

ACTIVATED SLUDGE RESPIRATION INHIBITION

TEST SUBSTANCE

Identity: Perfluorooctanesulfonylamido(ethyl)acetate; may also be referred to as PFOSAA, FC-128 or as the major component of FC-127, FC-129, FC-109, FC-109-X or R1904. (Glycine, N-ethyl-N-[(heptadecafluorooctyl)sulfonyl]-, potassium salt, CAS # 2991-51-7)

Remarks: The test sample is FC-129 referred to by the test laboratory as R1904. Current information indicates it is a mixture of 42% test substance, 32% water, 14% 2-butoxyethanol, 4% ethanol, and 8% C₄-C₇ fluoroalkyl carboxylate compounds. Test material was from 3M production lot 930014, mfg. date 3/97.

The following summary is abbreviated because the test sample is a mixture of the test substance in a water/organic solvent solution. 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: 1997

Test organism source: Activated sludge collected from the City of Superior, Wisconsin, Wastewater Treatment Plant.

RESULTS

Nominal concentrations: Bk control, Reference substance, 3.75, 7.5, 15.0, 30 mg/L

Element values: 30-minute EC₅₀ = >1000 mg/L
3-hour EC₅₀ = >1000 mg/L (No inhibition exhibited)

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 value reported applies to that mixture and not the test substance. No attempt was made to determine the impact of the presence of the organic solvents or what portion of the toxicity can be contributed to the Perfluorooctanesulfonylamido(ethyl)acetate.

CONCLUSIONS

The FC-129 3-hour EC₅₀ for activated sludge respiration inhibition was determined to be >1000 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.

REFERENCES

This study was conducted at AScl Corporation of Duluth, Minnesota at the request of the 3M Company.

OTHER

Last changed: 5/17/00

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STUDY TITLE

INHIBITION OF R1904 FOR ACTIVATED SLUDGE RESPIRATION

DATA STANDARD

OECD GUIDELINE 209

STUDY COMPLETED

JULY 10, 1997

TESTING FACILITY

ASCI Corporation
ASCI-Duluth Environmental Testing Division
4444 Airpark Boulevard
Duluth, MN 55811

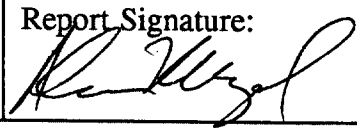
Tel. No. (218) 722-4040

PROJECT IDENTIFICATION NUMBERS

ASCI Study ID# 5010-068

3M Company Lab Request# R1904

1.0 GENERAL INFORMATION

Study Title	Inhibition of R1904 For Activated Sludge Respiration	
Data Standard	OECD Guideline 209.	
Sponsor	3M Environmental Technology and Safety Services, Building 2-3E-09, 935 Bush Avenue, St. Paul, MN 55133; Tel No. (612) 778-7452.	
Sponsor's Representative	Susan Beach, 3M Environmental Technology and Safety Services, Building 2-3E-09, 935 Bush Avenue, St. Paul, MN 55133; Tel No. (612) 778-7452.	
Sponsor's Lab Request#	R1904	
Testing Facility	ASCI Corporation/ASCI-Duluth Environmental Testing Division, 4444 Airpark Boulevard, Duluth, MN 55811; Tel. No. (218) 722-4040.	
Principal Investigator	Joe Dierkes	
Project Director	Joe Amato	
Testing Facility Director	Donald Mount	
Definitive Test Date	July 1, 1997	
Data Validation and Report Review	Alan Mozol	Report Signature: 
Retention of Raw Data and Final Report	Five years from the date study is completed.	
Location of Raw Data and Final Report	ASCI Corporation/ASCI-Duluth Environmental Testing Division, 4444 Airpark Boulevard, Duluth, MN 55811; Tel. No. (218) 722-4040.	

2.0 OBJECTIVE

To determine if possible, the 30-minute and 3-h (contact times) EC₅₀'s of the test substance R1904 for activated sludge respiration.

This study was conducted according to the ASCI study plan retained by the Sponsor and OECD Guideline 209 (OECD 1993).

