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3M Specialty Materials

3M Center
St. Paul, MN 55144-1000
651 733 1100

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August 11, 2000

MR 39005

Dr. Charles Auer
Director
Chemical Control Division
Office of Pollution Prevention and Toxics
United States Environmental Protection Agency
401 M Street, Southwest
Room 403 East Tower (Mail Code 7405)
Washington, D.C. 20460

Contain NO CBI

RE: Supplemental Information on Perfluorooctane Sulfonates – UEIP Form

Dear Charlie:

3M is enclosing a revised "Use and Exposure Information Profile" or "UEIP" for perfluorooctane sulfonic acid (PFOS). We originally submitted to you the UEIP form for PFOS on April 28, 2000. This revised form offers further explanation of our environmental and industrial hygiene management of this material at our manufacturing facilities.

Please feel free to contact me if you have any questions regarding this revised information.

Best regards,

William A. Weppner

FYI-00-001378

William A. Weppner, Ph.D.
Director
Environmental, Health, Safety & Regulatory Affairs
Specialty Material Markets Group
3M Center, Bldg. 236-1B-10
St. Paul, MN 55144

Enc.

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AR 226-1

Voluntary Use and Exposure Information Profile
Perfluorooctane Sulfonic Acid and Various Salt Forms

I. CHEMICAL IDENTIFICATION

Chemical Name: Perfluorooctane Sulfonates
CAS Number: Various, including: 1763-23-1 (acid)
29081-56-9 (ammonium salt)
70225-14-8 (DEA salt)
2795-39-3 (K-salt)
29457-72-5 (Li Salt)

The perfluorooctane sulfonate anion (PFOS) has no specific CAS number. The lis
summarize the designated Tier I perfluorochemicals that are all considered perfluo
sulfonates.

II. COMPANY IDENTIFICATION

Company Name: 3M

Site Locations:
1) 10746 Innovation Road
Cottage Grove, MN 55016

2) 1400 State Docks Road
Decatur, AL 35601

Technical Contact: W.A. Weppner
Phone: 651/733-6374
Address: 3M Center, Building 236-1B-10
St. Paul, MN 55144

III. ON-SITE ACTIVITIES

CAS #	Mfg. (1997)	Imported
1763-23-1	Less Than 200,000 lb/yr.	0
29081-56-9		0
70225-14-8		0
2795-39-3*		0
29457-72-5		0

Estimate the amount of subject chemical distributed off-site:

95% of manufacture/import

*Submitted in 1998 TSCA IUR additional information.

Narrative Description and Process Flow Schematic:

3M Company utilizes a process known as Simons Electro-Chemical Fluorination (ECF) to synthesize organofluorine molecules. In this process, organic feedstocks are dispersed in liquid, anhydrous hydrogen fluoride, and an electric current is passed through the solution, causing the hydrogen atoms on the molecule to be replaced with fluorine. The predominant components of the products created by this process have the same carbon skeletal arrangement as the feedstock used, but with all of the hydrogen atoms replaced by fluorine. However, fragmentation and rearrangement of the carbon skeleton can also occur and significant amounts of cleaved, branched and cyclic structures may be formed. The degree of fluorination of the organic feedstock is also dependent upon the specific carbon chain length of the feedstock and parameters of the ECF process such as electrical current and the length of time the process is run. It is possible to synthesize fully fluorinated or perfluoroorganic molecules where all of the hydrogen atoms of the hydrocarbon feedstock have been replaced by fluorine atoms. Using these perfluoroorganic molecules as basic building blocks, unique chemistries can be created by further reactions with functionalized hydrocarbon molecules.

3M has produced sulfonyl based fluorochemicals commercially for over 40 years using the ECF process. A basic building block of such products and the highest production volume fluorochemical 3M manufactures is perfluorooctanesulfonyl fluoride (POSF). The starting feedstock for this reaction is 1-octanesulfonyl fluoride.
(Reaction 1)

Reaction 1

$$\underset{\text{1-Octanesulfonyl fluoride}}{C_8H_{17}SO_2F} + 17\,HF \xrightarrow[ECF]{\text{Energy}} \underset{\text{Perfluorooctanesulfonyl fluoride}}{C_8F_{17}SO_2F} + 17\,H_2$$

The electrochemical fluorination process yields about 35%-40% straight chain (normal) POSF, and a mixture of biproducts and waste of unknown and variable composition comprised of the following:

1) higher and lower straight-chain homologs, i.e., n-$CnF_{2n+1}SO_2F$, e.g., $C_6F_{13}SO_2F$, $C_7F_{15}SO_2F$, $C_9F_{19}SO_2F$ which comprise about 7% of the process output

2) branched-chain, perfluoroalkylsulfonyl fluorides with various chain lengths, about 18-20% of the output

3) straight-chain, branched, and cyclic (non-functional) perfluoroalkanes and ethers, which comprise about 20-25% of the output

4) "tars" (high molecular weight fluorochemical byproducts) and other byproducts, including molecular hydrogen, which comprise about 10-15% of the output.

Because of slight differences in process conditions, raw materials, and equipment, the mixture produced by the electrochemical fluorination process varies somewhat from lot-to-lot and from plant-to-plant. The product that results from electrochemical fluorination is thus not a pure chemical but rather a mix of isomers and homologues. The commercialized POSF derived products are a mixture of approximately 70% linear POSF derivatives and 30% branched POSF derived impurities.

