BIODEGRADATION

TEST SUBSTANCE

Identity: Perfluorodecanesulfonate, ammonium salt; may also be referred to as PFDS, FC-121-X, or 3M Sample E2112 and E2566-1. (1-Decanesulfonic acid, 1,1,2,2,3,3,4,4,5,5,6,6,7,7,8,8,9,9,10,10,10-heneicosafluoro-, ammonium salt, CAS # 67906-42-7)

Remarks: Test sample is a mixture of the test substance in water and 2-propanol, 1-(1,1-dimethylethoxy). This mixture contains approximately 22-26% test substance, 33-37% propanol, 1-(1,1-dimethylethoxy), 0.5-1.5% perfluorononanesulfonate, ammonium salt and 38-42% 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 material was from 3M production lot 1.

METHOD

Method: Standard methods #507 for BOD, standard methods #508A for COD
Type: Aerobic
GLP: No
Year completed: 1987
Contact time: 20 days
Inoculum: Source of inoculum not recorded

RESULTS

5-day carbonaceous BOD: 5,800 mg/kg
10-day carbonaceous BOD: 8,000 mg/kg
20-day carbonaceous BOD: 11,000 mg/kg
COD: 870,000 mg/kg

Remarks: This material has a perfluorinated moiety and a non-fluorinated moiety. Current knowledge of these chemistries suggests that all biodegradation indicated in this study is likely due to reduction of the non-fluorinated moiety, propanol, 1-(1,1-dimethylethoxy)

Testing was conducted on the "as-sold" mixture of the subject material in water (~22-26% subject material). The values reported apply to that mixture and not directly to the subject material.

CONCLUSIONS

This testing indicated that the propanol, 1-(1,1-dimethylethoxy) moiety is likely to be biodegraded in aerobic environments capable of supporting biodegradation. This study cannot rule out the possibility that conditions could be found that would allow for biodegradation of the fluorochemical component, nor could it exclude the possibility that a microorganism could eventually be enriched that could metabolically alter this chemical.

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

DATA QUALITY

Reliability: Klimisch ranking 2. This study lacks sufficient documentation, characterization of the test substance purity, and analytical measurement of test concentrations. Because a mixture was tested, the biodegradation of the solvent could not be differentiated from biodegradation of the fluorochemical component.

REFERENCES

Study conducted at the request of 3M Company by Pace Incorporated of Minneapolis, MN, Lab Request number E2112, 11/3/87

OTHER

Last changed: 5/18/00

pace laboratories, inc.

REPORT OF LABORATORY ANALYSIS

Offices:
Minneapolis, Minnesota
Tampa, Florida
Coralville, Iowa

3M Environmental Laboratory
935 Bush Avenue
Bldg. 2-3E
St. Paul, MN 55133

November 03, 1987
PACE Project Number: 870917504

Attn: Mr. Wade Scheil

E2112

Date Sample(s) Collected: By Client
Date Sample(s) Received: 09/16/87

PACE Sample Number: 159240

Parameter	Units	MDL	E2112-1	E2112-2
Biochemical Oxygen Demand, Carb 5 Day(1)	mg/kg	600	5800	-
Biochemical Oxygen Demand, Carb 10 Day(1)	mg/kg	600	8000	-
Biochemical Oxygen Demand, Carb 20 Day(1)	mg/kg	600	11000	-
Chemical Oxygen Demand(2)	mg/kg	15000	850000	890,000

MDL Method Detection Limit
(1) Analysis for biochemical oxygen demand was performed in accordance with standard methods #507
(2) Analysis for chemical oxygen demand was performed in accordance with standard methods #508A

The data contained in this report were obtained using EPA or other approved methodologies. All analyses were performed by me or under my direct supervision.

Thomas L. Halverson
Inorganic Chemistry Manager

000176

ANALYSIS:

FOR CLP USE ONLY? ☐

CHEMICAL OXYGEN DEMAND, DATE ANALYZED: 9/21-22/87 CLIENT NAME:
COD ✓ ANALYZED BY: Q/Be PROJECT NUMBER:
COD-LOW ___ TIME: PROJECT NAME:
DATA REVIEWED BY: 9/23 FILE #:
ENTERED BY: 9-23 DATE RECEIVED:
DATE COLLECTED:

