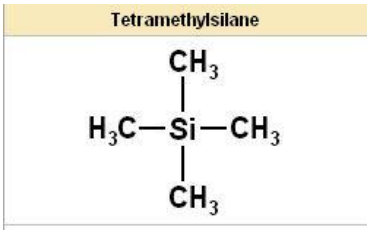
SIDS INITIAL ASSESSMENT PROFILE

CAS No.	75-76-3
Chemical Name	Tetramethylsilane
Structural Formula	

SUMMARY CONCLUSIONS OF THE SIAR

Physical-chemical properties

Tetramethylsilane is a liquid with a measured melting point of -99.1°C and a measured boiling point of 26.7°C at 1013 hPa. The extrapolated vapor pressure value from measured data is 957 hPa at 25 ºC. The measured water solubility is 19.6 mg/L at 25 ºC. The estimated log K_{ow} of tetramethylsilane is 3.24.

Human Health

No toxicokinetics data were available for tetramethylsilane. Based on acute toxicity studies, systemic absorption following inhalation or dermal exposure appears to be low, while there appears to be some absorption and systemic distribution following oral (gavage) exposure. Repeated inhalation exposures suggest tetramethylsilane may be distributed to the liver.

The 4-hour inhalation LC_{50} in rats was > 21.3 g/m^3 (21.3 mg/L) [OECD TG 403]. There were no clinical signs but macroscopic findings were noted in the lungs (discoloration, petechiae and/or hyaline spot/areas on one or more lobes) and intestines (tightened) at necropsy. The 7-hour inhalation LC_{50} in male rats is > 2130 ppm (7.7 mg/L) [no guideline specified]. There were no clinical signs of toxicity or macroscopic findings at necropsy. The dermal LD_{50} value is > 2000 mg/kg-bw [OECD TG 402] in rats. There were no clinical signs of toxicity or macroscopic findings at necropsy. The oral LD_{50} was >2000 mg/kg-bw [OECD TG 401]. The clinical signs noted at 30 minutes to 6 hours after treatment included abnormal gait, squatting and abdominal position, sedation, paddling movements, piloerection, diarrhea, and diuresis. In another study, the oral LD_{50} in male rats was ca. 2000 mg/kg bw [no guideline specified]. There was one death at this dose level, but there were no clinical signs of toxicity and abdominal distension was noted at necropsy. Tetramethylsilane was not irritating to the rabbit skin [OECD TG 404] or eyes [OECD TG 405], and is not expected to be irritating to the respiratory tract based on acute inhalation studies in rats, and was not sensitizing to the skin of the guinea pig [OECD TG 406].

In a combined repeated-dose/reproductive/developmental toxicity screening test [OECD TG 422], rats were exposed via whole-body vapor inhalation to 0, 200, 1000 or 5000 ppm (0, approximately 0.72, 3.6 or 18 mg/L, respectively) tetramethylsilane, for 6 hours/day, 7 days/week, for up to 29 days. No treatment-related effects were observed at any exposure concentration. The NOAEC for systemic toxicity was 5000 ppm (18 mg/L/day), the highest concentration tested.

Tetramethylsilane did not induce gene mutations in *Salmonella typhimurium* strains (TA 98, TA 100, TA 102, TA 1535 and TA 1537) in an *in vitro* test [OECD TG 471] in the presence and absence of metabolic activation. Tetramethylsilane did not induce gene mutations [OECD TG 476] and chromosomal aberrations [OECD TG 473] in mammalian cells *in vitro*. Tetramethylsilane is not considered genotoxic *in vitro*. Carcinogenicity data are not available.

In the combined repeated-dose/reproductive/developmental toxicity screening test [OECD TG 422], described above, rats were exposed to tetramethylsilane via whole-body inhalation, two weeks prior to mating, during mating and up to gestation day 19. Dams and pups were euthanized on post-natal day 4. There were no treatment-related effects observed on fertility or

developmental toxicity parameters. The NOAEC for reproductive and developmental toxicity was 5000 ppm (18 mg/L/day), the highest concentration tested.