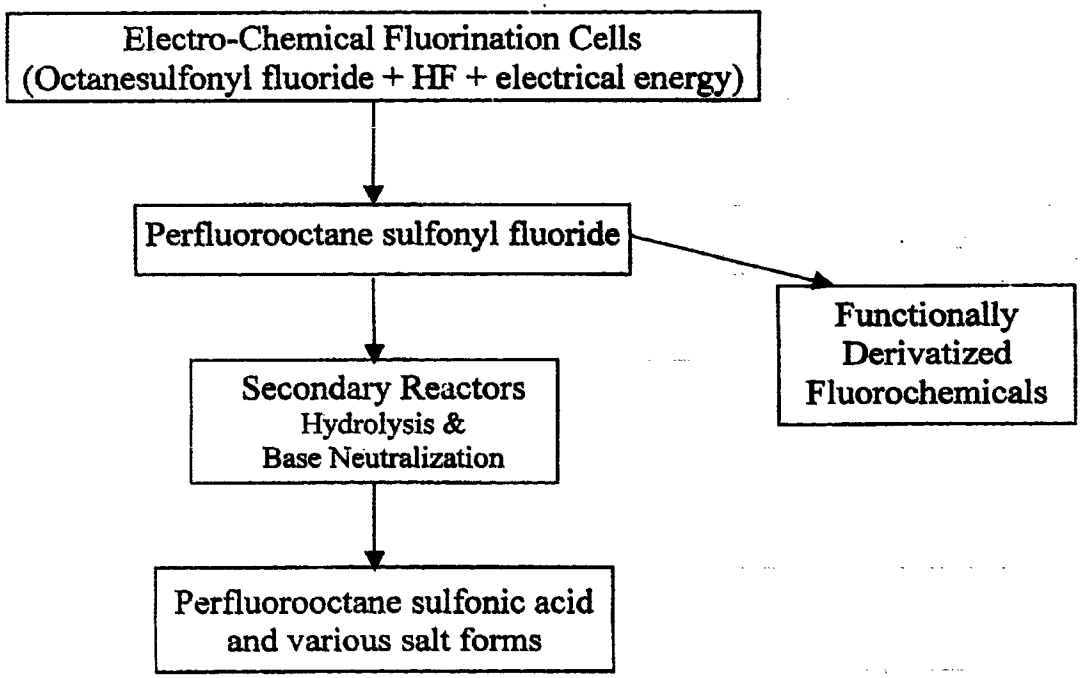
During production, byproducts and waste products are formed. The volatile waste products, such as perfluoromethane, have been vented to the atmosphere in the past, but plans are being implemented to capture and destroy these releases by thermal oxidation over the next few years. The tars have been landfilled in a hazardous waste landfill in the past, but are currently being incinerated at an in-house or external hazardous waste incinerator. The byproducts, many of which are incompletely fluorinated with hydrogen atoms still present, can be recycled back into the ECF process or are partially degraded in stabilization processes and discharged to controlled, in-house, wastewater treatment systems. The treatment sludge associated with the ECF process has been either landfilled or land-incorporated in the past, but all of this treatment sludge is being landfilled off-site since early 1998.

POSF is itself a commercially viable product, but is primarily an important intermediate in the synthesis of substances used in many other 3M fluorochemical products. The majority is used to produce functionally derivatized fluorochemicals and high molecular weight polymeric products.

The perfluorooctane sulfonic acid manufactured by hydrolyzing POSF intermediates to the sulfonic acid. The various salts of perfluorooctane sulfonate are manufactured by base neutralization of the acid to the appropriate salt in a batch reaction.

The following block flow diagram describes the process discussed above.

BLOCK FLOW DIAGRAM FOR PERFLUOROSULFONIC ACID AND ITS SALTS



IV. SITE RELEASE AND TRANSFER INFORMATION FOR TRI CHEMICALS

Not Applicable.

V. SITE RELEASE AND TRANSFER INFORMATION FOR NON-TRI CHEMICALS

While analytical methods have improved over time, large variability still exists for certain matrices and compounds, so data available for this report is mostly of a qualitative nature. Although limited monitoring data exists, most emission and waste estimates are based upon process models and engineering calculations. Engineering calculations, however, have limitations with respect to fluorochemicals because fluorochemical losses were not always included in the analysis of each intermediate step.

The accuracy of the emissions data submitted varies due to several factors. Batch process systems are difficult to measure due to quickly changing process conditions, venting pressures and difficulty in isolating processes to take measurements. Additionally, the unique characteristics of these compounds cause them to behave differently from conventional compounds, and physical chemical data properties are not available for all intermediate reaction steps.

A. **ALL PLANTS** - Fugitive emissions may occur from vacuum charging from drums, sampling from reactors, drumming of product/intermediate, flaking monomer, drying operations.

Industrial Hygiene monitoring has been conducted for some compounds. These compounds have been detected as fugitive emissions during industrial hygiene exposure testing.

Fugitive emissions may have occurred during some handling steps but have not been quantified.

DECATUR, ALABAMA ONLY: Wastewater fugitive emission data was based upon 1999 wastewater testing.

	Estimated Total Annual Releases (lbs. 1997)	Estimated % Accuracy of Estimate (optional)	#days/years release occurs
Fugitive (wastewater)	<100		
	Engineering calculations and models of process vent Emissions are used for estimates of point source emissions.		
Stack (point)	0		

Comments:

COTTAGE GROVE, MN ONLY:

	Estimated Total Annual Releases (lbs. 1997)	Estimated % Accuracy of Estimate (optional)	#days/years release occurs
Fugitive (wastewater)	Negligible, Not quantified		
Stack (point)	0		

Comments

B. WATER RELEASES FROM SITE

PFOS in wastewater discharge is not measured as specific salt compounds, but instead reflects the total amount of dissociated salts and other compounds that hydrolyze to PFOS. This is considered a qualitative measure due to the short time frame of the sampling event given operational variability, the status of analytical method development and sample handling and holding procedures at this time.

