ACTIVATED SLUDGE RESPIRATION INHIBITION TEST

TEST SUBSTANCE

Identity: A mixture containing perfluorooctanesulfonate, which may also be referred to as PFOS, FC-95, or as a component of FX-601. (1-Octanesulfonic acid) (CAS # 2795-39-3).

Remarks: The 3M production lot number was cc 835-34. The test sample is L-9235 (FX-601). Current information indicates it is a mixture of 1% PFOS, 12% diethylene glycol butyl ether, 81.25% water, 2% propane Sultone foamer, 1% sodium octyl sulfate, 1% sodium decyl sulfate, 0.1% N-(3-chloroallyl) hexaminium chloride, 0.8% xanthan gum, 0.8% starch, and 0.05% tolyltriazole.

The following summary applies to a mixture with incompletely characterized concentrations of impurities. Data may not accurately reflect the toxicity of the fluorochemical component of the test sample.

METHOD

Method: Activated sludge protocol EAR/WAS 5-09-84
Test type: Aerobic
GLP: No
Year Completed: 1984
Analytical monitoring: Dissolved oxygen concentrations
Statistical methods: Results were determined by calculation of the oxygen consumption rate.
Test organism source: Activated sludge mixed liquor from the Metropolitan Wastewater Treatment Plant, St. Paul, MN
Test condition:

Dilution water: Deionized water.
Synthetic sewage: Not given.
Reference and test solution preparation: The test material was added directly to the dilution water on a weight/volume basis.
Test vessels: Not given.
Number of concentrations: three plus blank control, in duplicate (two studies run)
Total suspended solids and pH on day of testing: Not given.
Element basis: Respiration inhibition as determined by oxygen consumption.

RESULTS

Nominal concentrations: Blank control, 10, 100, and 1000 mg/L.

Element values: No inhibitory effect on activated sludge respiration rate was seen at 1000 mg/L with a contact time of 7 minutes.

Element values based on nominal concentrations.

Testing was conducted on a mixture as described in the Test Substance Remarks field. The values reported apply to that mixture and not the fluorochemical proportion alone.

CONCLUSIONS

The material exhibited no inhibitory effects at 1000 mg/L over a 7 minute exposure. The respiration rate of the test bioreactor was higher than that of the blank controls.

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

DATA QUALITY

Reliability: Klimisch ranking = 3. The test lacks record of methodology used. The method was not an agency-approved method. The inoculum is not properly characterized. There is a lack of characterization of the test sample and the study lacks analytical confirmation of the amount of fluorochemical proportion in the solution.

REFERENCES

This study was conducted by the 3M Company, Environmental Laboratory, St. Paul, MN, Lab Request number B1684, 1984.

OTHER

Last changed: 6/26/00

3M Environmental Laboratory
Acute Toxicity of a Compound (Substance) to Activated Sludge Mixed Liquor
Protocol Reference: EAR/WAS 5-09-84

Lab request no.: B1684-1 Date: 6/20/84 Analyst: JS

The activated sludge mixed liquor was collected from the St. Paul/Minneapolis Metro Wastewater Plant on 6/20/84.

Sample description: L-9235 (FX601) CC835-54

Preparation of stock solution: * grams of sample were diluted to _____ ml with deionized reagent water. Date of preparation: _____.

SECOND RUN DUPLICATE? DISSOLVED OXYGEN READINGS

TIME min.	sec.	CONCENTRATION OF TEST MATERIAL IN ACTIVATED SLUDGE MIXTURE						
		DI H_2O CONTROL	10mg/l	100mg/l	1000mg/l	DI H_2O Control		Average of Control
	30	7.2	7.1	7.0	7.2	7.3		7.25
1	00	6.8	6.8	6.6	6.8	6.9		6.85
2	00	6.1	6.1	5.7	5.7	6.2		6.15
3	00	5.4	5.3	4.8	4.6	5.5		5.45
4	00	4.7	4.6	3.9	3.5	4.8		4.75
5	00	4.1	4.0	3.0	2.4	4.2		4.15
6	00	3.4	3.3	2.2	1.4	3.3		3.35
7	00	2.7	2.6	1.3	0.5	2.6		2.65
8	00	2.1	1.9	0.5		2.0		2.05
9	00	1.2	1.2			1.3		1.25
10	00	0.5	0.5			0.5		0.5
R		0.692	0.695	0.874	1.061	0.708		

COMMENTS:

* INDIVIDUAL WEIGHTS

mg/l	mg/300ml
10	3.003
100	30.03
1000	300.3

R is the Oxygen consumption rate (mgO_2/l and min)

3M Environmental Laboratory
Acute Toxicity of a Compound (Substance) to Activated Sludge Mixed Liquor
Protocol Reference: EAR/WAS 5-09-84

Lab request no.: B1683-1 Date: 6/20/84 Analyst: [signature]

The activated sludge mixed liquor was collected from the St. Paul/Minneapolis Metro Wastewater Plant on 6/20/84.

