

ACTIVATED SLUDGE RESPIRATION INHIBITION

TEST SUBSTANCE

Identity: Perfluorooctanoic acid, ammonium salt; may also be referred to as PFOA ammonium salt, Ammonium perfluorooctanoate, PFO, FC-116, FC-126, FC-169, FC-143, or as a major component of FX-1003. (Octanoic acid, pentadecafluoro-, ammonium salt, CAS # 3825-26-1)

Remarks: The 3M production lot number was 2327. The test sample is FX-1003. It's purity was not sufficiently characterized, though current information indicates it is a solution of <45% ammonium perfluorooctanoate, 50% water, <3% inert perfluorinated compound and 1 - 2% C₅ and C₇ perfluoro analogue compounds.

The following summary applies to the test sample as a mixture of the test substance in water solution with incompletely characterized concentrations of impurities. Data may not accurately relate toxicity of the test sample with that of the test substance.

METHOD:

Methods: OECD 209

Test type: Static acute

GLP: No

Year Completed: 1990

Analytical monitoring: Dissolved oxygen concentrations.

Stock and test solution preparation: Test substance solution was created by mass addition to a solution containing 284 mL Millipore Milli-Q® water, 16 mL synthetic sewage feed, and 200 mL inoculum. A reference solution was created using a 500 mg/L stock solution of 3,5-dichlorophenol.

Inoculum source: Mixed liquor activated sludge collected from Metro Wastewater Treatment Plant, St Paul, MN

Mixed liquor Suspended Solids: 3.2 g/L

Inoculum holding: None – used day obtained.

Test Conditions:

pH of Activated Sludge Mixed Liquor: 6.7 (initial) and 7.1 (final)

pH of 1,000 mg/L test concentration: 7.3 (initial).

Temperature: 20 – 21°C

Element basis: Respiration inhibition as determined by oxygen consumption.

RESULTS

Nominal concentrations: Bk control, Reference control, 1000 mg/L

Element values: 30-minute EC₅₀ = >1,000 mg/L
3-hour EC₅₀ = >1,000 mg/L

All element values based on nominal concentrations.

Remarks: Testing was conducted on the mixture of the test substance as described in the test substance remarks field. The values reported apply to that mixture and not the test substance.

CONCLUSIONS

The FX-1003 3-hour EC₅₀ for activated sludge respiration inhibition was determined to be >1,000 mg/L.

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

DATA QUALITY

Reliability: Klimisch ranking 2. Testing meets all criteria for quality testing, but lacks analytical confirmation of test substance concentrations. There is a lack of characterization of the test sample. The testing procedure was also not fully documented.

REFERENCES

This study was conducted by the 3M Environmental Laboratory, St. Paul, Minnesota, Lab Request number G2882.

OTHER

Last changed: 5/25/00

LR G2882
Date 2-16-90
Analyst SAB

ENVIRONMENTAL LABORATORY
ACTIVATED SLUDGE MIXED LIQUOR

Type Test OECD Activated Sludge Respiration Inhib. #209

Source Metro Waste Treatment Plant St Paul, MN

Date Obtained 2-16-90 Date Used 2-16-90

Mixed Liquor Suspended Solids (MLSS) 3.2 g/L Adjustment None g/L

pH Initial = 6.7 Final = 7.1

Comments _____

Test Substance

Sample Description FX-1003 Lot 2327

Sample pH 1000 mg/L = 7.3 Adjustment none

Comments _____

Reference Substance

Sample Description 3,5-Dichlorophenol

Sample pH Stock soln: 7.5 Adjustment None

Comments 500 mg/L

Exposure Conditions

Test Duration 3-Hours

Test Temperature 20-21 °C

Comments Test run with LR H1234

Lab Request No. G2282

Environmental Lab — Work Sheet

Page 1 of 3OECD ACTIVATED SLUDGE
RESPIRATION INHIBITION TEST #209Date: 2-16-90Analyst: SABSample Description
Clear Liquid
FX-1003
Lot 2327

Test Solutions Preparation

Test Conc. mg/l	mg added per 500 ml	ml MQ water per 500 ml	ml syn. sewage feed per 500 ml	ml microbial inoculum per 500 ml	Total volume ml
Blank Controls	—	284	+ 16	+ 200	= 500
1000	500	+ 284	+ 16	+ 200	= 500

Initial pH Test Soln. = 7.3

Test substance apparently miscible with water

Controls shared with LR H 1234

ENVIRONMENTAL LABORATORY

ACTIVATED SLUDGE RESPIRATION INHIBITION TEST #209
CALCULATION OF RESULTS

LR G2882
Date 2-16-91
Analyst SAB
Pg 3 of 3

Test Substance FX-1003 Lot 2327

30 - MINUTE EXPOSURE

Test Substance Concentration (mg/L)	Oxygen Uptake Rate R	R Corrected ⁽¹⁾ to 20°C	% Inhibition in Respiration Rate ⁽²⁾
CONTROL I	0.6485	0.6485	-
<u>1000</u>	0.6194	0.6194	9.1
CONTROL II	0.7139	0.7139	-

