

ACTIVATED SLUDGE RESPIRATION INHIBITION TEST

TEST SUBSTANCE

Identity: Perfluorooctanesulfonate; may also be referred to as PFOS or FC-95. (1-Octanesulfonic acid, 1,1,2,2,3,3,4,4,5,5,6,6,7,7,8,8,8-heptadecafluoro-, potassium salt, CAS # 2795-39-3)

Remarks: The test substance is a white powder. Sample was taken from 3M lot number 217. Sample was stored under ambient conditions prior to testing. Purity determined to be 90.49% by LC/MS, ^1H -NMR, ^{19}F -NMR and elemental analyses techniques.

METHOD

Method: OECD 209

Test type: Static acute

GLP: Yes

Year Completed: Study completed 1999. Report completed 2000

Analytical monitoring: Dissolved oxygen concentrations.

Statistical methods: Probit analysis using the computer software of C.E. Stephan.

Test organism source: Activated sludge collected from the Prospect Bay Wastewater Treatment Facility, Grasonville, Maryland.

Test conditions

Dilution water: NANOpure®

Synthetic Sewage:

1 liter municipal water
16.0 g peptone
11.0 g meat extract
3.0 g urea
0.7 g NaCl
0.4 g $\text{CaCl}_2 \cdot 2\text{H}_2\text{O}$
0.2 g $\text{MgSO}_4 \cdot 7\text{H}_2\text{O}$
2.8 g K_2HPO_4

Reference and test solution preparation: A stock solution of the reference substance, 3,5-dichlorophenol, was prepared by dissolving 500 mg in 10 mL of 1N NaOH, diluted to 30 mL with NANOpure® water, then brought to the point of incipient precipitation with 1N H_2SO_4 , and diluted to 1 L with NANOpure® water. The pH of the reference solution was measured to be 7.18.

PFOS was added directly to test vessels rather than volumetric addition of a stock solution. This method was deemed appropriate based on the observed solubility of the test substance in water.

Test vessels: Mixtures were prepared and aerated in 500 mL Erlenmeyer flasks and then transferred into 300 mL Biochemical Oxygen Demand (BOD) bottles

Number of concentrations: 7 plus 3 reference controls and 2 Blank controls

Temperature: 19-21°C

Total Suspended Solids and pH for sludge on day of testing: 4380 mg/L and 7.87 respectively.

Element Basis: Respiration inhibition as determined by dissolved oxygen concentration.

Method Remarks: Stock solutions of PFOS that were prepared at nominal concentration of approximately 500 and 1000 mg/L in NANOpure® water contained test material that was not in solution after 20-minutes of sonication. Therefore, direct weight addition was employed to administer PFOS to the test system.

Test mixtures were prepared at 15-minute intervals and aerated until the contact time of the test substance with the activated sludge was three hours. After 3-hours of contact time, dissolved oxygen was measured over a period of up to 10-minutes.

RESULTS

Nominal concentrations: Two blank controls, three reference substance controls, 0.90, 2.7, 9.0, 27, 90, 271, 905 mg/L test material solutions

Statistical Analyses: EC₅₀ values were calculated for the reference material by probit analysis using the computer software of C.E. Stephan. An EC₅₀ value could not be calculated for the test substance.

Analytical Methodology: Analysis of DO concentrations in all test solutions were performed at Wildlife International Ltd. using a YSI Model 50B Dissolved Oxygen Meter. Dissolved oxygen readings were recorded every 10 seconds for 10 minutes or until the dissolved oxygen dropped below 1.0 mg/L

Respiration Rates and Percent Inhibitions

Treatment	Respiration Rate mg O ₂ /L/hour	Percent Inhibition
Control 1	39.6	NA
Control 2	41.1	NA
3,5-dichlorophenol 3 mg/L	31.1	22.9
3,5-dichlorophenol 15 mg/L	14.6	63.8
3,5-dichlorophenol 50 mg/L	5.1	87.4
Test substance 0.90 mg/L	38.9	3.6
Test substance 2.7 mg/L	35.1	13.0
Test substance 9.0 mg/L	33.5	17.0
Test substance 27 mg/L	37.9	6.1
Test substance 90 mg/L	32.7	19.0
Test substance 271 mg/L	28.1	30.4
Test substance 905 mg/L	24.7	38.8

Control response: satisfactory

CONCLUSIONS

The test substance exhibited a maximum inhibitory effect of 38% upon respiration at a nominal test substance concentration of 905 mg/L. The EC₅₀ (respiration inhibition) is therefore greater than the solubility of the test substance.

Submitter: 3M Company, Environmental Laboratory, P.O. Box 33331, St. Paul, Minnesota, 55133

DATA QUALITY

Reliability: Klimisch ranking 1.

REFERENCES

This study was conducted at Wildlife International, Ltd. Easton, MD at the request of the 3M Company.

OTHER

Last changed: 5/3/00

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