DECATUR, AL

	Estimated Total Annual Releases (lbs. 1997)	Estimated % Accuracy of Estimate (optional)
Water releases:	10,000	

Number of days/year release occurs: Although manufacturing of the salts listed on this form is associated with 4 to 6 wastewater discharge events per year, the hydrolysis of other sulfonated compounds to PFOS in the wastewater treatment system result in an ongoing discharge of the PFOS compounds. The calculated discharge amount therefore is not attributed to just the salt production.

Receiving Water Name: Baker's Creek at the junction with the Tennessee River

NPDES Number: ALD004023164

Comments:

COTTAGE GROVE, MN

	Estimated Total Annual Releases (lbs. 1997)	Estimated % Accuracy of Estimate (optional)
Water releases:	1000	

Number of days/year release occurs: 11 times per year

Receiving Water Name: Mississippi

NPDES Number: MN00001449

Comments:

Engineering calculations were used to estimate the amount of material discharged to wastewater. The amount of material discharged to the river was determined through use of existing removal efficiency testing results from another facility. Estimates were based upon 1999 production information since no wastewater data was available for 1997 or 1998.

C. ON-SITE LAND RELEASES

DECATUR, AL

The land treatment of Decatur sludge was discontinued in early 1998. Sludge is now transported to an offsite landfill, after passing through a thickener and a sludge press. An impoundment was used in 1997 as part of the wastewater treatment operation but is now only used for back-up operation. Levels of the compound in the sludge were determined from wastewater data. Wastewater data from 1999 shows about 20,000 pounds per year to the sludge which is now landfilled off-site.

	Estimated Total Annual Releases (lbs. 1997)	Estimated % Accuracy of Estimate (optional)
Landfill	0	
Land Treatment/Land Amendment	40,000 – No longer used	
Surface Impoundments	No data available	
Underground Injection	0	
Other (specify):		

Comments:

COTTAGE GROVE, MN

Sludge from the Cottage Grove facility is sent to an off-site industrial landfill.

	Estimated Total Annual Releases (lbs. 1997)	Estimated % Accuracy of Estimate (optional)
Landfill	0	
Land Treatment/Land Amendment	0	
Surface Impoundments	0	
Underground Injection	0	
Other (specify):		

Comments:

D. **OFF-SITE TRANSFERS** – Decatur, AL and Cottage Grove, MN (1997)

Process wastewaters are managed in an on-site wastewater treatment facility and are not sent to the POTW.

D1. Transfer to Publicly Owned Treatment Works (POTW)

Number of days/year the release occurs: Not applicable

Annual Transfer (lb): 0

Estimated % Accuracy of Transfer Estimate (optional) (%):

POTW Name:
Street Address:
City: **Country:**
State: **Zip Code:**
NPDES Number:

Comments:

D2. TRANSFERS TO OTHER OFF-SITE LOCATIONS

General Waste Information: There is limited information by CAS number for compound specific reporting and off-site transfers cannot be readily verified. Rather, wastes are classified by halogen content, regulatory waste codes, physical properties and non-specific fluorochemical categories. Where wastes are tracked by CAS number, the amounts have been included.

DECATUR, AL

A review of plant records regarding waste disposal locations for Decatur fluoride-containing (not CAS number specific) wastes indicates that 70% was disposed through incineration at various off-site locations and approximately 30% was landfilled at a hazardous waste landfill. Incineration is now the primary disposal method for these materials.

	Estimated Total Annual Releases (lbs. 1997)	**Estimated % Accuracy of Estimate (optional)**
Incineration:	No specific CAS number data available.	
Wastewater Treatment (Excluding POTW)	0	
Underground Injection	0	
Hazardous Waste (RCRA Subtitle C) landfill	No specific CAS number data available.	
Other Landfill	No specific CAS number data available.	
Recycle or Recovery	0	
Unknown or Other		
Comments:		

COTTAGE GROVE, MN

Cottage Grove facility utilizes incineration for all their drummed wastes. Waste summary does not show any drummed salt wastes in 1997.

	Estimated Total Annual Releases (lbs. 1997)	Estimated % Accuracy of Estimate (optional)
Incineration:	0	
Wastewater Treatment (Excluding POTW)	0	
Underground Injection	0	
Hazardous Waste (RCRA Subtitle C) landfill	0	
Other Landfill	7400	
Recycle or Recovery	0	
Unknown or Other		
Comments:		

VI. ON-SITE WORKPLACE EXPOSURE

CAS Number: 2795-39-3 Company: 3M Company, Specialty Materials Manufacturing Division, Cottage Grove, MN

(potassium perfluorooctane sulfonate)

This information will assist EPA in characterizing the number of workers potentially exposed and the magnitude, frequency, and duration of potential exposure. When providing monitoring data, ensure that data is linked with worker activities described in question 2.

1. **Estimate the number of workers potentially exposed routinely to the subject chemical for each of the exposure duration times. If a worker is involved in more than one activity, enter only his/her most typical activity in the table. Don't count a worker more than once. The total number in the table should equal the total number of workers potentially exposed.**

Hours/Day	Days/Year			
	<10	10-100	100-250	>250
<.25				
.25-1	12	23		
1-8	6	23		
>8				

2. **Describe the routine worker activities to which the workers in question 1 are exposed: sampling, removal of filter cake, and drumming of liquids, manufacture an article, etc. For these activities, describe the physical state of the subject chemical (liquid, gas, particulate, or aerosol, etc.) and, if in a mixture, the chemical's concentration:**

The chemical (2795-39-3) is a light, free-flowing powder. Initially, the material is a wet slurry (within a reactor) and is then transferred to drying equipment for final processing and packaging. The above employees operate and maintain the drying equipment, collect quality samples, and also package (by gravity or by hand scooping) dry powder from the drying equipment into drums, pails, and cans

3. Provide industrial hygiene monitoring data, if available, with a brief description of the sampling method and exposure scenario monitored, e.g., describe the specific worker activities performed by the individuals monitored. For privacy considerations, please do not include any personal identifiers such as the worker's name or social security number with any data submitted to EPA.

