

ACTIVATED SLUDGE RESPIRATION INHIBITION TEST

TEST SUBSTANCE

Identity: Perfluorodecanesulfonate, ammonium salt; may also be referred to as PFDS, FC-120, or 3M Sample J2905-1. (1-Decanesulfonic acid, 1,1,2,2,3,3,4,4,5,5,6,6,7,7,8,8,9,9,10,10,10-heneicosafuoro-, ammonium salt, CAS # 67906-42-7)

Remarks: Test sample is a mixture of the test substance in water and butyl cellosolve (approximately 25% test substance, 37.5% butyl cellosolve and 37.5% water). All values reported relate to this mixture. No calculations were made to adjust for the actual concentration of the test substance in the test sample. Test sample was from 3M Lot 164.

METHOD

Method: OECD 209

Test type: Static acute

GLP: No

Inoculum source: Metro Waste Treatment Plant, St Paul, MN.

Inoculum holding: None – used the day it was obtained.

Inoculum MLSS: 4.3 g/L.

Year Completed: 1992

Analytical monitoring: Dissolved oxygen concentrations.

Exposure Period: 30-minutes and 3-hours

Measurements: Dissolved oxygen depletion rate after 30-minutes and 3-hours of exposure.

RESULTS

Nominal concentrations: Blank controls and 1000 mg/L test material solution, in duplicate.

Element value: 30-min and 3-hour $EC_{50} > 1000$ mg/L

All element values based on nominal concentrations.

Inhibition in respiration rate: After 3-hours exposure, the mean of both replicates was 17.3% inhibition at 1000 mg/L

Control response: The largest percent difference between control uptake rates was 1.5%; thus the two controls were within 15% of each other.

Reference substance results: 3,5-dichlorophenol at a concentration of 10 mg/L induced 57% inhibition in respiration rate. This was within the normal range seen in this laboratory with this inoculum.

Remarks: Testing was conducted on the "as-sold" mixture of the subject material (25% subject substance in water). The value reported applies to that mixture and not the test material.

CONCLUSIONS

FC-120 exhibited a 17.3% inhibitory effect at 1000 mg/L after a 3-hour exposure.

Testing was conducted on the "as-sold" mixture of the subject material in water (~25% subject material). The values reported apply to that mixture and not directly to the subject material.

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

DATA QUALITY

Reliability: Klimisch ranking 2. This study, while well conducted, lacks analytical data for: determination of the test substance concentration in the test solutions; and determination of the sample purity. Because a mixture was tested, care must be taken when interpreting the results. The solvent in the mixture could have enhanced or restricted biological uptake and/or toxicity of the fluorochemical component.

REFERENCES

This study was conducted by the 3M Company, Environmental Laboratory, St Paul, MN, Lab Request number J2904, 3/6/92.

OTHER

Last changed: 5/18/00

ENVIRONMENTAL LABORATORY
ACTIVATED SLUDGE MIXED LIQUOR

LR 52904-1
Date 3/9/92
Analyst KSP
Page 1 of 4

Type Test OECD ACTIVATED SLUDGE RESPIRATION INHIBITION TEST #209

ACTIVATED SLUDGE MIXED LIQUOR

Date Obtained 3/6/92

Date Used 3/6/92

Mixed Liquor Suspended Solids (MLSS) 4.3 g/L Adjusted to — g/L

MLSS in final test solution 1.7 g/L

Initial pH 7.5 (1st test soln. prepared)

Final pH 7.7 (last soln. prepared)

