Technical Information

Stepan

Stepan Company
22 Frontage Road
Northfield, Illinois 60093
Telephone (847) 446-7500

www.stepan.com

ECOTOXICOLOGY OF ALKYL DIMETHYL BENZYL/ETHYL BENZYL AMMONIUM CHLORIDES

Applicable to these current Stepan products:

BTC® 2125 M-80% BTC® 2125M	BTC® 2125 M P40 AGENT 2248-14	SO/SAN® 30M

Applicable to these inactive Stepan products:

BTC® 2125	BTC® 2125-80	BTC® 2125 P40

Toxicological Information:

Test/Conditions	Results/Classification	References
Acute Oral Toxicity (Quail)(14 day)	LD_{50} (Lethal Dose) = 164 mg/kg (highly toxic)	Stepan Study No. 93-021A
Acute Aquatic Toxicity (Bluegill sunfish) (96 hr.)	LC_{50} (Lethal Concentration) = 0.515 ppm (highly toxic)	Stepan Study No. 91-029A
Acute Aquatic Toxicity (Rainbow trout) (96 hr.)	LC50 = 0.930 ppm (highly toxic)	Stepan Study No. 91-030A
Acute Aquatic Toxicity (D. magna) (48 hr.)	LC_{50} = 0.0058 ppm-0.016 mg/l (extremely toxic)	Stepan Study No. 91-031A, 07-015A
Acute Aquatic Toxicity (Sheepshead minnow) (96 hr.)	LC_{50} = 0.860 ppm (highly toxic)	Stepan Study No. 92-016A
Acute Aquatic Toxicity (fathead minnow) (96 hr.)	LC_{50} = 1.4 mg/l w/20 mg/l humic acid (moderately toxic)	Stepan Study No. 94-020A
Acute Aquatic Toxicity (Embryo larvae-eastern oyster) (48 hr.)	LC_{50} = 0.055 ppm (extremely toxic)	Stepan Study No. 92-015A
Acute Aquatic Toxicity (Saltwater mysid) (96 hr.)	LC_{50} = 0.092 ppm (extremely toxic)	Stepan Study No. 92-017A

Test/Conditions	Results/Classification	References
Early Life Stage Toxicity (Fathead minnow)(34 day)	No effects on hatchability were observed at 0.273 ppm	Stepan Study No. 5019
Chronic Toxicity (21 day)(D. magna)	No effects on survival, growth or reproduction were observed at or less than 0.0042 ppm	Stepan Study 92-010A
Acute Aquatic Toxicity (algae)(96 hr.)	EC_{50} = 0.063 mg a.i./L(cell density) NOAEC= 0.035 mg a.i./L	Stepan Study 05-021A
Acute Aquatic Toxicity (plant)(7 day)	EC_{50} = 0.12 mg a.i./L(highly toxic) NOAEC= 0.019 mg a.i./L	Stepan Study 05-020A
Chronic Toxicity (midge)(28 days)	LC_{50} = 479 mg/kg (practically non-toxic) NOEC= 520 mg/kg	Stepan Study 95-015A

Discussion:

It should be noted that the above studies reflect acute toxicity of quaternary ammonium compounds (QACs) to aquatic organisms conducted in high quality laboratory water using test methods that do not consider the physical and chemical properties of these molecules in surface water; thus representing an unrealistic scenario. An aquatic safety assessment by Lewis and Wee have shown that when the aquatic studies were conducted in river waters toxicity to aquatic organisms was much reduced. For example the 96-hr and 48 hr. LC_{50} values for bluegill sunfish and Daphnia magna for QACs determined in laboratory high quality waters ranged from 0.62 to 3.0 mg/l and 0.16 to 1.06 mg/l respectively. The acute toxicities of the same compounds for bluegill sunfish and Daphnia magna in river water ranged from 10 to 24 mg/l and 3.1 mg/l respectively. The 96 hr. LC_{50} value for freshwater alga to these compounds in the laboratory water was 0.23 mg/l. In river water the algistatic concentrating for freshwater alga ranged from 0.71 to greater than 4.0 mg/l. These results represent a 3 to greater than 17-fold reduction in toxicity compared to results from the tests using high-quality laboratory water. It is known that quaternaries adsorb to suspended solids and have a tendency to form complexes with anionic moieties (both of which are found in much greater concentrations in river waters). It is believed that these properties are responsible for substantially reducing bioavailability and subsequent toxicity of QACs to aquatic organisms in natural surface waters.

References:

*Boethling, R.S., 1984, Environmental Fate and Toxicity in Wastewater Treatment of Quaternary Ammonium Surfactants, Water Res. Vol. 18, No. 9, pp. 1061-1076.

*Cross, J., and Singer, E.J., Editors, 1994. Cationic Surfactants: Analytical and Biological Evaluation, Marcel Dekker, Inc., Vol. 53, pp. 95-135.

*Lewis, M.A., and Wee, V. T., (1983) Aquatic Safety Assessment for Cationic Surfactants, Environmental Toxicology and Chemistry, Vol. 2, pp. 105-118.

Last Update: 2.8.10 Revision Reference: TX016.03
Last Modified by: Barbara Gomez on 02/08/2010 01:30:15 PM