See the attached table for personal air monitoring data. These samples were collected during operation of drying equipment and packaging activities. Past sample collection and analysis has utilized 37-mm Nucleopore filter cassettes with either gravimetric, ICP (for K+), or LC analysis. The current method is an OSHA Versatile Sampler (OVS) tube analyzed by LC/MS. Wipe sample data for the chemical does exist and has indicated significant levels of this material on surfaces in the production area. The results were used for focusing decontamination and exposure control efforts.

There has been area/source air monitoring data and/or surface wipe sampling data collected for this material at the plant. Area/source sample results and/or surface wipe sample results are used to identify areas with employee exposure potential as part of the exposure assessment under 3M's industrial hygiene program and are not measurements of actual employee exposures. Hence, they are not included with this submission. Prior to 1999, these samples were considered to be semi-validated.

The sample results of any air monitoring are compared to 3M's voluntary exposure guideline (EG) of 0.1 mg/m^3 (milligrams of fluorochemical compound per cubic meter of air) for PFOS homologues, such as FC-95. The EG is an 8-hour time-weighted average (TWA) personal breathing zone exposure chosen to minimize potential for uptake.

Each 3M plant that produces sulfonated fluorochemicals has an industrial hygienist on staff and is supported by a corporate industrial hygiene group. 3M's industrial hygiene program focuses on task-based exposure assessment and control. Exposures are identified and assessed qualitatively and/or quantitatively. Qualitative assessments are performed by an industrial hygienist. Quantitative assessments include task-based personal sampling for certain, specific fluorochemicals and/or source or area sampling. The results of the assessments support decisions on exposure control. Engineering controls are preferred, but personal protective equipment may be used on an interim basis or when effective engineering control is not feasible.

CAS# 2795-39-3 (potassium perfluorooctane sulfonate)
Personal Air Monitoring Results

Area/Job Classification	Sample Type	# of Samples	Minimum Concentration	Maximum Concentration	Geometric Mean	Geometric Standard Deviation
Production Unit:						
Chemical Process Operator	Partial Shift (Sample Time Range: 7-125 minutes)	10	0.00013 mg/m3	40 mg/m3	0.050 mg/m3	64.407
Pilot Plant:						
Technician	Partial Shift (Sample Time: 70 minutes)	1	0.45 mg/m3	0.45 mg/m3	NA	NA

4. **Briefly describe the engineering controls used to minimize exposure to this chemical:**

The drying and packaging activities are contained within small-room enclosures with negative pressure and filtered exhaust ventilation. Local exhaust may be present directly at the point of packaging.

5. **Briefly list the personal protective equipment your workers regularly wear to prevent exposure of this chemical:**

Employees working within the above small-room enclosures use airline respirators, chemical-protective coveralls (Tyvek), boot covers, and gloves.

Comments: (This section is available to clarify the responses given. Attach additional pages if desired.)

CAS Number: 1763-23-1 Company: 3M Company, Specialty Material Manufacturing Division, Cottage Grove, MN

Chemical Name	CAS No.
Perfluorooctane sulfonic acid	1763-23-1

This information will assist EPA in characterizing the number of workers potentially exposed and the magnitude, frequency, and duration of potential exposure. When providing monitoring data, ensure that data is linked with worker activities described in question 2.

1. **Estimate the number of workers potentially exposed routinely to the subject chemical for each of the exposure duration times. If a worker is involved in more than one activity, enter only his/her most typical activity in the table. Don't count a worker more than once. The total number in the table should equal the total number of workers potentially exposed.**

Hours/Day	Days/Year			
	<10	10-100	100-250	>250
<.25				
.25-1		6		
1-8		12		
>8				

2. **Describe the routine worker activities to which the workers in question 1 are exposed: sampling, removal of filter cake, and drumming of liquids, manufacture an article, etc. For these activities, describe the physical state of the subject chemical (liquid, gas, particulate, or aerosol, etc.) and, if in a mixture, the chemical's concentration:**

The chemical formulation containing 1763-23-1 is a clear colorless liquid solution (32-38% concentration). Employee activities include operation and maintenance of process equipment, product quality sampling and drumming as an intermediate or final product liquid solution containing 1763-23-1.

Provide industrial hygiene monitoring data, if available, with a brief describe the specific worker activities performed by the individuals monitored. For privacy considerations, please do not include any personal identifiers such as a worker's name or social security number with any data submitted to EPA.

There is no chemical-specific personal industrial hygiene monitoring data or area/source monitoring data for this specific material at this facility. For most areas of the facility, recent qualitative assessment of potential exposure to this material under 3M's ongoing industrial hygiene program indicates a low exposure potential to this material.

Each 3M plant that produces sulfonated fluorochemicals has an industrial hygienist on staff and is supported by a corporate industrial hygiene group. 3M's industrial hygiene program focuses on task-based exposure assessment and control. Exposures are identified and assessed qualitatively and/or quantitatively. Qualitative assessments are performed by an industrial hygienist. Quantitative assessments include task-based personal sampling for certain, specific fluorochemicals and/or source or area sampling. The results of the assessments support decisions on exposure control. Engineering controls are preferred, but personal protective equipment may be used on an interim basis or when effective engineering control is not feasible.

4. **Briefly describe the engineering controls used to minimize exposure to this chemical:**

Local exhaust ventilation used at product container openings during container filling.

5. **Briefly list the personal protective equipment your workers regularly wear to prevent exposure of this chemical:**

Employees wear PVC jackets and pants, neoprene gloves, and face shield and chemical splash goggles for containerization of solutions containing 1763-23-1.

Comments: (This section is available to clarify the responses given. Attach additional pages if desired.)