Comments —

TEST SUBSTANCE

Sample Description FC-120 LOT 164

Initial pH of highest conc. tested (1000 mg/L) = 7.7

Adjusted to pH —

Comments Yellow Liquid

REFERENCE SUBSTANCE

Sample Description 3,5 - DICHLOROPHENOL

Initial pH of stock solution (500 mg/L) = 8.1

Adjusted to pH 7.7

Comments —

EXPOSURE CONDITIONS

Test Duration 3 hours

Test Temperature Range: 19.6 - 21.0 °C

Comments —
—
—
—

Py 2 & 4

LR 32904-1

ENVIRONMENTAL LABORATORY

OECD ACTIVATED SLUDGE RESPIRATION INHIBITION TEST #209 TEST SOLUTIONS PREPARATION

Test Substance: FC-120 LOT 164

Sample Description: YELLOW LIQUID

Analyst: KSN

Date: 3/9/92

Test Conc. mg/L	mg added per 500 ml	mL MQ(1) water per 500 ml	mL syn. sewage feed per 500 ml	mL microbial inoculum per 500 ml	Total Volume ml
<u>Blank Control</u>	<u>-</u>	<u>284</u>	<u>16</u>	<u>200</u>	<u>500</u>
<u>1000-A</u>	<u>500</u>	<u>284</u>	<u>16</u>	<u>200</u>	<u>500</u>
<u>1000-B</u>	<u>500</u>	<u>284</u>	<u>16</u>	<u>200</u>	<u>500</u>

INITIAL pH values: A: 7.7

B: 7.7

(1) Millipore Milli-Q^R high purity water

ENVIRONMENTAL LABORATORY

CECO ACTIVATED SLUDGE RESPIRATION INHIBITION TEST #209

RAW DATA

Test Substance: FC-120 LOT 164Source of Activated Sludge Mixed Liquor: NEW WASTE TREATMENT PLANT; ST. Paul, MNDate Received: 3/6/92Date Used: 3/6/92Analyst: KSN

30-MINUTE EXPOSURE

DISSOLVED OXYGEN CONCENTRATIONS, mg/L

Test Substance Concentration (mg/L)	TIME-MINUTES											Temp °C
	0.5	1.0	1.5	2.0	2.5	3.0	3.5	4.0	4.5	5.0	5.5	
BK CONTROL I	8.4	8.0	7.6	7.2	6.6	6.1	5.6	5.2	4.7	4.2	3.7	20.0
1000-A	4.5	4.0	3.6	3.1	2.6	2.1	1.6	1.0	0.5	—	—	21.0
1000-B	2.8	2.2	1.6	1.0	0.5	—	—	—	—	—	—	20.7
BK CONTROL II	7.6	7.1	6.6	6.2	5.7	5.2	4.9	4.2	3.7	3.1	2.7	20.2

3-HOUR EXPOSURE

DISSOLVED OXYGEN CONCENTRATIONS, mg/L

Test Substance Concentration (mg/L)	TIME - MINUTES											Temp °C
	0.5	1.0	1.5	2.0	2.5	3.0	3.5	4.0	4.5	5.0	5.5	
BK CONTROL I	8.0	7.5	7.0	6.4	6.0	5.5	5.0	4.5	3.9	3.4	2.9	19.9
1000-A	8.3	7.9	7.5	7.1	6.7	6.3	5.8	5.3	4.9	4.5	4.1	20.5
1000-B	8.5	8.0	7.6	7.2	6.8	6.3	5.9	5.5	5.1	4.6	4.2	19.9
BK CONTROL II	7.1	6.7	6.3	5.8	5.3	4.8	4.2	3.7	3.3	2.8	2.4	19.6

pH of activated sludge mixed liquor: Initial 7.5Final 7.7pH of highest concentration tested: Initial 7.6Final 7.4Test temperature: 19.6-21.0 °C

ENVIRONMENTAL LABORATORY
OECD ACTIVATED SLUDGE RESPIRATION INHIBITION TEST #209
CALCULATION OF RESULTS

Pg 4 of 4
Lr: J2904-1
Date: 3/6/92

Test Substance: FC-120 LOT 164

Analyst: KSN

30-Minute Exposure												Dissolved Oxygen Concentrations, mg/L			
mg/L	0.5	1.0	1.5	2.0	2.5	3.0	3.5	4.0	4.5	5.0	5.5	Temp, °C	R (1)	Ra (2)	% Inh. (3)
BK1	8.4	8.0	7.6	7.2	6.6	6.1	5.6	5.2	4.7	4.2	3.7	20.0	0.9661	0.9661	0.0
1000.00	4.5	4.0	3.6	3.1	2.6	2.1	1.6	1.0	-	-	-	21.0	1.0000	0.9328	3.8
1000.00	2.8	2.2	1.6	1.0	-	-	-	-	-	-	-	20.7	1.2000	1.1430	
BK2	7.6	7.1	6.6	6.2	5.7	5.2	4.9	4.2	3.7	3.1	2.7	20.2	0.9867	0.9730	-
% diff in controls (4): 0.7												EC50 (95% CI): >1000 mg/L			
												RaCm (5): 0.9696			

