FOREWORD INTRODUCTION

METHACRYLIC ACID

CAS N°: 79-41-4

SIDS INITIAL ASSESSMENT PROFILE

CAS No.	79-41-4
Chemical Name	Methacrylic acid
Structural Formula	CH_2=CH(CH_3)-COOH

RECOMMENDATIONS

The chemical is a candidate for further work.

SUMMARY CONCLUSIONS OF THE SIAR

Human Health

No relevant data are available concerning possible effects of methacrylic acid (MAA) in humans.

MAA is rapidly absorbed in rats after oral and inhalation administration.

The main clinical sign in animal tests on acute toxicity of MAA is severe irritancy at the site of contact. Oral LD 50 values of 1320-2260 mg/kg for rats, a dermal LD 50 value between 500 and 1000 mg/kg for rabbits and a LC 50 (rat) of 7.1 mg/l/4h were determined. MAA causes adverse effects at the site of application, depending on the concentration and frequency or time of exposure. The undiluted acid causes skin and eye corrosion and respiratory tract lesions. MAA is not sensitizing as demonstrated by human experience and by animal tests.

The main effect of MAA in acute and subchronic animal studies is irritation/corrosivity at the site of contact. In repeated dose inhalation studies the relevant toxic effect was irritation of the nasal mucosa. Rhinitis was observed in rats $\geq$20 ppm (71.4 mg/m³) and mice at 300 ppm (1071 mg/m³) when animals were exposed on 90 days. Additionally, in mice degenerative lesions of the olfactory epithelium occurred at doses from 100 ppm (357 mg/m³). A NOAEL for the local effects of 20 ppm (71.4 mg/m³) was derived from a study on mice. The NOAEC for systemic toxic effects was identified to be 100 ppm in mice and 300 ppm in rats. Toxic effects after dermal or oral application routes are unknown.

MAA is negative in a bacterial gene mutation test. Taking into consideration the data on the methyl ester of MAA (methyl methacrylate, MMA) - which indicate that MMA does not express a genotoxic potential *in vivo* - there is no need for further testing of MAA. No cancer studies on MAA are available. Focal hyperplasia of the respiratory epithelium or lymphatic hyperplasia of mandibular lymph nodes in a 90-day inhalation study were not interpreted as a preneoplastic lesion but considered to represent reactive or inflammatory processes due to the irritant effect of MAA. With respect to MMA data, there is no concern on carcinogenic properties of MAA.

Data on reproductive toxicity of MAA in animals or humans does not exist. From studies with MMA no concern in relation to reproductive toxicity of MAA has to be assumed.

No specific human population at risk could be identified within the general population.

Environment
Approximately 45 000 t/a of methacrylic acid (MAA) are assumed to be available on the European market. MAA is used as an internal and external intermediate in the chemical industry for the production of methacrylic acid esters and as a co-monomer in different kinds of polymers.

MAA has a water solubility of 89 g/l, a vapour pressure of 0.9 hPa and a log Kow of 0.93. According to the physico-chemical properties the target compartment for this substance is the hydrosphere.

MAA is stable in neutral solution and is classified as "readily biodegradable". There is no considerable potential for bio- or geoaccumulation. An atmospheric half-life of 11 h was calculated for this substance.

The following results from ecotoxicity tests with aquatic species are available:

In a short-term test with fish a 96h LC50 of 85 mg/l was found for *Oncorhynchus mykiss*: For invertebrates acute and long-term studies on *Daphnia magna* had been conducted. A 48h EC_{50} between 100 and 180 mg/l and a 21d NOEC of 53 mg/l were found in these tests. The most sensitive environmental species to MAA is the alga *Selenastrum capricornutum* with a 72h EC50 of 45 mg/l and a 72h-EC10 of 8.2 mg/l. Based on these data there is a moderate hazard concern to aquatic organisms. With an assessment factor of 50 a PNEC of 164 µg/l is determined.

For the production and processing of MAA and for the use of polymeric products made from MAA most of the estimated PECs are well below the PNEC and no further work is recommended. However, from the use of a grouting agent containing hydroxyethyl-methacrylate high releases of MAA to the hydrosphere via drainage water were identified. Measured effluent concentrations up to 4 mg/l are reported for a specific tunnel construction site leading to local water concentrations up to 200 µg/l.

Exposure
No information.

NATURE OF FURTHER WORK RECOMMENDED

Environment
This substance has been agreed in the European Risk Assessment Program under Regulation EEC/793/93 with the following conclusion:

A risk to the aquatic environment in the vicinity of a tunnel construction site was identified. A quantitative extrapolation to other construction sites seems not possible but similar conditions can be anticipated. It is recommended to develop a risk reduction strategy to achieve an environmentally safe handling of the grouting agent.

Human Health
MAA is a respiratory tract irritant. There is a need for limiting the risks of respiratory tract irritation in several working areas (particularly in the industrial area without use of LEV). Risk Reduction Measures at the community level are recommended.