3.0 TEST METHODS

Test Substance	<i>Properties:</i> R1904, yellow liquid, specific gravity ca. 1.3 (water = 1), stable, and completely soluble in water. <i>Test concentrations:</i> 0 and 1,000 mg/L prepared in duplicate by direct additions.																
Reference Substance	<i>Name:</i> 3,5-dichlorophenol, purity 97%, Aldrich Chemicals, Lot# 02110JX. <i>Test concentrations:</i> 3.75, 7.5, 15.0, and 30 mg/L prepared by direct addition of 500 mg/L stock solution in Millipore® water.																
Test Organisms	<i>Source:</i> Activated sludge from the City of Superior (Wisconsin) Wastewater Treatment Plant receiving approximately 95% domestic sewage. <i>Use in test:</i> (1) Centrifuged five minutes, three times (4°C, 7500 rpm), (2) diluted the sludge pellet with carbon-treated water to selected volume, final total solids concentration of 1.6 g/L was obtained by further dilution, and (3) added 50 ml of synthetic sewage feed per L of the diluted sludge, and aerated at 20°C until test initiation. The sludge was held for less than 24 hours between collection and test initiation.																
Synthetic Sewage Feed	<i>Composition:</i> <table> <tr> <th><u>Chemical</u></th><th>g dissolved/L of deionized water</th></tr> <tr> <td>Bacto. peptone</td><td>16.0</td></tr> <tr> <td>Beef extract</td><td>11.0</td></tr> <tr> <td>Urea</td><td>3.0</td></tr> <tr> <td>NaCl</td><td>0.7</td></tr> <tr> <td>CaCl₂·2H₂O</td><td>0.4</td></tr> <tr> <td>MgSO₄·7H₂O</td><td>0.2</td></tr> <tr> <td>K₂HPO₄</td><td>2.8</td></tr> </table>	<u>Chemical</u>	g dissolved/L of deionized water	Bacto. peptone	16.0	Beef extract	11.0	Urea	3.0	NaCl	0.7	CaCl ₂ ·2H ₂ O	0.4	MgSO ₄ ·7H ₂ O	0.2	K ₂ HPO ₄	2.8
<u>Chemical</u>	g dissolved/L of deionized water																
Bacto. peptone	16.0																
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NaCl	0.7																
CaCl ₂ ·2H ₂ O	0.4																
MgSO ₄ ·7H ₂ O	0.2																
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Deionized Water	Deionized water used in the study was obtained from a Millipore® Milli-Q System. The most recent chemical analysis is in Raw Data Package.																

Test Setup	<i>Exposure vessels:</i> 8, 1-L borosilicate glass beakers; two inoculum controls, two test exposures, and four reference substance treatments. <i>Order of preparation:</i> At 10-minute time intervals: (1) first inoculum control, (2) test exposure concentration replicates, (3) from low to high reference substance exposure concentrations, and (4) second inoculum control. The final volume in each beaker was 800 ml. <i>Preparation:</i> (1) Added 284 ml of the sludge preparation in each beaker, (2) added 26 ml of synthetic sewage feed to each beaker, and (3) in test and reference exposures, added the required amounts of the test and reference substances, respectively, (4) and diluted each exposure to 800 ml with carbon-treated water. <i>Incubation and aeration:</i> 19.9° to 20.0°C and vigorous aeration.
Determination of Respiration	<i>Sequence:</i> Same as exposures were prepared. <i>Determination:</i> At 30-min and 3-h contact times: (1) filled one 300-ml BOD bottle with the exposure medium and continued to aerate the remaining medium, (2) using a YSI 54A oxygen meter with a self-stirring probe, determined the DO concentration in the exposure medium every 0.5 minutes for up to 5.5 minutes (the first determination was made after 0.5 minutes), and (3) the sub-sample was properly disposed. DO meter calibration checks were made between the sets of measurements for each control or treatment.
Calculation of Respiration Rate	For each exposure, correlated DO depletion and time interval, and calculated the slope of the regression line as the respiration rate.
Endpoint Calculation	<i>EC50:</i> Probit Analysis (EPA 1988).

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3.0 RESULTS

Test Substance Toxicity (Pertinent data are in Table 1)	30-minute EC_{50} : >1,000 mg/L. 3-h EC_{50} : >1,000 mg/L.
Reference Substance Toxicity (Pertinent data are in Table 1)	30-minute EC_{50} : <3.75 mg/L. 3-h EC_{50} : <3.75 mg/L.