SAMPLE #	ANALYSIS RESULTS	UNITS	COMMENTS	SAMPLE VOL (mls) A	BLANK B	SAMPLE TITRANT BEG	END	TOTAL C	TITRANT NORMALITY N
Blk	<50	mg/l		50	25.5	0.0	25.5	25.5	0.25
Blk.	<50	↓		50	↓	0.0	25.6	25.6	↓
EPA	148	↓	WP1284-4 TV-145 mg/l	50	↓	25.5	47.3	21.8	↓
15756	190,000	mg/kg	E1894-3 Gen. use between .40 → 0.04 g	0.0921g	↓	25.6	42.5	16.9	↓
128230	2,300	mg/l	Old result 21000 mg/l Rerun	10	↓	0.0	13.8	13.8	↓
15778	950	↓		25	↓	13.8	27.4	13.6	↓
15828	5,400	↓		10	↓	27.4	50.0	22.8	↓
15924	850,000	mg/kg	E2112-1 Include Method + Raw Data with report HW	0.0132 ~~0.00864~~	↓	0.2	20.1	19.9	↓
↓	890,000	↓	↓	0.0115 ~~0.01617~~	↓	20.1	40.5	20.4	↓
~~15925~~	~~360,000~~	↓	E2113-1	0.0112g	↓	0.0	23.5	23.5	↓
~~15926~~	~~390,000~~	↓	E2113-1	0.0227g	↓	23.5	44.6	21.1	↓
15948	2,100	mg/l		10	↓	0.0	15.1	15.1	↓
15949	790	↓		35	↓	0.0	11.7	11.7	↓

A = SAMPLE VOLUME USED (mls OR gms)
B = TITRANT VOL USED FOR BLANK (mls)
C = TITRANT VOL USED FOR SAMPLE (mls)
N = NORMALITY OF TITRANT

$$\frac{B-C \times N \times 8{,}000}{A} = \text{mg COD/l OR mg COD/kg}$$

NOTE: WHEN PERFORMING A COD ON AN EP LEACH SAMPLE, THE COD OF THE ACETIC ACID MUST BE SUBTRACTED TO OBTAIN THE FINAL VALUE. 1 ml OF 0.5 N ACETIC ACID IN LEACHATE EQUALS A COD OF 16 mg/l

0189W

ANALYSIS:

5 DAY BIOCHEMICAL OXYGEN DEMAND, BOD-05 ___
SOLUBLE BOD, SOL-BOD
CARBONACEOUS BOD 5 DAY, C-BOD-05 ✓
DISSOLVED OXYGEN, DO
CARBONACEOUS BOD 10 DAY, C-BOD-10
CARBONACEOUS BOD 20 DAY, C-BOD-20

DATE ANALYZED: IN 10-2 OUT 10-7-87
ANALYZED BY:
TIME:
DATA REVIEWED BY:
SEED VOL USED ml/l 2
DO DROP 3.0

FOR CLP USE ONLY

CLIENT NAME:
PROJECT NAME:
FILE #:
DATE COLLECTED:
DATE RECEIVED: 10-23

SAMPLE	ANALYSIS RESULTS	UNITS	COMMENTS	pH	SAMPLE VOL (mls)	BOTTLE #	D1	D2	D1-D2	F FACTOR	SEED CORRECT	DIFF (D1-D2)-SC	(DIFF)(303 SAMP VOL
					BLK	220	7.6	7.4	.2	.08	.024		
					Seed	43	7.7	4.7	3.0				
			T.V = 200 Glucose Glutamic Acid		6	412	7.7	4.0	3.7			3.46	175
187	mg/L				4	33	7.8	3.6	4.2	↓	↓	3.96	200
					Seed	13	7.7	5.5	2.2	.10	.22		
			Poly Pac + sludge		6	71	7.7	3.6	4.1			3.88	196
201	mg/L		T.V = 200 Glucose Glutamic Acid		6	30	7.7	3.4	4.3	↓	↓	4.06	206
					50	81	7.6	<1					
16788					35	73	7.7	<1					
	.8400	mg/L	1 → 100	7.4	15	61	7.8	3.4	4.4	.09	.024	4.16	841
					1	302	7.6	6.4	1.2	.08	.24	.96	290

DI = INITIAL DO, D2 = FINAL 5 DAY DO, F = % SEED IN DI/% SEED IN CONTROL
SEED CORRECT (SC) = SEED CONTROL DO DROP x F

ANALYSIS:

5 DAY BIOCHEMICAL OXYGEN DEMAND, BOD-05 ___
SOLUBLE BOD, SOL-BOD ___
CARBONACEOUS BOD 5 DAY, C-BOD-05 ✓
DISSOLVED OXYGEN, DO ___
CARBONACEOUS BOD 10 DAY, C-BOD-10 ___
CARBONACEOUS BOD 20 DAY, C-BOD-20 ___

DATE ANALYZED: IN 10-2 OUT 10-7-97
ANALYZED BY: T.M.
TIME:
DATA REVIEWED BY:
SEED VOL USED ml/l 2
DO DROP 3.0

FOR CLP USE ONLY

CLIENT NAME:
PROJECT NAME:
FILE #:
DATE COLLECTED:
DATE RECEIVED: 10-23

SAMPLE	ANALYSIS RESULTS	UNITS	COMMENTS	pH	SAMPLE VOL (mls)	BOTTLE #	D1	D2	D1-D2	F FACTOR	SEED CORRECT	DIFF (D1-D2)-SC	(DIFF)(303) SAMP VOL
5924					50	57	7.6	6.4	1.2	.08	.24	.96	5.5
= 2112-1	5,800 ~~56,000~~	mg/L	1 → 1000	7.3	35	53	7.5	7.0	.5				
					15	51	7.6	7.4	.2				
					1	28	7.7	7.3	.4				
5925					50	12	7.5	<1					
= 2113-1	31,000	mg/L	1 → 1000	7.3	35	8	7.6	2.3	5.3			5.06	31
					15	428	7.7	5.1	2.6			2.36	24
					1	66	7.6	6.2	1.4				
5926					50	45	7.5	5.7	1.8			1.56	9500
= 2114-1	10900	mg/L	1 → 1000	7.2	35	7	7.6	6.1	1.5			1.26	11,000
					15	15	7.5	6.8					
					1	66	7.5	7.2		↓	↓		

