

***ACETONE CYANOHYDRIN
ECOLOGICAL FATE AND EFFECTS PROFILE***

CAS No. 75 - 86 - 5

Prepared for

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by

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ECOLOGICAL FATE AND EFFECTS PROFILE

Common Name: Acetone Cyanohydrin

Chemical Name: Propanenitrile, 2-hydroxy-2-methyl

CAS Number: 75-86-5

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1.0 SUMMARY

Acetone cyanohydrin may be released to the environment as a result of its manufacture and use as a chemical intermediate in the production of insecticides and other organic compounds, especially methyl methacrylate. It has been used as a transcyanohydration agent for steroids.

If released to water, it will be expected to rapidly dissociate with a calculated half-life of 9 minutes; thus, adsorption to sediment and suspended solids are not expected to be significant processes. Any undissociated acetone cyanohydrin will not be expected to volatilize from environmental waters due to the low Henry's Law constant. With a low bioconcentration factor, acetone cyanohydrin is not expected to bioaccumulate in aquatic organisms. Based on results of aqueous activated sludge screening tests, biodegradation of acetone cyanohydrin may not be a dominant process in aquatic systems.

If released to the atmosphere, acetone cyanohydrin is expected to exist almost entirely in the vapor phase based on its vapor pressure. It will be susceptible to photooxidation via vapor phase reaction with photochemically produced hydroxyl radicals with a half-life of 39 days.

If released to a moist soil, acetone cyanohydrin is not expected to volatilize due to a low Henry's Law constant and rapid dissociation from aqueous solution. But it will be a significant process in a dry surface soil or other surfaces. No degradation of acetone cyanohydrin in soil is reported.

Acetone cyanohydrin appears to be highly toxic to freshwater and marine fish, and moderately toxic to wildlife.

2.0 ENVIRONMENTAL FATE

2.1 Environmental Fate Data

TYPE OF FATE	DATA	REFERENCE
Hydrolysis	N.A. ¹	
Water Solubility	Freely soluble in water	Merck, 1989
Photolysis - soil	N.A.	
Photolysis - water	Half-life – 0.15 hours at pH 7 and 25°C (rate constant 4.47 hour ⁻¹)	Ellington, J.J. et al., 1988
	Miscibility of undissociated compound with water	Smiley, R.A., 1981
Photolysis - air	half-life 39 days (rate constant 0.408E-12cm ³ /mole-sec)	Atkinson, R., 1987
Sorption/desorption (K _d)	N.A.	
Organic Carbon/Water Partition Coefficient (K _{OC})	K _{OC} = 12	Lyman et al., 1982
Octanol/water partition Coefficient (K _{OW})	N.A.	
Bioconcentration	Log BCF = 0.23	Lyman et al., 1982
Henry's Law Constant	8.95x10 ⁻⁸ atm-m ³ /mole	Lyman et al., 1982
Vapor Pressure	0.8 mm Hg at 20°C	Clayton, & Clay, 1981.
	0.75 mm Hg at 20°C	Weber et al., 1981
Others	Aqueous activated sludge screening tests suggest that biodegradation may not be a dominant process in aquatic systems.	Slave et al., 1974.

¹ N.A. = not available

2.2 Summary of Environmental Fate of Acetone Cyanohydrin

2.2.1 Environmental Degradation/Bioconcentration: With a short life of 9 minutes in water and miscibility in water, acetone cyanohydrin is expected to rapidly dissociate in water, but not expected to volatilize from water or from a moist soil surface. Acetone cyanohydrin is, however, expected to volatilize from dry surface soil rapidly due to a reported high vapor pressures. No degradation of acetone cyanohydrin in soil is reported. It is not expected that acetone cyanohydrin accumulates in aquatic organisms.

2.2.2 Aquatic Fate: Acetone cyanohydrin is freely soluble in water and has a half-life of 9 minutes. Thus, if released into water, it will be expected to dissociate rapidly. Furthermore, with the reported miscibility of undissociated compound with water, adsorption to sediment and suspended solids and bioconcentration in aquatic organisms are expected to be insignificant. Biodegradation of acetone cyanohydrin in aqueous systems is not a dominant process. Any undissolved acetone cyanohydrin is also not expected to volatilize from environmental water body due to a low Henry's Law constant of 8.95×10^{-8} atm-m³/mole (Lyman et al., 1982).