Sample description: L-9235 (FX601) CC835-34

Preparation of stock solution: * grams of sample were diluted to _____ ml with deionized reagent water. Date of preparation: _____.

FIRST RUN DISSOLVED OXYGEN READINGS

TIME min.	sec.	CONCENTRATION OF TEST MATERIAL IN ACTIVATED SLUDGE MIXTURE: DI H2O CONTROL	10 mg/l	100 mg/l	1000 mg/l	DI H2O Control		Average for Control
	30	7.0	6.9	7.1	7.1	7.2		7.1
1	00	6.7	6.5	6.7	6.6	6.9		6.8
2	00	5.9	5.8	5.8	5.5	6.2		6.05
3	00	5.3	5.1	4.9	4.4	5.5		5.4
4	00	4.6	4.4	4.0	3.3	4.8		4.7
5	00	3.9	3.7	3.0	2.2	4.1		4.0
6	00	3.2	3.0	2.2	1.2	3.4		3.3
7	00	2.6	2.4	1.3	0.5	2.8		2.7
8	00	1.9	2.0	0.5	(Extrapolation)	2.1		2.0
9	00	1.0	1.0			1.2		1.1
10	00	0.5	0.5			0.5		0.5
		0.690	0.1165	0.893	1.048	0.705		

R

COMMENTS:
* Individual weights

mg/l	mg/300ml
10	3.003
100	30.03
1000	300.3

R is the Oxygen consumption rate (O2/l and min)

Form 10620-8-8 PWO

Lab Request No B/6854

Environmental Lab – Work Sheet

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SLUDGE TOXICITY CALCULATIONS

Date: 6/22/84

Analyst: JS

Sample Description
L-9235 (FX601)
CC 835-34
FIRST RUN

$$\% \text{ Inhibition} = \frac{\left(\frac{R_{C_1} + R_{C_2}}{2}\right) - R_S}{\frac{R_{C_1} + R_{C_2}}{2}} \times 100$$

R = Oxygen consumption rate (mg O_2/l and min)
S = Test substance
C_1 = Control 1
C_2 = Control 2

Sample Description	R Value (mg O_2/l)	% Inhibition
DI Control 1	0.690	—
10 mg/l	0.6625	4.7
100 mg/l	0.893	-28.0
1000 mg/l	1.078	-54.6
DI Control 2	0.705	—

10MN IC_{50} = >1000 mg/l

$$\% \text{ Difference in Controls} = \frac{|R_{C_1} - R_{C_2}|}{\frac{R_{C_1} + R_{C_2}}{2}} \times 100 =$$

$$= \frac{|0.690 - 0.705|}{\frac{0.690 + 0.705}{2}} \times 100$$

$$= \frac{0.015}{0.6975} \times 100$$

$$= 2.2\%$$

002104

Form 10620-8-B PWO

Lab Request No. B1484

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Environmental Lab – Work Sheet

SLUDGE TOXICITY CALCULATIONS

Date: 6/22/84

Analyst: [signature] 3

Sample Description
L-9235 (EX601)
CC835-34
~~DUPLICATED~~ 3
SECOND RUN

$$\% \text{ Inhibition} = \frac{\left(\frac{R_{C_1} + R_{C_2}}{2}\right) - R_S}{\frac{R_{C_1} + R_{C_2}}{2}} \times 100$$

Sample Description	R Value (mg O2/l)	% Inhibition
DI Control 1	0.692	—
10 mg/l	0.695	0.4
100 mg/l	0.874	-24.9
1000 mg/l	1.061	-51.6
DI Control 2	0.708	—

10 MIN. IC_{50} = > 1000 mg/l

$$\% \text{ Difference in Controls} = \frac{|R_{C_1} - R_{C_2}|}{\frac{R_{C_1} + R_{C_2}}{2}} \times 100$$

$$= \frac{|0.692 - 0.708|}{\frac{0.692 + 0.708}{2}} \times 100$$

$$= \frac{0.016}{0.7} \times 100$$

$$= 2.3\%$$