

BIODEGRADATION (BOD/COD)

TEST SUBSTANCE

Identity: A mixture containing perfluorooctanesulfonate, which may also be referred to as PFOS, FC-95, or as a component of FC-3041. (1-Octanesulfonic acid) (CAS # 2795-39-3).

Remarks: The 3M production lot number was 2300. The test sample is FC-3041 (cc 809-1). Current information indicates it is a mixture of 6% PFOS, 36% diethylene glycol butyl ether, 36.05% water, 12% Sultone foamer, 9% sodium octyl sulfate, 0.55% sodium lauryl sulfate, and 0.4% tolyltriazole.

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

METHOD:

Method: BOD Protocol of EAR (2/29/80).

Type: Aerobic

GLP: No

Year completed: 1981

Contact time: 20 days

Inoculum: Stale sewage, Chemolite, Cottage Grove, MN.

RESULTS

Biochemical Oxygen Demand (BOD):

5-Day:	164,000 – 329,000 mg/kg
12-Day:	645,000 mg/kg
20-Day:	642,000 mg/kg

CONCLUSIONS

No conclusions given.

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

DATA QUALITY

Reliability: Klimisch ranking 3. The study lacks description and records of the method followed. The inoculum is not properly characterized. There is no characterization of the test substance purity, and the study lacks analytical confirmation of the amount of fluorochemical proportion in solution. The testing was conducted on a mixture of chemicals having varying degrees of biodegradability, leading to potential misinterpretation of the results.

REFERENCES

This study was conducted by the 3M Company, Environmental Laboratory, St. Paul, MN, Lab Request number 6508S, 1981.

OTHER

Last changed: 6/26/00

3M ENVIRONMENTAL LABORATORY

ANALYSIS FORM 1038A

ULTIMATE BOD

BOD 5

BOD 12

BOD 20

1 CONCENTRATION OF
 2 SAMPLE IN BOD
 3 BOTTLES

8.5 mg/l

329,000

645,000

642,000

} all reported results should be rounded
 to 2 significant figures.

17 "

278,000

-

-

34 "

164,000

-

-

RESULTS EXPRESSED IN mg/kg

RESULTS CALCULATED ACCORDING TO SEC. 3.7 OF BOD PROTOCOL (EAA 2/29/80),
 FORMULA NO. 5.

3M

Bottle No.	Conc. of Sample ¹	Sample Size ²	Initial D.O. (D_1)	Present D.O. (D_2)	Total D.O. Depletion ($D_1 - D_2$)	Depletion Due To Sample	$\frac{12}{\text{BOD}}$ · Day	Average BOD · Day
22	8.5	2.0	8.75	2.40	6.35	5.51	645,000 mg/kg	
80	17	4.0	8.80	< 0.5				
88	34	8.0	8.75	< 0.5	-			
64	51	(WTS) 16 1.36	8.75	—				
18	68	16	8.75	—				

BOD TEST RESULTS

2 ML/G

6.35 TDEP

5.505666667 DDS

825.85 $f = \text{BOD}$

BOD TEST RESULTS

2.	ML/G
6.35	TDEP
5.505666667	DDS
825.85	$\theta f = \text{BOD}$

645,000 mg/kg

Comments

COO - ~720,000 mg/kg

[illegible][illegible]

Environmental Laboratory
BOD Work Sheet - Blanks,
Controls, and Standards

Other LA Nos. 6544, 6553, 6566, 6574

3M

Protocol Reference: EAR, 2-29-80

Lab Request No. 6508 S (original)		BOD Run No. 81-1	
Analyst W. A. Scheil		Date Started 2-13-81	5 - Day BOD Readings
Seed Type & Source Stale sewage, Chemolite	Seed Concentration 6.0 ml/l	Analyst W. A. Scheil	Date 2-18-81

Nonseeded Dilution - Water Blank

Bottle No.	Initial D.O. (A ₁)	Present D.O. (A ₂)	D.O. Depletion (A ₁ - A ₂)	Average D.O. Depletion ($\bar{A}_1 - \bar{A}_2$)
9	8.80	8.40	0.40	0.383
85	8.80	8.40	0.40	
22	8.80	8.45	0.35	

Seeded Dilution - Water Blank (optional)

Bottle No.	Initial D.O. (C ₁)	Present D.O. (C ₂)	D.O. Depletion (C ₁ - C ₂)	Average D.O. Depletion ($\bar{C}_1 - \bar{C}_2$)
1	8.80	8.25	0.55	0.55
118	8.80	8.25	0.55	
7	8.85	8.30	0.55	

Seed Controls

Bottle No.	Sample Size	Initial D.O. (B ₁)	Present D.O. (B ₂)	D.O. Depletion (B ₁ - B ₂)
2	20	8.50	5.90	3.60
3	40	8.05	3.05	5.00
14	80	7.15	<0.5	—
81	160	5.55	<0.5	—

Glucose - Glutamic Acid Standard

Bottle No.	Sample Size	Initial D.O. (D ₁)	Present D.O. (D ₂)	Total D.O. Depletion (D ₁ - D ₂)	Depletion Due To Standard	5 - Day BOD	Average 5 - Day BOD
13	3.0	8.80	6.35	2.45	1.91	191	200 mg/l
123	5.0	8.75	4.90	3.85	3.31	199	
120	7.0	8.65	3.50	5.15	4.61	198	

Potassium Hydrogen Phthalate Standard (optional)

Seeded dilution water blanks with nitrification inhibitor added (~0.1g/300 ml, HACH Formula 2533)