Tetramethylsilane has a low hazard profile for human health. Adequate screening-level data are available to characterize the human health hazard for the purposes of the OECD HPV Programme.

Environment

The EPISuite program developed by the U.S. Environmental Protection Agency and Syracuse Research Corporation has not been validated for chemicals that contain silanes in their molecular structure (although measured data are included in some of the training sets); therefore, there is uncertainty associated with the calculated values and they should be used with caution whenever they are reported.

The Si-C bond in tetramethylsilane is expected to be hydrolytically stable under conditions typically found in the environment for very long periods of time; a hydrolysis study has not been conducted. Measured photodegradation data are available for tetramethylsilane. Based on measured OH radical rate constants, the calculated lifetime of tetramethylsilane for indirect photo-oxidation (reaction with OH radicals) ranges from 9 to 30 days. Level III Fugacity modeling, using equal releases to air, soil, and water (loading rates of 1000 kg/hour to each medium), shows the following percent distribution of tetramethylsilane: Air = 50.9%, Water = 48.4%, Soil = <1%, and Sediment = <1%. Tetramethylsilane was not readily biodegradable (8 % after 28 days) under the conditions of a ready biodegradability test conducted following EC Directive 92/69/EEC C.4-C and ISO/DIS 14593 (Modified Sturm test). The biodegradation results may be conservative as the substance will partition to the headspace during the test. The estimated Henry's Law constant of 2.24 $x10^4$ Pa-m3/mole (0.22 atm-m3/mole) suggests that volatilization from the water phase for tetramethylsilane is expected to be high.

The BCF for tetramethylsilane cannot be predicted accurately, however, the regression-based estimated BCF value is 63.79 L/kg wet-wt (BCFBAF Program, v3.00).

Due to the physical chemical properties of the test substance, volatilization during the conduct of the reported algal and daphnia studies occurred, such that the reported concentration may be uncertain. Modelled data are provided to supplement the measured data.

The following acute toxicity test results with tetramethylsilane have been determined for aquatic species:

Fish [*Oncorhynchus mykiss*] 96 h LC50 = 1.9 mg/L (OECD TG 203; WAF, flow-through, closed system; measured)
96 h LC50 = 15.9 mg/L (estimated)

Invertebrate [*Daphnia magna*] 48 h EC50>103 mg/L (OECD TG 202; static; closed system, measured by headspace analysis)
48 h EC50 = 9.9 mg/L (estimated)

Algae [*Scenedesmus subspicatus*] 72-hour ErC50, EbC50> 0.0079 mg/L; NOEC $\geq$0.0079 (OECD TG 201; WAF, closed system, measured). Where: EbC50 = EC50 based on biomass; ErC50 = EC50 based on growth rate.
96 h EC50 = 6.5 mg/L (estimated)

Tetramethylsilane possesses properties indicating a hazard for the environment (acute toxicity to fish and Daphnia from 1 to 10 mg/L). Tetramethylsilane is not readily biodegradable. Adequate screening-level data are available to characterize the hazard for the environment for the purposes of the OECD HPV Programme.

Exposure

The North American production and import volume in 2005 was 106,594 tonnes (235 million lbs), the European production and import volume in 2005 was 90,718 tonnes (200 million lbs), and the Japanese production and import volume in 2005 was 2268 tonnes (5 million lbs). Tetramethylsilane is used as a precursor for chemical vapor deposition of SiO and SiC layers in the production of integrated circuits, as an analytical reference standard for Nuclear Magnetic Resonance Spectroscopy method, and is used in coatings and sealants. These uses are the same in North America, Europe and Japan.

Tetramethylsilane is produced in closed systems [hard-piped]; it is shipped by road in tanks, trailers and drums. Engineering controls such as local ventilation are used during packaging and sampling. Worker exposure due to non-accidental releases at the facility level is expected to be minimal.