3-Hour Exposure												Dissolved Oxygen Concentrations, mg/L			
mg/L	0.5	1.0	1.5	2.0	2.5	3.0	3.5	4.0	4.5	5.0	5.5	Temp, °C	R (1)	Ra (2)	% Inh. (3)
BK1	8.0	7.5	7.0	6.4	6.0	5.5	5.0	4.5	3.9	3.4	2.9	19.9	1.0194	1.0265	-
1000.00	8.3	7.9	7.5	7.1	6.7	6.3	5.8	5.3	4.9	4.5	4.1	20.5	0.8594	0.8300	18.5
1000.00	8.5	8.0	7.6	7.2	6.8	6.3	5.9	5.5	5.1	4.6	4.2	19.9	0.8485	0.8544	16.1
BK2	7.1	6.7	6.3	5.8	5.3	4.8	4.2	3.7	3.3	2.8	2.4	19.6	0.9830	1.0108	-
% diff in controls (4): 1.5												EC 50 (95% CI): >1000 mg/L			
												RaCm (5): 1.0186			

- (1) R= Oxygen uptake rate (mg O₂/L-min)
 (2) Ra= R adjusted to 20°C= [R/(T-20)]
 (3) % Inhibition= [(RaCm)-RaS/(RaCm)]100
 (4) % difference in controls: [(RaBk1-RaBk2)/RaCm]100 (Two controls must be within 15% of each other.)
 (5) Mean adjusted R, controls= (RaBk1+RaBk2)/2

g= 1.072
 RaCm= mean adjusted R, controls
 Bk= blank control, S= sample
 Tobs= sample temp
 T= Tobs-20°C

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LR 52729

ENVIRONMENTAL LABORATORY

OECD ACTIVATED SLUDGE RESPIRATION INHIBITION TEST # 209 TEST SOLUTIONS PREPARATION

Test Substance: 3,5 - DICHOROPHENOL REFERENCE SUBSTANCE

Sample Description: ALDRICH RED LABEL LOT D7, 060-0

Analyst: KSN

Date: 3/6/92

Stock Solution Preparation: 500 mg/L ; EACH 1.0 ml = 0.5 mg.
DISSOLVED 500 mg 3,5-DCP IN 10 ml 1.0 N NaOH
ADDED ≈ 20 ml MILLI-Q WATER
ADDED 1.0 N H₂SO₄ DROPS, UNDER STIRRING UNTIL INSOLUBLE PPT.
ADDED ≈ 500 ml MILLI-Q WATER. STOCK SOLUTION INITIAL pH = 8.1
ADJUSTED TO 7.7 WITH H₂SO₄, DILUTED TO 1 LITER WITH
MILLI-Q WATER. STOCK SOLUTION pH = 7.7

Test Conc. mg/L	mL added per 500 mL	mL MQ(1) water per 500 mL	mL syn. sewage feed per 500 mL	mL microbial inoculum per 500 mL	Total Volume mL
Blank Control	—	284	16	200	500
10	10	274	16	200	500

(1) Millipore Milli-Q[®] high purity water

P. 3-63
 J2-00
 J2-04
 LA 53320

ENVIRONMENTAL LABORATORY

COD ACTIVATED SLUDGE RESPIRATION INHIBITION TEST #209

RAW DATA

Test Substance: 3.5-DICHLOROPHENOL Reference Substance

Source of Activated Sludge Mixed Liquor: Metro Wastewater Treatment Plant, St. Paul, MN