SIDS PROFILE SUMMARY

CAS NO: 79-41-4		SPECIES	PROTOCOL	RESULTS
PHYSICAL-CHEMICAL				
2.1	Melting Point		N.A.	15 ^{0}C
2.2	Boiling Point		DIN 51751	ca. 161 ^{0}C (at 101.3 kPa)
2.3	Relative density		DIN 51757	1.015 at 20 ^{0}C
2.4	Vapour Pressure		N.A.	0.90 hPa at 20 ^{0}C
2.5	Partition Coefficient (Log Pow)		shake-flask	0.93 at 22 ^{0}C
2.6 A.	Water Solubility		N.A.	89 g/l at 25 ^{0}C
B.	pH		N.A	1.2 – 2.0 at 98 g/l water at 20 ^{0}C
	pKa		N.A.	4.66 at 20 ^{0}C
2.7	Surface tension		ring method	65.9 mN/m at 20 ^{0}C
ENVIRONMENTAL FATE AND PATHWAY				
3.1.1	Photodegradation		Calculated (Atkinson)	In air $T_{1/2}$ = 11 hour
3.1.2	Stability in Water		EPA 796.3500	no hydrolysis at pH 3, 7 and 11
3.2	Monitoring Data			In air = mg/m^3 In surface water = mg/l In soil/sediment = mg/g In biota = mg/g
3.3	Transport and Distribution		Calculated (Fugacity Level III type)	In Air 2.9 % In Water 97 % In Sediment % In Soil 0.1 % In Biota %
	organic carbon-water partition coefficient		EPA 796.2750	Kp = 0.5 l/kg
3.5	Biodegradation		OECD 301 D	Readily biodegradable
ECOTOXICOLOGY				
4.1	Acute/Prolonged Toxicity to Fish	Oncorhynchus mykiss	OECD 203	LC_{50} (96 hr) = 85 mg/l
4.2	Acute Toxicity to Aquatic Invertebrates *Daphnia*	Daphnia magna	OECD 202 part I	EC_{50} (24 hr) = >100, <180 mg/l
4.3	Toxicity to Aquatic Plants e.g. Algae	Selenastrum capricornutum	OECD 201	E_rC_{50} (72 hr) = 45 mg/l NOEC (72 hr) = 8.2 mg/l
4.4	Toxicity to microorganisms	Pseudomonas putida	DIN 38412 part 8	EC_{10} (17 hr) = 100 mg/l EC_{50} (17 hr) = 270 mg/l
4.5.2	Chronic Toxicity to Aquatic Invertebrates (*Daphnia*)	*Daphnia magna*	OECD 202	NOEC (21 d) = 53 mg/l
TOXICOLOGY				
5.1.1	Acute Oral Toxicity	mouse rat		LD50 = 1600 mg/Kg LC50 = 1320-2260 mg/ m^3

CAS NO: 79-41-4		SPECIES	PROTOCOL	RESULTS
5.1.2	Acute Inhalation Toxicity	rat	OECD 403	LC_{50} = 7.1 mg/l/4h
5.1.3	Acute Dermal Toxicity	rabbit		LD_{50} = 500 mg/Kg
5.2.1	Skin irritation	rabbit	OECD 404	Corrosive
5.2.2	Eye irritation	rabbit	OECD 405	Corrosive
5.3	Sensitisation	guinea pig	Buehler test	not sensitising
		guinea pig	Polak adjuvant test	not sensitising
5.4	Repeated Dose Toxicity	mouse	90-day inhalation study	NOAEL (local) = 0.07 mg/l
		rat	90-day inhalation study	NOAEL (local) = 0.07 mg/l
5.5	Genetic Toxicity In Vitro			
A.	Bacterial Test (Gene mutation)	S. typhimurium	Ames-test	Negative (With and without metabolic activation)
B.	Non-Bacterial In Vitro Test (Chromosomal aberrations)			+ or - (With metabolic activation) + or - (Without metabolic activation)
5.6	Genetic Toxicity In Vivo			+ or -
5.8	Toxicity to Reproduction			NOEL =mg/Kg (General toxicity) NOEL =mg/Kg (Repro. Tox. parental) NOEL =mg/Kg (Repro. Tox. F1 generation)
5.9	Developmental Toxicity/ Teratogenicity			NOEL =mg/Kg (General toxicity) NOEL =mg/Kg (Pregnancy/litter) NOEL =mg/Kg (Foetal data)
5.11	Experience with Human Exposure			Not sensitizing by human experience

RISK ASSESSMENT

2-Propenoic acid, 2-methyl (Methacrylic acid)

CAS-No.: 79-41-4

EINECS-No.: 201-204-4

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NOTE

The complete report of the risk assessment on methyacrylic acid can be found at European Chemical Bureau (ECB) website: http://ecb.jrc.it/existing-chemicals/

In addition, the extract from IUCLID data base for methacrylic acid can be found in the annex of this publication.