Percent Difference in Controls⁽³⁾ 9.6%

EC₅₀ (95% Confidence Limits) mg/L > 1000

3 - HOUR EXPOSURE

Test Substance Concentration (mg/L)	Oxygen Uptake Rate R	R Corrected ⁽¹⁾ to 20°C	% Inhibition in Respiration Rate ⁽²⁾
CONTROL I	0.6836	0.6529	-
<u>1000</u>	0.5503	0.5503	17
CONTROL II	0.7030	0.6714	-

Percent Difference in Controls⁽³⁾ 2.8%

EC₅₀ (95% Confidence Limits) mg/L > 1000

(1) Temp. Correction = $\frac{R_{T,obs}}{\theta^x}$ (mg O₂/L-min.)

(3) % Difference = $\frac{|RC_1 - RC_2|}{\left(\frac{RC_1 + RC_2}{2}\right)} \times 100$

(2) % Inhibition = $\frac{\left(\frac{RC_1 + RC_2}{2}\right) - R_S}{\left(\frac{RC_1 + RC_2}{2}\right)} \times 100$

The two control respiration rates should be within 15% of each other

See pg 1 for test soln. prep.

Where:

R = Oxygen uptake rate (mg O₂/L-min.)

T_{obs} = Sample temp., °C

θ = 1.047, x = T_{obs} - 20°C

C = Control

Lab Request No. 62882
H1234

Environmental Lab — Work Sheet

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Sample Description

3,5-Dichlorophenol
Reference Substance
Aldrich Red Label
Lot D7-060-0OECD ACTIVATED SLUDGE
RESPIRATION INHIBITION TEST #209Date: 2-16-90Analyst: SAB

Stock and Test Solutions Preparation

STOCK SOLUTION: Dissolved 500 mg 3,5-DCP in 10 ml 1.0N NaOH

Diluted to 30 ml with Milli-Q water

Added 1.0N H₂SO₄, under stirring, dropwise until incipient ppt

Diluted to one liter with Milli-Q water

Stock soln. pH = 7.5

Each 1.0 ml = 0.5 mg 3,5-DCP

Test Conc. mg/L	ml stock soln per 500 ml	ml MQ water per 500 ml	ml syn. sewage feed per 500 ml	ml microbial inoculum per 500 ml	Total volume ml
Blank Controls	—	284	16	200	500
10	10	274	16	200	500

ENVIRONMENTAL LABORATORY

ACTIVATED SLUDGE RESPIRATION INHIBITION TEST #209
CALCULATION OF RESULTS

LR G-2822, H123

Date 2-16-90

Analyst SLB

Test Substance 3,5-Dichloro Phenol

Pg 3 of 3

30 - MINUTE EXPOSURE

Test Substance Concentration (mg/L)	Oxygen Uptake Rate R	R Corrected ⁽¹⁾ to 20°C	% Inhibition in Respiration Rate ⁽²⁾
CONTROL I	0.6485	0.6485	-
10	0.3515	0.3515	48
CONTROL II	0.7139	0.7139	-

Percent Difference in Controls⁽³⁾ 9.6 %

EC₅₀ (95% Confidence Limits) mg/L 10 mg/L induced 48 % inhib.

3 - HOUR EXPOSURE

Test Substance Concentration (mg/L)	Oxygen Uptake Rate R	R Corrected ⁽¹⁾ to 20°C	% Inhibition in Respiration Rate ⁽²⁾
CONTROL I	0.6836	0.6529	-
10	0.2109	0.2014	70
CONTROL II	0.7030	0.6714	-

Percent Difference in Controls⁽³⁾ 2.8 %

EC₅₀ (95% Confidence Limits) mg/L 10 mg/L induced 70 % inhib.

(1) Temp. Correction = $\frac{R_{T,obs}}{x}$ (mg O₂/L-min.)

(3) % Difference = $\frac{|RC_1 - RC_2|}{\left(\frac{RC_1 + RC_2}{2}\right)} \times 100$

(2) % Inhibition = $\frac{\left(\frac{RC_1 + RC_2}{2}\right) - R_s}{\left(\frac{RC_1 + RC_2}{2}\right)} \times 100$

The two control respiration rates should be within 15% of each other

See pg 1 for test soln. prep.

Where:

R = Oxygen uptake rate (mg O₂/L-min.)

T_{obs} = Sample temp., °C

θ = 1.047, x = T_{obs} - 20°C

C = Control