Date Received: 3/6/92

Date Used: 3/6/92

Analyst: KSN

30-MINUTE EXPOSURE

DISSOLVED OXYGEN CONCENTRATIONS, mg/L

Test Substance Concentration (mg/L)	TIME-MINUTES											Temp °C
	0.5	1.0	1.5	2.0	2.5	3.0	3.5	4.0	4.5	5.0	5.5	
BK CONTROL I	8.4	8.0	7.6	7.2	6.6	6.1	5.6	5.2	4.7	4.2	3.7	20.0
10	8.1	7.9	7.5	7.1	6.9	6.6	6.3	5.9	5.6	5.2	4.9	20.8
BK CONTROL II	7.6	7.1	6.6	6.2	5.7	5.2	4.9	4.2	3.7	3.1	2.7	20.2

3-HOUR EXPOSURE

DISSOLVED OXYGEN CONCENTRATIONS, mg/L

Test Substance Concentration (mg/L)	TIME - MINUTES											Temp °C
	0.5	1.0	1.5	2.0	2.5	3.0	3.5	4.0	4.5	5.0	5.5	
BK CONTROL I	8.0	7.5	7.0	6.4	6.0	5.5	5.0	4.5	3.9	3.4	2.9	19.9
10	9.4	9.2	9.1	9.0	8.8	8.5	8.2	8.1	7.8	7.6	7.4	19.6
BK CONTROL II	7.1	6.7	6.3	5.8	5.3	4.9	4.3	3.7	3.3	2.8	2.4	19.6

pH of activated sludge mixed liquor: Initial 7.5
 pH of highest concentration tested: Initial 7.6
 Test temperature: 19.6 - 20.8 °C

Final 7.7
 Final 7.3

ENVIRONMENTAL LABORATORY
OECD ACTIVATED SLUDGE RESPIRATION INHIBITION TEST #209
CALCULATION OF RESULTS

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Lr: J2902 & J2904 15330
Date: 3/6/92

Test Substance: 3,5-DICHLOROPHENOL

Analyst: KSN

30-Minute Exposure

		Dissolved Oxygen Concentrations, mg/L										Temp, °C	R (1)	Ra (2)	% Inh. (3)
mg/L		0.5	1.0	1.5	2.0	2.5	3.0	3.5	4.0	4.5	5.0				
BK1		8.4	8.0	7.6	7.2	6.6	6.1	5.6	5.2	4.7	4.2	20.0	0.9661	0.9661	-
10.00		8.1	7.9	7.5	7.1	6.9	6.6	6.3	5.9	5.6	5.2	20.8	0.6533	0.6180	36.3
BK2		7.6	7.1	6.6	6.2	5.7	5.2	4.9	4.2	3.7	3.1	20.2	0.9867	0.9730	-

% diff in controls (4): 0.7

EC50 (95% CI):

RaCm (5): 0.9696

3-Hour Exposure

		Dissolved Oxygen Concentrations, mg/L										Temp, °C	R (1)	Ra (2)	% Inh. (3)
mg/L		0.5	1.0	1.5	2.0	2.5	3.0	3.5	4.0	4.5	5.0				
BK1		8.0	7.5	7.0	6.4	6.0	5.5	5.0	4.5	3.9	3.4	19.9	1.0194	1.0265	-
10.00		9.4	9.2	9.1	9.0	8.8	8.5	8.2	8.1	7.8	7.6	19.6	0.4255	0.4375	57.1
BK2		7.1	6.7	6.3	5.8	5.3	4.8	4.2	3.7	3.3	2.8	19.6	0.9830	1.0108	-

% diff in controls (4): 1.5

EC 50 (95% CI):

RaCm (5): 1.0186

(1) R = Oxygen uptake rate (mg O₂/L-min)

(2) Ra = R adjusted to 20°C = [R/e.Ex]

(3) % Inhibition = [(RaCm) - RaS / (RaCm)] 100

(4) % difference in controls: [(RaBk1 - RaBk2) / RaCm] 100 (Two controls must be within 15% of each other)

(5) Mean adjusted R, controls = [RaBk1 + RaBk2] / 2

e = 1.072

RaCm = mean adjusted R, controls

Bk = blank control, S = sample

Tobs = sample temp

z = Tobs - 20°C