CAS Number: 70225-14-8 Company: 3M Company, Specialty Materials Manufacturing Division, Cottage Grove, MN

Chemical Name	CAS No.
Diethanolamine salt of perfluorooctane sulfonate	70225-14-8

This information will assist EPA in characterizing the number of workers potentially exposed and the magnitude, frequency, and duration of potential exposure. When providing monitoring data, ensure that data is linked with worker activities described in question 2.

1. **Estimate the number of workers potentially exposed routinely to the subject chemical for each of the exposure duration times. If a worker is involved in more than one activity, enter only his/her most typical activity in the table. Don't count a worker more than once. The total number in the table should equal the total number of workers potentially exposed.**

Hours/Day	Days/Year			
	<10	10-100	100-250	>250
<.25				
.25-1	2			
1-8	4			
>8				

2. **Describe the routine worker activities to which the workers in question 1 are exposed: sampling, removal of filter cake, and drumming of liquids, manufacture an article, etc. For these activities, describe the physical state of the subject chemical (liquid, gas, particulate, or aerosol, etc.) and, if in a mixture, the chemical's concentration:**

This product is a clear, light colored solution containing 19-23% 70225-14-8. This material is a salt with a very low vapor pressure, which is not typically handled dry. Employee activities include operation and maintenance of process equipment, product quality sampling and drumming of final liquid solution containing 70225-14-8.

3. **Provide industrial hygiene monitoring data, if available, with a brief description of the sampling method and exposure scenario monitored, e.g., describe the specific worker activities performed by the individuals monitored. For privacy considerations, please do not include any personal identifiers such as a worker's name or social security number with any data submitted to EPA.**

There is no chemical-specific personal industrial hygiene monitoring data or area/source monitoring data for this specific material at this facility. For most areas of the facility, recent qualitative assessment of potential exposure to this material under 3M's ongoing industrial hygiene program indicates a low exposure potential to this material.

Each 3M plant that produces sulfonated fluorochemicals has an industrial hygienist on staff and is supported by a corporate industrial hygiene group. 3M's industrial hygiene program focuses on task-based exposure assessment and control. Exposures are identified and assessed qualitatively and/or quantitatively. Qualitative assessments are performed by an industrial hygienist. Quantitative assessments include task-based personal sampling for certain, specific fluorochemicals and/or source or area sampling. The results of the assessments support decisions on exposure control. Engineering controls are preferred, but personal protective equipment may be used on an interim basis or when effective engineering control is not feasible.

4. **Briefly describe the engineering controls used to minimize exposure to this chemical:**

Local exhaust ventilation used at product container openings during packaging.

5. **Briefly list the personal protective equipment your workers regularly wear to prevent exposure of this chemical:**

Employees wear PVC gloves and chemical splash goggles for containerization of product.

Comments: (This section is available to clarify the responses given. Attach additional pages if desired.)

CAS Number: 29081-56-9 Company: 3M Company, Specialty Materials Manufacturing Division, Cottage Grove, MN

Chemical Name	CAS No.
Ammonium perfluorooctane sulfonate	29081-56-9

This information will assist EPA in characterizing the number of workers potentially exposed and the magnitude, frequency, and duration of potential exposure. When providing monitoring data, ensure that data is linked with worker activities described in question 2.

1. **Estimate the number of workers potentially exposed routinely to the subject chemical for each of the exposure duration times. If a worker is involved in more than one activity, enter only his/her most typical activity in the table. Don't count a worker more than once. The total number in the table should equal the total number of workers potentially exposed.**

Hours/Day	Days/Year			
	<10	10-100	100-250	>250
<.25				
.25-1	12			
1-8	12			
>8				

2. **Describe the routine worker activities to which the workers in question 1 are exposed: sampling, removal of filter cake, and drumming of liquids, manufacture an article, etc. For these activities, describe the physical state of the subject chemical (liquid, gas, particulate, or aerosol, etc.) and, if in a mixture, the chemical's concentration:**

The chemical formulation containing 29081-56-9 is a clear amber solution (19-23% concentration). This material is a salt with a very low vapor pressure, which is not typically handled dry. Employee activities include transferring wet slurry to filter press, operating filter press, transferring filter cake to reactor, and drumming final liquid solution containing 29081-56-9. The above employees also operate and maintain process equipment and collect quality samples.

3. **Provide industrial hygiene monitoring data, if available, with a brief description of the sampling method and exposure scenario monitored, e.g., describe the specific worker activities performed by the individuals monitored. For privacy considerations, please do not include any personal identifiers such as a worker's name or social security number with any data submitted to EPA.**

There is no chemical-specific personal industrial hygiene monitoring data or area/source monitoring data for this specific material at this facility. For most areas of the facility, recent qualitative assessment of potential exposure to this material under 3M's ongoing industrial hygiene program indicates a low exposure potential to this material.

Each 3M plant that produces sulfonated fluorochemicals has an industrial hygienist on staff and is supported by a corporate industrial hygiene group. 3M's industrial hygiene program focuses on task-based exposure assessment and control. Exposures are identified and assessed qualitatively and/or quantitatively. Qualitative assessments are performed by an industrial hygienist. Quantitative assessments include task-based personal sampling for certain, specific fluorochemicals and/or source or area sampling. The results of the assessments support decisions on exposure control. Engineering controls are preferred, but personal protective equipment may be used on an interim basis or when effective engineering control is not feasible.

4. **Briefly describe the engineering controls used to minimize exposure to this chemical:**

Local exhaust available at the filter press, at the reactor opening and at the product container openings.

5. **Briefly list the personal protective equipment your workers regularly wear to prevent exposure of this chemical:**

Employees wear PVC jackets and pants, neoprene gloves, and chemical splash goggles. Half mask dust-mist respirators are used for handling of wet filter cake.

Comments: (This section is available to clarify the responses given. Attach additional pages if desired.)