4.0 TEST QA/QC

QA/QC Criteria	Data
Respiration rates of two inoculum controls must not vary by more than 15%.	Variations after 30-minute and 3-h contact times were less than 3%.
3-h EC_{50} of reference substance must be between 5-30 mg/L.	3-h EC_{50} was <3.75 mg/L indicating the sludge had greater than normal sensitivity. The lack of effect due to R1904 is a valid result.
Test duration must be 3 h.	The test duration was 3 h.

5.0 REFERENCES

Organization for Economic Cooperation and Development (OECD). 1993. OECD Guidelines for Testing of Chemicals. OECD Publication Information Center, Washington, D.C.
U.S. Environmental Protection Agency (EPA). 1988. Computer Program Probit. Biological Methods Branch, EMSL, U.S. EPA, Cincinnati, OH 45268.

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TABLE 1.0
OECD ACTIVATED SLUDGE RESPIRATION INHIBITION TEST #209
CALCULATION OF RESULTS

StdY N 5010-068

Date: 7/1/97

ASCI Corporation/ASCI-Duluth
Environmental Testing Division
ASCI Study ID# 5010-068

Test Substance: R1904

Analyst: DIERKES

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	6.8	6.5	6.0	5.6	5.1	4.6	4.2	3.7	3.2	2.7	2.2	19.9	0.9503	0.9569	
1000A	6.9	6.5	6.2	5.8	5.4	5.0	4.6	4.2	3.8	3.3	3.0	19.9	0.7976	0.8031	16
1000B	6.8	6.4	6.0	5.6	5.2	4.8	4.4	4.0	3.6	3.2	2.8	20.0	0.8000	0.8000	16
3.75ref	7.6	7.3	7.1	6.9	6.6	6.4	6.2	5.9	5.7	5.5	5.2	19.9	0.4655	0.4687	51
7.5ref	7.6	7.4	7.3	7.1	7.0	6.8	6.6	6.4	6.2	6.1	5.9	20.0	0.3442	0.3442	64
15ref	8.1	8.0	7.9	7.8	7.8	7.7	7.6	7.5	7.4	7.3	7.3	19.9	0.1636	0.1648	83
30ref	8.7	8.6	8.6	8.5	8.5	8.4	8.4	8.3	8.2	8.2	8.1	20.0	0.1139	0.1139	88.0
BK2	6.9	6.4	6.0	5.5	5.1	4.5	4.1	3.7	3.1	2.6	2.2	20.0	0.9479	0.9479	

% diff in controls(4) 1.0

EC50 (95% CI): >1000 mg/L (NC)

RaCm (5): 0.9524

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	7.5	7.0	6.7	6.2	5.8	5.4	5.0	4.6	4.1	3.7	3.2	20.0	0.8448	0.8448	
1000A	7.3	6.8	6.4	5.9	5.5	5.1	4.6	4.2	3.7	3.2	2.8	20.0	0.8945	0.8945	-5
1000B	7.0	6.6	6.2	5.7	5.3	4.8	4.3	3.9	3.4	2.9	2.5	19.9	0.9236	0.9301	-9
3.75ref	8.3	8.1	7.9	7.7	7.5	7.3	7.1	6.9	6.8	6.5	6.1	20.0	0.4158	0.4158	51
7.5ref	8.5	8.3	8.2	8.0	7.9	7.7	7.6	7.4	7.3	7.2	7.0	19.9	0.2885	0.2905	66
15ref	8.9	8.8	8.7	8.6	8.6	8.5	8.4	8.4	8.3	8.3	8.2	20.0	0.1261	0.1261	85
30ref	9.0	9.0	8.9	8.9	8.9	8.8	8.8	8.8	8.7	8.7	8.7	20.0	0.0655	0.0655	92.3
BK2	7.9	7.4	7.0	6.6	6.2	5.7	5.3	4.9	4.4	4.0	3.5	20.0	0.8655	0.8655	

% diff in controls(4) 2.4

EC 50 (95% CI): >1000 mg/L (NC)

RaCm (5): 0.8552

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

(2) Ra= R adjusted to 20°C= [R/θ.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

θ= 1.072

RaCm= mean adjusted R, controls

Bk= blank control, S= sample

Tobs= sample temp

x= Tobs-20°C

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