Bottle No.	Sample Size	Initial D.O. (D ₁)	Present D.O. (D ₂)	Total D.O. Depletion (D ₁ - D ₂)	Depletion Due To Standard AVE.	5 - Day BOD	Average 5 - Day BOD
8		8.80	8.30	0.50	0.47		
84		8.80	8.30	0.50			
78		8.75	8.35	0.40			

Environmental Laboratory
BOD Work Sheet - Blanks,
Controls, and Standards

Other Lab Nos. 6553, 6566, 6574

3M

Protocol Reference: EAP 2-29-80

Lab Request No. 6508 S (original)		BOD Run No. 81-1	
Analyst W.A. Schil		Date Started 2-13-81	
Seed Type & Source State Sewage Chemists		Seed Concentration 6.0 ml/l	
Analyst W.A. Schil		Date 2/25/81	

Nonseeded Dilution - Water Blank

Bottle No.	Initial D.O. (A ₁)	Present D.O. (A ₂)	D.O. Depletion (A ₁ - A ₂)	Average D.O. Depletion (A ₁ - A ₂)
9	8.80	8.20	0.60	0.60
85	8.80	8.15	0.65	
22	8.80	8.25	0.55	

Seeded Dilution - Water Blank (optional)

Bottle No.	Initial D.O. (C ₁)	Present D.O. (C ₂)	D.O. Depletion (C ₁ - C ₂)	Average D.O. Depletion (C ₁ - C ₂)
1	8.80	7.90	0.90	0.85
118	8.80	7.95	0.85	
7	8.85	8.00	0.85	

Seed Controls

Bottle No.	Sample Size	Initial D.O. (B ₁)	Present D.O. (B ₂)	D.O. Depletion (B ₁ - B ₂)
2	20	8.50	4.85	3.65
3	40	8.05	1.15	6.90
14	80	7.15	—	—
81	160	5.55	—	—

Glucose - Glutamic Acid Standard

Bottle No.	Sample Size	Initial D.O. (D ₁)	Present D.O. (D ₂)	Total D.O. Depletion (D ₁ - D ₂)	Depletion Due To Standard	12 - Day BOD	Average 12 - Day BOD
13	3.0	8.80	5.70	3.10	2.26	226	230
123	5.0	8.75	4.05	4.70	3.86	232	
120	7.0	8.65	2.45	6.20	5.37	230	

Potassium Hydrogen Phthalate Standard (optional)

Seeded dilution water blanks with nitrification inhibitor added (~0.1g/300 ml, HACH® Formula 2533)

Bottle No.	Sample Size	Initial D.O. (D ₁)	Present D.O. (D ₂)	Total D.O. Depletion (D ₁ - D ₂)	Depletion Due To Standard	12 - Day BOD	Average 12 - Day BOD
8	X	8.80	8.05	0.75	AVE. Depletion 0.70		
84		8.80	8.10	0.70			
78		8.75	8.10	0.65			

Environmental Laboratory
BOD Work Sheet - Blanks,
Controls, and Standards

Other L.R. NOS. 6544, 6553, 6566, 6574

3M

Protocol Reference: EAR, 2-29-80

Lab Request No. 65083 (original)		BOD Run No. 81-1	
Analyst W. A. Scheil		Date Started 2-13-81	
Seed Type & Source State Sewage, Chemnitz		Seed Concentration 6.0 ml/l	
Analyst J. P. Gore		Date 3-05-81	

Nonseeded Dilution - Water Blank

Bottle No.	Initial D.O. (A ₁)	Present D.O. (A ₂)	D.O. Depletion (A ₁ - A ₂)	Average D.O. Depletion ($\bar{A}_1 - \bar{A}_2$)
9	8.80	8.00	0.80	0.767
85	8.80	8.00	0.80	
22	8.80	8.10	0.70	

Seeded Dilution - Water Blank (optional)

Bottle No.	Initial D.O. (C ₁)	Present D.O. (C ₂)	D.O. Depletion (C ₁ - C ₂)	Average D.O. Depletion ($\bar{C}_1 - \bar{C}_2$)
1	8.80	7.40	1.40	1.28
118	8.80	7.50	1.30	
7	8.85	7.70	1.15	

Seed Controls

Bottle No.	Sample Size	Initial D.O. (B ₁)	Present D.O. (B ₂)	D.O. Depletion (B ₁ - B ₂)
2	20	8.50	< 0.50	—
3	40	8.05	—	—
14	80	7.15	—	—
81	160	5.55	—	—

Glucose - Glutamic Acid Standard

Bottle No.	Sample Size	Initial D.O. (D ₁)	Present D.O. (D ₂)	Total D.O. Depletion (D ₁ - D ₂)	Depletion Due To Standard	20 BOD - Day	Average 20 BOD - Day
13	3.0	8.80	3.30	5.50	4.23	423	340
123	5.0	8.75	2.10	6.60	5.39	323	
120	7.0	8.65	1.15	7.50	6.25	268	

Potassium Hydrogen Phthalate Standard (optional)

Seeded dilution water blanks with nitrification inhibitor added (~0.1g/300 ml, HACH Formula 2533)

Bottle No.	Sample Size	Initial D.O. (D ₁)	Present D.O. (D ₂)	Total D.O. Depletion (D ₁ - D ₂)	Depletion Due To Standard AUG.	20 BOD - Day	Average 20 BOD - Day
8	X	8.80	7.70	1.10	1.08		
84		8.80	7.65	1.15			
78		8.75	7.75	1.00			