CAS Number: 29457-72-5 Company: 3M Company, Specialty Materials Manufacturing Division, Cottage Grove, MN

Chemical Name	CAS No.
Lithium perfluorooctane sulfonate	29457-72-5

This information will assist EPA in characterizing the number of workers potentially exposed and the magnitude, frequency, and duration of potential exposure. When providing monitoring data, ensure that data is linked with worker activities described in question 2.

1. **Estimate the number of workers potentially exposed routinely to the subject chemical for each of the exposure duration times. If a worker is involved in more than one activity, enter only his/her most typical activity in the table. Don't count a worker more than once. The total number in the table should equal the total number of workers potentially exposed.**

Hours/Day	Days/Year			
	<10	10-100	100-250	>250
<.25				
.25-1	12			
1-8	6			
>8				

2. **Describe the routine worker activities to which the workers in question 1 are exposed: sampling, removal of filter cake, and drumming of liquids, ~~manufacture an article, etc.~~ ~~For these activities, describe the physical state of the~~ subject chemical (liquid, gas, particulate, or aerosol, etc.) and, if in a mixture, the chemical's concentration:**

The chemical formulation containing 29457-72-5 is a clear amber solution (24-26% concentration). This material is a salt with a very low vapor pressure, which is not typically handled dry. Employee activities include operation and maintenance of process equipment, product quality sampling and drumming of final liquid solution containing 29457-72-5.

3. **Provide industrial hygiene monitoring data, if available, with a brief description of the sampling method and exposure scenario monitored, e.g., describe the specific worker activities performed by the individuals monitored. For privacy considerations, please do not include any personal identifiers such as a worker's name or social security number with any data submitted to EPA.**

There is no chemical-specific personal industrial hygiene monitoring data or area/source monitoring data for this specific material at this facility. For most areas of the facility, recent qualitative assessment of potential exposure to this material under 3M's ongoing industrial hygiene program indicates a low exposure potential to this material.

Each 3M plant that produces sulfonated fluorochemicals has an industrial hygienist on staff and is supported by a corporate industrial hygiene group. 3M's industrial hygiene program focuses on task-based exposure assessment and control. Exposures are identified and assessed qualitatively and/or quantitatively. Qualitative assessments are performed by an industrial hygienist. Quantitative assessments include task-based personal sampling for certain, specific fluorochemicals and/or source or area sampling. The results of the assessments support decisions on exposure control. Engineering controls are preferred, but personal protective equipment may be used on an interim basis or when effective engineering control is not feasible.

4. **Briefly describe the engineering controls used to minimize exposure to this chemical:**

Local exhaust ventilation used at product container openings during packaging.

5. **Briefly list the personal protective equipment your workers regularly wear to prevent exposure of this chemical:**

Employees wear PVC jackets, neoprene gloves, and chemical splash goggles for containerization of product.

Comments: (This section is available to clarify the responses given. Attach additional pages if desired.)

CAS Number: 2795-39-3 Company: 3M Company, Specialty Materials Manufacturing Division, Decatur, AL

Chemical Name	CAS No.
Potassium perfluorooctane sulfonate	2795-39-3

This information will assist EPA in characterizing the number of workers potentially exposed and the magnitude, frequency, and duration of potential exposure. When providing monitoring data, ensure that data is linked with worker activities described in question 2.

1. **Estimate the number of workers potentially exposed routinely to the subject chemical for each of the exposure duration times. If a worker is involved in more than one activity, enter only his/her most typical activity in the table. Don't count a worker more than once. The total number in the table should equal the total number of workers potentially exposed.**

Hours/Day	Days/Year			
	<10	10-100	100-250	>250
<.25				
.25-1			24	
1-8				
>8				

2. **Describe the routine worker activities to which the workers in question 1 are exposed: sampling, removal of filter cake, and drumming of liquids, manufacture an article, etc. For these activities, describe the physical state of the subject chemical (liquid, gas, particulate, or aerosol, etc.) and, if in a mixture, the chemical's concentration:**

The chemical (2795-39-3) is in an aqueous solution (ca. 25%). Employees operate and maintain the production equipment and collect quality samples. Material is produced, stored, and metered into product container in a closed system.

3. **Provide industrial hygiene monitoring data, if available, with a brief description of the sampling method and exposure scenario monitored, e.g., describe the specific worker activities performed by the individuals monitored. For privacy considerations, please do not include any personal identifiers such as a worker's name or social security number with any data submitted to EPA.**

   There is no chemical-specific personal industrial hygiene monitoring data or area/source monitoring data for this specific material at this facility. For most areas of the facility, recent qualitative assessment of potential exposure to this material under 3M's ongoing industrial hygiene program indicates a low exposure potential to this material.

   Each 3M plant that produces sulfonated fluorochemicals has an industrial hygienist on staff and is supported by a corporate industrial hygiene group. 3M's industrial hygiene program focuses on task-based exposure assessment and control. Exposures are identified and assessed qualitatively and/or quantitatively. Qualitative assessments are performed by an industrial hygienist. Quantitative assessments include task-based personal sampling for certain, specific fluorochemicals and/or source or area sampling. The results of the assessments support decisions on exposure control. Engineering controls are preferred, but personal protective equipment may be used on an interim basis or when effective engineering control is not feasible data available.

4. **Briefly describe the engineering controls used to minimize exposure to this chemical:**

   Enclosed process.

5. **Briefly list the personal protective equipment your workers regularly wear to prevent exposure of this chemical:**

   Employees use safety glasses and neoprene gloves.

   Comments: (This section is available to clarify the responses given. Attach additional pages if desired.)

CAS Number: 1763-23-1, 29081-56-9, 29457-72-5, 70225-14-8 Company: 3M – Decatur, AL

Chemical Name	CAS No.
Perfluorooctane sulfonic acid	1763-23-1
Ammonium perfluorooctane sulfonate	29081-56-9
Lithium perfluorooctane sulfonate	29457-72-5
Diethanolamine salt of perfluorooctane sulfonate	70225-14-8

None of these materials are manufactured at 3M-Decatur.

