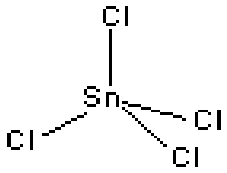
SIDS INITIAL ASSESSMENT PROFILE

CAS No. (Nos.)	7646-78-8
Chemical Name(s)	Tin Tetrachloride ($SnCl_4$)
Structural Formula	

SUMMARY CONCLUSIONS OF THE SIAR

In aqueous media, tin tetrachloride rapidly hydrolyzes to form hydrochloric acid (hydrogen chloride, HCl) and inorganic tin (IV) oxide or hydroxides; the oxide and hydroxides are insoluble and form precipitates. HCl (CAS.7647-01-0), the other biologically active hydrolysis product of tin tetrachloride, has already been through the OECD SIDS evaluation process. HCl rapidly dissociates and its effects are thought to be a result of pH change rather than effects of hydrogen chloride/hydrochloric acid. Thus ecotoxicity and mammalian toxicity data for HCl is considered representative of the toxicity to tin tetrachloride.

Human Health

Toxicokinetic studies show that inorganic tin (IV) is poorly absorbed and does not cross the placenta in pregnant rats. Absorbtion of Sn (IV) via the oral route (i.e., the gastrointestinal tract) has been shown to range from <1% to ca. 8%. Ingested tin is largely unabsorbed and excreted mainly in the faeces, with the absorbed fraction eliminated slowly in the urine. Inorganic tin typically distributes mainly to bone, but also to the liver and kidneys.

For tin tetrachloride, the inhalation LC_{50} was determined to be 1.35 mg/L for male rats exposed to vapors in humidified air. For HCl, acute oral LD_{50} values were determined to be 238–277 mg/kg bw for female; inhalation LC_{50} values were determined to be 23.7–60.9 mg/L/5min, 5.7–7.0 mg/L/30min, and 4.2–4.7 mg/L/60min for rats, and 20.9 mg/L/5min, 3.9 mg/L/30min, and 1.7 mg/L/60min for mice, depending on the exposure period.

Tin tetrachloride is a severe eye irritant and may cause necrosis of the skin. If ingested, tin tetrachloride can cause severe burns of the mouth, throat, and stomach. HCl is corrosive to the skin and severe effects can be expected from exposure to the eyes. Tin tetrachloride did not cause sensitization in rats following mucosal elicitation and is not expected to be a skin sensitizer. HCl is not a skin sensitizer.

A 28-day gavage study of tin tetrachloride administered in milk+Tween 80 at a dose of 798 mg/kg/day produced no mortality and no treatment-related changes in body weight to male and female rats, although these data are limited (i.e., dosing was done in young animals and only a single dose was used). Additional supporting information for tetravalent inorganic tin (a primary hydrolysis product of $SnCl_4$ at neutral pH) shows that rats fed inorganic tin(IV)oxide at 0, 0.03, 0.10, 0.30, and 1.00% of the diet (~ 0, 23.7, 79, 237 and 790 mg Sn/kg-bw) for 28 days did not show any adverse effects at dietary levels up to 7900 ppm tin (1.0%) in overall weight gain, absolute and relative organ weights, and the gross and microscopic appearance of the liver, heart, kidneys and spleen. For HCl, a NOAEL of 10 ppm was determined for rats and mice in 90-day repeat dose inhalation studies. Liver weight changes (male mice) and histopathological inflammatory changes were seen at higher doses.

Tin tetrachloride was negative in standard and modified Ames tests, and positive in two *in vitro* chromosomal aberration tests. HCl was negative in a standard Ames test. Chromosomal aberration tests of HCl yielded both positive and negative results; however, the positive effect was considered an artifact of low pH. Overall, tin tetrachloride is not considered to be genotoxic.

For HCl, no evidence of treatment-related carcinogenicity was observed in animal studies performed by inhalation, oral, or dermal administration.

No information was available for tin tetrachloride regarding reproduction or developmental toxicity. In reliable 90-day inhalation studies, no effects were observed in the reproductive organs of rats and mice exposed to HCl

up to 50 ppm. Although no information is available on tin (IV) oxide for reproductive and developmental toxicity, available data for other endpoints show that the compound generally has low toxicity and is not expected to be a reproductive or developmental toxicant.