2.2.3 Atmospheric Fate: The estimated atmospheric half-life of acetone cyanohydrin is 39 days (Atkinson, R., 1987). The reported vapor pressure of 0.80 mm Hg at 20°C indicating that if acetone cyanohydrin is released to the atmosphere, it is expected to exist almost entirely in the vapor phase (Weber et al., 1981).

2.2.4 Terrestrial Fate: As noted in the above two sections of Aquatic Fate and Atmospheric Fate, adsorption on organic sediment or bioconcentration in aquatic organisms are insignificant processes for acetone cyanohydrin. In addition, having such a low Henry's Law constant, acetone cyanohydrin is considered nonvolatile. Thus, volatilization from a moist surface soil, acetone cyanohydrin is not expected; but it will be a significant process in a dry surface soil or other surfaces due to a reported vapor pressure of 0.80 mm Hg at 20C (Clayton, & Clay, 1981). No degradation of acetone cyanohydrin in soil is reported.

2.2.5 Soil Adsorption and soil Mobility: With a K_{OC} value of 12, acetone cyanohydrin is negligible sorption to soil.

2.2.6 Volatilization from Water and Soil: Acetone cyanohydrin is not expected to volatilize from water but it is expected to volatilize from dry soil due to reported vapor pressure of 0.8 mm Hg, but not expected to volatilize from moist soil due to low Henry Law constant.

3.0 ENVIRONMENTAL EFFECTS

3.1 Environmental Effects Data

TYPE OF EFFECTS	DATA	REFERENCE
Acute LC ₅₀ Bluegill (<i>Lepomis macrochirus</i>)	570 µg/L, 96-hours	Dawson et al., 1977
Acute LC ₅₀ Inland silverside (<i>Menidia beryllina</i>)	500 µg/L 96-hour static bioassay	Dawson et al., 1977
Acute LC ₅₀ Northern squawfish (<i>Ptychocheilus oregonensis</i>)	10,000 µg/L, 24-hour static bioassay	MacPhee, C. and Ruelle, R., 1969
Avian/Terrestrial wildlife oral LD ₅₀ Toxicity	LD ₅₀ = 0.17 g/Kg	Merck, 1989
Avian/Terrestrial Wildlife Dietary LC ₅₀ Toxicity	N.A.	
Chronic Avian/Terrestrial Wildlife Toxicity	N.A.	
Acute Toxicity - Plants or soil Organisms	N.A.	
Bacteria - Toxicity Test	N.A.	
Acute Toxicity to Benthic Organisms	N.A.	

3.2 Summary of Environmental Effects of Acetone Cyanohydrin

3.2.1 Acute Toxicity to Aquatic Organisms: Acetone cyanohydrin appears to be highly toxic (<1.0 mg/l) to bluegill, a fresh water fish, and inland silverside, a salt water fish and moderate toxic (1-100 mg/L) to Northern squawfish.

3.2.2 Acute Toxicity to Benthic Organisms or Animals Exposed to contaminated sediments: No available data.

3.2.3 Acute Toxicity to Terrestrial Wildlife via Oral Dose: Based on the acute toxicity data to rats, acetone cyanohydrin is considered moderate toxic to wildlife.

3.2.4 Acute Toxicity to Terrestrial Wildlife via Diet or Food: No data available.

3.2.5 Acute Toxicity to Plants or Soil Organisms exposed through soil concentrations: No data available.

3.2.6 Chronic Toxicity to Aquatic Organisms: No data available.

3.2.7 Chronic Toxicity to Terrestrial Wildlife via Diet or Food: No data available.

3.2.8 Toxicity to Bacteria or Algae: No data available.

4.0 REFERENCES

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5.0 SOURCE

Computer data base: August, 1998
HSDB (Hazardous Substances Databank)
BIODEG
CHEMFATE
DATALOG
AQUIRE

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