VII. CHEMICAL END USES

A. END USE AS AN INTERMEDIATE CONSUMED TO MAKE OTHER CHEMICALS

A1. On-Site Use as a Intermediate:

CAS #1763-23-1

Perfluorooctane sulfonic acid is used as an intermediate while the salts are not used as intermediates. The perfluorooctane sulfonate salts are only used as finished products.

	Product chemical class or product chemical (Include CAS number if appropriate)	% of total* volume of subject chemical manufactured or imported
1.	Fluorochemical trivalent chromium compound	1-5
2.	Perfluorooctane sulfonate salt	1-5

***As reported in Part III, p.2**

A2. Off-Site Use as an Intermediate:

	Product chemical class or product chemical (Include CAS number if appropriate)	% of total volume of subject chemical manufactured or imported*
1.	Not Applicable	Not Applicable

***As reported in Part III, p.2**

B. END USES OTHER THAN AS A CONSUMED INTERMEDIATE

The following two tables present a summary of the information contained in VII.B regarding uses of perfluorooctane sulfonic acid and its salt forms.

Table 1 details the end applications in which a particular CAS Number is used. For each CAS Number, the % used in each application totals to 100%.

Table 1. CAS Number by Application

CAS NUMBER	APPLICATION
2795-39-3	1. Film former in Fire Fighting Foams 2. Mist suppressant for acid baths in metal plating factories 3. Surfactant in acid etching processes for production of circuit boards
29457-72-5	1. Surfactant in alkaline cleaners 2. Emulsifier in commercial floor polish 3. Mist suppressant for acid baths in metal plating factories 4. Surfactant in acid etching processes for production of circuit boards 5. Registered active ingredient for insect control. Used in formulations used in bait traps
70225-14-8	1. Emulsifier in commercial floor polishes 2. Mist suppressant for acid baths in metal plating factories 3. Surfactant in acid etching processes for production of circuit boards
29081-56-9	1. Surfactant in acid etching processes for production of circuit boards
1763-23-1	No commercial products

Table 2 details the multiple CAS Numbers which may be used in any one application.

Table 2. Application by CAS Number

CAS NUMBER	APPLICATION
2795-39-3	Film former in Fire Fighting Foams
2795-39-3 29457-72-5 70225-14-8	Mist suppressant for acid baths in metal plating factories
2795-39-3 29457-72-5 70225-14-8 29081-56-9	Surfactant in acid etching processes for production of circuit boards
29457-72-5 70225-14-8	Emulsifier in commercial floor polishes
29457-72-5	Surfactant in alkaline cleaners
29457-72-5	Registered active ingredient for insect control. Used in formulations used in bait traps
1763-23-1	No commercial products

CAS Number 2795-39-3, Potassium perfluorooctane sulfonate

Use Number 1 of 3
Description of Chemical End Use: Chemical used as film former which is blended into fire fighting foams. These products are designed for primary use by fire fighting professionals.

Percent of total manufactured or imported Volume going to this use: 92 ± 2

If used in a mixture check appropriate box To indicate weight fraction. Average Values are acceptable:

- X <1% (600-1200 ppm)
- ___ 1-30%
- ___ 30-60%
- ___ 60-90%
- ___ >90%

Check all physical forms of the chemical during this use:

- ___ Aerosol
- ___ Dry Powder
- ___ Pellets or large crystals
- ___ Water or solvent – wet solid
- ___ Gas or vapor
- X Liquid solution
- ___ Other (Explain)

Use Number 2 of 3
Description of Chemical End Use: Metal plating factories use this chemical to suppress oxidizing acid mist in order to protect their workers' health.

Percent of total manufactured or imported Volume going to this use: 6 ± 2

If used in a mixture check appropriate box To indicate Weight fraction. Average Values are acceptable:

- X <1% (1000 ppm)
- ___ 1-30%
- ___ 30-60%
- ___ 60-90%
- ___ >90%

Check all physical forms of the chemical during this use:

- ___ Aerosol
- ___ Dry Powder
- ___ Pellets or large crystals
- ___ Water or solvent – wet solid
- ___ Gas or vapor
- X Liquid solution
- ___ Other (Explain)

Use Number 3 of 3

Description of Chemical End Use: Electronic factories add this chemical as a surfactant to improve the wetting of strong acids used in the etching of precise patterns in a silicon water or a printed circuit board.

Percent of total manufactured or imported Volume going to this use: 2 ± 0.5

If used in a mixture check appropriate box To indicate Weight fraction. Average Values are acceptable:

- X <1% (<1000 ppm)
- ___ 1-30%
- ___ 30-60%
- ___ 60-90%
- ___ >90%

Check all physical forms of the chemical during this use:

- ___ Aerosol
- ___ Dry Powder
- ___ Pellets or large crystals
- ___ Water or solvent – wet solid
- ___ Gas or vapor
- X Liquid solution
- ___ Other (Explain)

CAS Number 29457-72-5, Lithium perfluorooctane sulfonate

Use Number 1 of 5
Description of Chemical End Use: Chemical formulators use this chemical as a surfactant to improve the wetting of water-based products that are sold as alkaline cleaners. These cleaners are then diluted and sold to the consumer or contract cleaner.

Percent of total manufactured or imported Volume going to this use: 23.5 ± 0.5

If used in a mixture check appropriate box To indicate Weight fraction. Average Values are acceptable:

X <1% (30 ppm)
___ 1-30%
___ 30-60%
___ 60-90%
___ >90%

Check all physical forms of the chemical during this use:

___ Aerosol
___ Dry Powder
___ Pellets or large crystals
___ Water or solvent – wet solid
___ Gas or vapor
X Liquid solution
___ Other (Explain)

Use Number 2 of 5
Description of Chemical End Use: Metal plating factories use this chemical as a surfactant to suppress oxidizing acid mist in order to protect their workers' health.