Environment

Tin tetrachloride is a colorless to pale yellow liquid with a melting/freezing point of -33°C and a boiling point of 114°C. The vapor pressure of tin tetrachloride is 24 hPa at 20°C. Tin tetrachloride is violently water reactive and rapidly undergoes chemical change to form tin (IV) oxide or hydrated tin (IV) oxide, hydrochloric acid (HCl), and heat. Stannic chloride pentahydrate is the commercially-available form and is chemically stable under normal conditions of use and storage. Similarly to tin tetrachloride, stannic chloride pentahydrate also will decompose upon exposure to water or to moist air.

The physical/chemical properties of tin tetrachloride make it impossible to maintain tin tetrachloride in preparations to be used for dosing in mammalian or aquatic studies as it rapidly hydrolyzes in water. Tin tetrachloride was not toxic to zebra fish (*B. rerio*) in a limit test (96-h LC_{50} > 1000 mg/L), and primary productivity was only slightly inhibited in various algal species (IC_{50} values range from > 11 mg/L to > 110 mg/L). For the ecotoxicity tests with tin tetrachloride, pH adjustment was conducted to stabilize the pH of the tested media. For HCl, a 96-h LC_{50} of pH 4.3 (equivalent to 4.92 mg/L as test material) was reported for *Cyprinus carpio*, the 48-h EC_{50} for immobilization of *D. magna* was determined to be pH 5.3 (0.492 mg/L), and the 72-h EC_{50} and NOEC based on growth rate of the green alga *Pseudokirchneriella subcapitata* were determined to be pH 5.3 (0.492 mg/L) and pH 6.0 (0.097 mg/L), respectively. Tin tetrachloride is not toxic to aerobic bacteria in activated sludge.

The degree to which aquatic ecosystems can resist a change in pH depends on its buffering capacity, and aquatic organisms have different optimum pH conditions. HCl released into the environment is distributed both into water (as ions) and into the air, since HCl exists as a gaseous form at normal temperature and pressure and is very soluble in water. Considering its dissociation properties, HCl is not expected to accumulate in living organisms due to its high solubility. Further, the pH of effluents is frequently measured to maintain the water quality because pH is a key parameter in water quality and can be adapted easily in the aquatic ecosystem. Significant increase of the pH of the receiving water, therefore, is not expected.

Research on stability constants indicates generally stronger affinity of the Sn (IV) ion with oxides/hydroxides than with other anions, such as fluorides and chlorides. Tin (IV) oxide is insoluble in water and is expected to partition primarily to the soil and the sediment. Inorganic tin is relatively immobile and nonvolatile, and bioavailability to organisms tends to be low. Release of inorganic tin from benthic sediments is unlikely, except under highly anoxic conditions.

Exposure

In 2000, worldwide production of tin tetrachloride was estimated at 20,000 to 25,000 tonnes. There is not expected to be any direct consumer exposure to tin tetrachloride in any appreciable amounts. The majority of tin tetrachloride produced is used as a chemical intermediate in the manufacture of other tin compounds, for example, organotin compounds used as PVC stabilizers. Other uses include glass bottle coatings and specialty catalyst applications, including elastomer processing. Analysis shows that in most cases, tin tetrachloride was found at levels less then 0.1% in organotin stabilizers; one exception noted was the presence of ca. 5% tin tetrachloride in monomethyltin trichloride. When used as a chemical intermediate, closed systems control worker exposure and releases. The glass coating applications utilize local control of process vapor, with hoods and exhaust ventilation in the application area. The controlled nature of the applications limits potential for exposure to tin tetrachloride.

Releases to the environment are expected to only occur as part of the production of this intermediate or its conversion to other organotin chemicals. In the presence of air, tin tetrachloride reacts to generate tin oxide fume and chlorine gas, which may be released during production. Tin (IV) oxide has long been used in industry and is insoluble and nonvolatile. HCl occurs naturally and may be released to the environment from production and user sites. Increasing of the concentration of HCl in water decreases the pH in the aquatic ecosystem; however, generally, there is a buffer capacity to maintain the pH in the aquatic ecosystem.

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

Human Health: This chemical is a low priority for further work. The hydrolysis product of the chemical (HCl) possesses corrosive properties indicating a hazard for human health (acute and repeated-dose toxicity via inhalation and corrosivity to eyes and skin) at relatively low levels during professional use. Based on data presented by the Sponsor country, adequate risk management measures are being applied. Countries may desire to check their own risk management measures to find out whether there is a need for additional measures.

Environment: This chemical is a low priority for further work. The hydrolysis product of the chemical (HCl) possesses properties indicating a hazard for the environment (acute toxicity to fish, invertebrates and algae due to the acidity of the test solution). This hazard does not warrant further work as it is related to pH effect which may become evident only at high exposure levels. They should nevertheless be noted by chemical safety professionals and users.