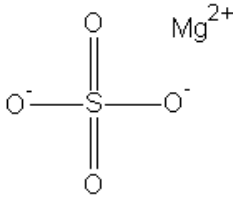
SIDS INITIAL ASSESSMENT PROFILE

CAS No.	7487-88-9
Chemical Name	Magnesium sulfate
Structural Formula	

SUMMARY CONCLUSIONS OF THE SIAR

Physical and chemical properties

Magnesium sulfate is a colourless crystalline powder that decompose at 1124 °C. It has a density of 2.66 g/cm^3 and water solubility of 357 g/L at 25 °C. The boiling point, vapour pressure, dissociation constants and partition coefficients are not applicable to an inorganic salt like magnesium sulfate.

Human Health

Magnesium is a cofactor of many enzymes involved in intermediary metabolism. Magnesium is absorbed in the intestinal tract and excreted into the digestive tract by bile and pancreatic and intestinal juices. There is an apparent obligatory urinary loss of magnesium, which amounts to about 12 mg/day and the urine is the major route of excretion under normal conditions. Unabsorbed magnesium is excreted in the feces.. Magnesium is filtered by the glomeruli and reabsorbed by renal tubules. In the blood plasma, about 65 percent is the ionic form while the remainder is bound to protein. Excretion also occurs via the sweat and milk. Approximately 70 percent of serum magnesium is ultrafilterable, and about 95 percent of the filtered magnesium is reabsorbed, which is an important factor in maintaining magnesium homeostasis. Tissue distribution studies indicate that of 20 g body burden in humans, the majority is intracellular in the bone and muscle including the myocardium, but some magnesium is present in every cell of the body.

In an acute oral toxicity study [OECD TG 423], 2 groups of 3 female rats were administered magnesium sulfate of 300 (1st and 2nd step) and 2,000 mg/kg (3rd and 4th step) bw via gavage. Mortality, body weights and clinical signs were recorded during a 14 days observation period and the animals were subjected to gross necropsy examination. The oral LD_{50} values were ≥ 2,000 mg/kg bw for female rats. No deaths were observed. Body weights increased normally. Clinical signs such as diarrhea and watery diarrhea were observed in animals dosed with 2,000 mg/kg bw. All rats survived until the experiment was terminated. No treatment related findings were observed during treatment. No experimental data were available for acute dermal and inhalation toxicity in animals.

No reliable data were available for skin and eye irritation.

No reliable data were available for sensitisation.

In a combined oral repeated dose and reproductive/developmental toxicity screening study in rats following OECD TG 422, magnesium sulfate was administered via gavage to 13 animals/sex/dose at 0, 50, 150 or 450 mg/kg bw/day. Males of the main group and both sexes of the recovery group were dosed once daily for a total of six weeks (two weeks each prior to, during and post mating), and females of the main group were dosed once daily for two weeks prior to mating, throughout gestation and for five or six days after delivery. No deaths were observed in either sex. Treatment related effects of clinical signs, increased body weight gain, food

consumption, haematology, clinical biochemistry, organ weight changes, macroscopical/histopathological findings were not observed in males/females at dose levels of 50 and 150 mg/kg bw/day. Based on the effects of soft stool in 450 mg/kg group, the NOAEL for repeated dose oral toxicity was considered to be 150 mg/kg bw/day and the LOAEL for repeated dose oral toxicity was considered to be 450 mg/kg bw/day.

In a bacterial reverse mutation assay [OECD TG 471] with *Salmonella typhimurium* strains TA98, TA100, TA1535, TA1537 and *Escherichia coli* WP2*uvr*A, magnesium sulfate was negative both with and without metabolic activation. In an *in vitro* chromosomal aberration test [OECD TG 473] using Chinese Hamster Lung (CHL) cells, both in the absence and the presence of a metabolic activation system, magnesium sulfate was negative with and without metabolic activation. In an *in vivo* micronucleus assay [no guideline followed] using femoral marrow cells of male mice, results were negative up to 500 mg/kg bw (the highest dose tested). Based on these results, magnesium sulfate is considered to be non genotoxic *in vitro* and *in vivo*.

