is predicted to occur with a half-life of 4.5 hours. This substance is readily biodegradable under aerobic condition within 28 days by OECD TG 301C (BOD = 81) or by TG 301E (DOC = 94.2 %). This substance is predicted to have low bioaccumulation potential (BCF = 3.2). Fugacity modelling (Mackay level III) predicts that all of this substance released to water or soil will not migrate into other compartments. When this substance is released to air, it is mainly distributed to air (57.1%), water (16.2%), and soil (26.6%).

This substance has been tested in aquatic species (algae, invertebrates and fish). An acute growth inhibition test was performed using green algae (*Pseudokirchneriella subcapitata*, OECD TG 201). Both 72-h EC50s in biomass and growth rate were > 97 mg/L. An acute toxicity test for invertebrates was performed using water fleas (*Daphnia magna*, OECD TG 202). Both 48-h EC0 and 48-h EC50 were more than 140 mg/L. An acute toxicity test for fish was performed using golden orfe (*Leuciscus idus melanotus*). The 48-h LC50 was 490 mg/L which agree with a calculated value for 96 hour LC50 for fathead minnow by QSAR. The most sensitive species for which measurement data is obtainable is green algae (*Pseudokirchneriella subcapitata*), and the 72-h EC50 was more than 97 mg/L. Chronic toxicity data for algae can be obtained from the test performed in accordance with OECD TG 201 using green algae (*Pseudokirchneriella subcapitata*). The NOEC (biomass; 72-h) and NOEC (growth rate; 72-h) were 31 and more than 97 mg/L. A chronic toxicity test for invertebrates was performed using water flea (OECD TG 211, *Daphnia magna*) on reproduction. The 21-d LC50, 21-d EC50, 21-d NOEC, and 21-d LOEC were more than 96, more than 96, 45, and 96 mg/L, respectively.

Exposure

The production volume of methacrylic acid, monoester with propane-1, 2-diol was 850 ton/year in Japan, 2003. The production volume is known to exceed 450 ton/year in US. This substance is an intermediate chemical, and is used extensively in chemical, varnishes, paper textile industry, etc. Environmental exposure may occur at the processing or production sites mainly to the waters where it may be hydrolyzed.

During production and use of this substance at the processing sites, occupational exposure is possible by inhalation and dermal route. This substance is produced in a closed system. The workplace exposures during manufacturing processes are controlled by personal protective equipment to prepare for any accidental exposure. Consumer exposures to this chemical does not occur in normal uses. Because, this chemical is used to produce plastic composite material.

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RECOMMENDATION AND RATIONALE FOR THE RECOMMENDATION AND NATURE OF FURTHER WORK RECOMMENDED

Human Health: This chemical is currently of low priority for further work. The chemical possesses properties indicating a hazard for human health (irritation and potential for skin sensitization). These hazards do not warrant further work. They should nevertheless be noted by chemical safety professionals and users.

Environment: This chemical is currently of low priority for further work because of its low hazard profile.

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