DI = INITIAL DO, D2 = FINAL 5 DAY DO, F = % SEED IN DI/% SEED IN CONTROL
SEED CORRECT (SC) = SEED CONTROL DO DROP x F

000179

0182W

ANALYSIS:

5 DAY BIOCHEMICAL OXYGEN DEMAND, BOD-05 ___
SOLUBLE BOD, SOL-BOD ___
CARBONACEOUS BOD 5 DAY, C-BOD-05 ___
DISSOLVED OXYGEN, DO ___
CARBONACEOUS BOD 10 DAY, C-BOD-10 V
CARBONACEOUS BOD 20 DAY, C-BOD-20 ___

DATE ANALYZED: IN 10-2 OUT 10-12-87
ANALYZED BY: Tim
TIME: 6
DATA REVIEWED BY: ___
SEED VOL USED ml/l 2
DO DROP 3.5

FOR CLP USE ONLY

CLIENT NAME: ___
PROJECT NAME: ___
FILE #: ___
DATE COLLECTED: ___
DATE RECEIVED: 10-23

SAMPLE	ANALYSIS RESULTS	ANALYSIS UNITS	ANALYSIS COMMENTS	pH	SAMPLE VOL (mls)	BOTTLE #	D1	D2	D1-D2	F FACTOR	SEED CORRECT	DIFF (D1-D2)-SC	(DIFF)(303) SAMP VOL
15924					50	286	7.4	5.8	1.6	.08	.28	1.32	80
					35	223	7.5	6.7					
E2112-1	8,000	mg/l	1 → 1000	7.3	15	65	7.6	6.8					
					1	72	7.7	7.0					
15925					50	227	7.5	<1					
					35	432	7.6	<1					
E2113-1	61,000	mg/l	1 → 1000	7.3	15	50	7.7	4H	3.3			3.02	61
					1	56	7.7	5.6					
15926					50	61	7.5	5.2	2.3			2.02	12
					35	2	7.5	5.6	1.9			1.62	11
E2114-1	13,000	mg/l	1 → 1000	7.2	15	59	7.6	6.2					
					1	52	7.7	6.4		↓	↓		

DI = INITIAL DO, D2 = FINAL 5 DAY DO, F = % SEED IN DI/% SEED IN CONTROL
SEED CORRECT (SC) = SEED CONTROL DO DROP x F

ANALYSIS:

5 DAY BIOCHEMICAL OXYGEN DEMAND, BOD-05 ___
SOLUBLE BOD, SOL-BOD ___
CARBONACEOUS BOD 5 DAY, C-BOD-05 ___
DISSOLVED OXYGEN, DO ___
CARBONACEOUS BOD 10 DAY, C-BOD-10 ___
CARBONACEOUS BOD 20 DAY, C-BOD-20 ___

DATE ANALYZED: IN 10-2 OUT 10-22-87
ANALYZED BY: T.M
TIME:
DATA REVIEWED BY:
SEED VOL USED ml/l 2
DO DROP 3.7

FOR CLP USE ONLY

CLIENT NAME:
PROJECT NAME:
FILE #:
DATE COLLECTED:
DATE RECEIVED: 10-23

SAMPLE	ANALYSIS RESULTS	UNITS	COMMENTS	pH	SAMPLE VOL (mls)	BOTTLE #	D1	D2	D1-D2	F FACTOR	SEED CORRECT	DIFF (D1-D2)-SC	(DIFF)(303) SAMP VOL
15924					50	72	7.5	5.4	2.1	.08	.296	1.804	11
E 2112-1	11,000	mg/L	1 → 1000	7.3	35	210	7.4	6.0	1.4			1.104	10
					15	266	7.3	6.1					
					1	58	7.4	6.2					
15925					50	62	7.5	<1					
E 2113-1	69,000	mg/L	1 → 1000	7.3	35	29	7.6	<1					
					15	280	7.5	3.8	3.7			3.404	69
					1	217	7.5	4.4					
15926					50	70	7.4	4.6	2.8			2.504	15
E 2114-1	17000	mg/L	1 → 1000	7.2	35	61	7.5	4.9	2.6			2.304	20
					15	17	7.5	6.3					
					1	157	7.6	6.2		✓	✓		

DI = INITIAL DO, D2 = FINAL 5 DAY DO, F = % SEED IN DI/% SEED IN CONTROL
SEED CORRECT (SC) = SEED CONTROL DO DROP x F