No data were available for the carcinogenicity of magnesium sulfate.

The reproductive/developmental toxicity of the magnesium sulfate has been investigated in a combined oral repeated dose/reproductive and developmental toxicity screening test in rats [OECD TG 422]. Rats were treated by gavage at doses of 0, 50, 150, or 450 mg/kg bw/day. Males in the main group (13 rats per group) were administered for a total of six weeks (two weeks each prior to, during and post mating), and females in main group (13 rats per group) were administered for two weeks prior to mating, throughout gestation and five days (six days in twelve females) after delivery. No deaths were observed in either sex. The gestation indices were 100 %, and the pre-implantation loss rates were 10.5% and 4.8% in the control and 450 mg/kg bw/day groups, respectively. The post-implantation loss rates were 7.9% and 5.5% in the control and 450 mg/kg bw/day groups, respectively, and the live birth indices were 92.1% and 94.5% in the control and 450 mg/kg bw/day groups, respectively. In addition, the viability indices on postnatal day 0 were 97.6% and 99.0% in the control and 450 mg/kg, respectively, and the viability indices on postnatal day 4 were 99.6% and 96.8% in the control and 450 mg/kg bw/day groups, respectively. Furthermore, there were no effects in live birth index, sex ratio, mean litter size, and external findings including eye, ear, mouth, palate, absence of limbs and tail, position, size and shape on day 0 and 4. No dose-related effects on reproductive and developmental parameters were observed up to the highest dose tested. There were no treatment related effects on parental animals observed at any dose. Based on these results, the NOAEL for reproductive and developmental toxicity was considered to be 450 mg/kg bw/day. Also, magnesium sulfate is not considered to be a reproductive and developmental toxicant.

Magnesium sulfate does not present a hazard for human health due to its low hazard profile. Adequate screening-level data are available to characterize the human health hazard for the purposes of the OECD HPV Programme.

Environment

Environmental fate analysis based on log K_{ow} and log K_{oc} and typical fugacity modelling are not applicable to magnesium sulphate due to its inorganic properties. Photodegradation and biodegradation are also not applicable to an inorganic metal salt like magnesium sulfate. Given its high solubility in water, magnesium sulfate will dissociate and release Mg^{2+} and SO_4^{2-} ions. The dissociated Mg^{2+} cation can then transform and form complexes with dissolved ligands present in natural waters. Under anaerobic conditions, the dissociated sulfate ion is reduced to sulfide ion, which establishes an equilibrium with hydrogen ion to hydrogen sulphide. As a macronutrient, magnesium is widespread in living cells and so it is not expected to bioconcentrate in aquatic organisms.

The following acute toxicity test results for magnesium sulfate have been determined for aquatic species:

Fish [*Oryzias latipes*]	96 h LC_{50} > 96.4 mg/L (measured)
[*Pimephales promelas*]	96 h LC_{50} = 2,820 mg/L (nominal)
Invertebrate [*Daphnia magna*]	48 h EC_{50} > 88.7 mg/L (measured)
[*Daphnia magna*]	48 h LC_{50} = 1,820 mg/L (nominal)
Algae [*Pseudokirchneriella subcapitata*]	72 h E_rC_{50} > 99.2 mg/L (growth rate) (measured)
	72 h E_yC_{50} > 99.2 mg/L (yield) (measured)

Magnesium sulfate does not present a hazard for the environmental based on its low hazard profile. Adequate screening-level data are available to characterize the environmental hazard for the purposes of the OECD HPV Programme.

Exposure

In the Republic of Korea (sponsor country), production, import, and export volume were 2,075, 2,408, and 17 tonnes, respectively, in 2006.

Magnesium sulfate is used as a raw material in high polymer, process regulators, fixing agents, cleaning/washing agents and disinfectants, pesticides, fertilisers, stabilisers, synthetic resin, flame retardants and fire preventing agents in the sponsor country. It is also used for weighting cotton and silk, increasing the bleaching action of chlorinated lime, fire-proofing fabrics, dyeing and printing calicos and explosives. In the Republic of Korea, the manufacturing process of magnesium sulfate is handled in a closed system.