SIDS INITIAL ASSESSMENT PROFILE

CAS No.	116-15-4
Chemical Name	1-Propene, 1,1,2,3,3,3, hexafluoro (Hexafluoropropylene; HFP)
Structural Formula	$F_3C\text{-}CF{=}CF_2$

RECOMMENDATIONS

The chemical is a candidate for further work.

SUMMARY CONCLUSIONS OF THE SIAR

Human Health

Hexafluoropropylene (HFP) has been tested in various acute and repeat-dose toxicity tests and genotoxicity tests. Results indicate that HFP causes kidney damage in rats, mice, guinea pigs, and rabbits under both acute and subchronic inhalation exposure conditions. Kidney effects include changes in urinary output (increased volume and decreased osmolality) as well as pathological changes including regeneration of cortical tubules, cytomegaly of tubular epithelium, and necrosis. All changes appear reversible in male and female rats and female mice, but not in male mice, at concentrations of 50 ppm and above in 13-week studies. A 13-week NOEL of 10 ppm has been established for human health in this hazard assessment. Genotoxicity studies with HFP show that it does not cause gene mutations in *in vitro* tests, is not a heritable mutagen based on a negative dominant lethal test in rats, but does cause chromosomal aberrations in both *in vitro* and *in vivo* tests. The latter positive results were seen at high exposure levels (*in vitro* – 0.29 to 1.40% of the atmosphere above plates; and at a single, six-hour inhalation concentration of 1200 ppm, the highest concentration tested in the *in vivo* micronucleus test). An unscheduled DNA synthesis study in rats was also negative.

The only SIDS endpoint not fulfilled at this time is the reproductive/developmental toxicity endpoint. It is recommended that this be filled (see below for rationale).

Environment

HFP by virtue of its physical form as a gas will be found mainly in the air compartment. Estimations of abiotic degradation via reactions with hydroxyl radicals is a half-life of 5-25 days in air. HFP is not likely to partition into water, soil, sediment, suspended sediments or biota. HFP is also not likely to bioaccumulate based on estimated partition coefficients. The environmental exposure potential is low since relatively small quantities are released into the environment.

Because HFP's distribution is almost exclusively into the air compartment, there are no aquatic hazard data available or needed for this assessment. The only potential hazard is the possible effects of HPF in terms of global warming potential. Neither HFP or its breakdown products (COF_2 and C_2F_4O) following reaction with hydroxyl radicals, are listed as individual contributors to global warming potential in the U.S.

Exposure

HFP is a gas that is a chemical intermediate manufactured in closed system and used primarily in the synthesis of

fluropolymers, fluoroelastomers and fluorolubricants. Total production ranges from 10,000 to 20,000 metric tonnes each year in closed systems. HFP is normally utilized in the synthesis process. However, it can be sold and transported as a compressed, non-flammable gas in 1 to 15 ton pressurized containers or via pipelines to other processing/production facilities.

Measured occupational exposure data at U.S. production sites exist from the mid-1980's. The data indicate predominantly low exposure (below the limit of detection – between 0.3 to "less than 1.0" ppm), with occasional, rare variances up to 6.3 ppm (highest reported level). There is no known direct consumer use and so consumer exposure is limited to HFP at the impurity level in the marketed end-use products.

Release to the environment from regular use is anticipated to be negligible. However, computer modeling of a U.S. facility from which estimated fugitive emissions were reported resulted in a "fenceline" air level of 0.017 mg/m^3, or 2.7×10^{-3} ppm. This level can be considered a PEC for the environment.

NATURE OF FURTHER WORK RECOMMENDED

The OECD SIDS test plan for HFP was approved in 1993, indicating there was no need for a reproductive/developmental toxicity test because HFP is a gas and a closed-system intermediate. Following subsequent review (SIAM 8), it was decided that HFP needed to be evaluated for potential developmental toxicity based on the possibility of a single exposure to a pregnant woman during an industrial accident.

In order to evaluate the developmental toxicity, a reproductive/developmental test is needed for this chemical. Based on similarity of chemical structure and comparable repeat dose toxicity data it is recommended that this data gap be filled by using information on a surrogate chemical – tetrafluoroethene (TFE) before the conduct of additional animal experiments. TFE is currently being investigated in the U.S. HPV Challenge Program.