Percent of total manufactured or imported Volume* going to this use: 1 ± 1

If used in a mixture check appropriate box To indicate Weight fraction. Average Values are acceptable:

X <1% (30-50 ppm)
___ 1-30%
___ 30-60%
___ 60-90%
___ >90%

Check all physical forms of the chemical during this use:

___ Aerosol
___ Dry Powder
___ Pellets or large crystals
___ Water or solvent – wet solid
___ Gas or vapor
X Liquid solution
___ Other (Explain)

Use Number 3 of 5

Description of Chemical End Use: Electronics factories add this chemical as a surfactant to improve the wetting of strong acids used in the etching of precise patterns in a silicon water or a printed circuit board.

Percent of total manufactured or imported Volume going to this use: 1 ± 1

If used in a mixture check appropriate box To indicate Weight fraction. Average Values are acceptable:

- X <1% (30-50 ppm)
- ___ 1-30%
- ___ 30-60%
- ___ 60-90%
- ___ >90%

Check all physical forms of the chemical during this use:

- ___ Aerosol
- ___ Dry Powder
- ___ Pellets or large crystals
- ___ Water or solvent – wet solid
- ___ Gas or vapor
- X Liquid solution
- ___ Other (Explain)

Use Number 4 of 5

Description of Chemical End Use: Chemical formulators use this chemical as a surfactant to improve the wetting of water-based products that are sold as commercial floor polishes.

Percent of total manufactured or imported Volume going to this use: 23.5 ± 0.5

If used in a mixture check appropriate box To indicate Weight fraction. Average Values are acceptable:

- X <1% (15 ppm)
- ___ 1-30%
- ___ 30-60%
- ___ 60-90%
- ___ >90%

Check all physical forms of the chemical during this use:

- ___ Aerosol
- ___ Dry Powder
- ___ Pellets or large crystals
- ___ Water or solvent – wet solid
- ___ Gas or vapor
- X Liquid solution
- ___ Other (Explain)

Use Number 5 of 5

Description of Chemical End Use: Chemical formulators use this chemical as a registered active ingredient for insect control. It is blended with bait that is attractive to insects and placed in it stations. Either commercial facilities or consumers can use these bait stations.

Percent of total manufactured or imported Volume going to this use: 53 ± 0.5

If used in a mixture check appropriate box To indicate Weight fraction. Average Values are acceptable:

- X <1%
- ___ 1-30%
- ___ 30-60%
- ___ 60-90%
- ___ >90%

Check all physical forms of the chemical during this use:

- ___ Aerosol
- ___ Dry Powder
- ___ Pellets or large crystals
- ___ Water or solvent – wet solid
- ___ Gas or vapor
- X Liquid solution
- ___ Other (Explain)

CAS Number 29081-56-9, Ammonium perfluorooctane sulfonate

Use Number 1 of 1

Description of Chemical End Use: Electronics factories add this chemical as a surfactant to improve the setting of strong acids used in the etching of precise patterns in a silicon wafer or a printed circuit board.

Percent of total manufactured or imported Volume going to this use: 100

If used in a mixture check appropriate box To indicate Weight fraction. Average Values are acceptable:

- X <1% (~100 ppm)
- ___ 1-30%
- ___ 30-60%
- ___ 60-90%
- ___ >90%

Check all physical forms of the chemical during this use:

- ___ Aerosol
- ___ Dry Powder
- ___ Pellets or large crystals
- ___ Water or solvent – wet solid
- ___ Gas or vapor
- X Liquid solution
- ___ Other (Explain)

CAS Number 70225-14-8, Diethanol amine perfluorooctane sulfonate

Use Number 1 of 3
Description of Chemical End Use: Chemical formulators use this chemical as a surfactant to improve the emulsification of materials used in commercial and consumer floor polishes.

Percent of total manufactured or imported Volume going to this use: 35 ± 2

If used in a mixture check appropriate box To indicate Weight fraction. Average Values are acceptable:

- X <1% (~15 ppm)
- ___ 1-30%
- ___ 30-60%
- ___ 60-90%
- ___ >90%

Check all physical forms of the chemical during this use:

- ___ Aerosol
- ___ Dry Powder
- ___ Pellets or large crystals
- ___ Water or solvent – wet solid
- ___ Gas or vapor
- X Liquid solution
- ___ Other (Explain)

Use Number 2 of 3
Description of Chemical End Use: Metal plating factories use this chemical to suppress oxidizing acid mist in order to protect their workers' health.

Percent of total manufactured or imported Volume going to this use: 48.5 ± 3

If used in a mixture check appropriate box To indicate Weight fraction. Average Values are acceptable:

- X <1% (~100-1000 ppm)
- ___ 1-30%
- ___ 30-60%
- ___ 60-90%
- ___ >90%

Check all physical forms of the chemical during this use:

- ___ Aerosol
- ___ Dry Powder
- ___ Pellets or large crystals
- ___ Water or solvent – wet solid
- ___ Gas or vapor
- X Liquid solution
- ___ Other (Explain)

Use Number 3 of 3

Description of Chemical End Use: Electronic factories add this chemical as a surfactant to improve the wetting of strong acids used in the etching of precise patterns in a silicon water or a printed circuit board.

Percent of total manufactured or imported Volume going to this use: 16.5 ± 2

If used in a mixture check appropriate box To indicate Weight fraction. Average Values are acceptable:

- X <1% (~100-1000 ppm)
- ___ 1-30%
- ___ 30-60%
- ___ 60-90%
- ___ >90%

Check all physical forms of the chemical during this use:

- ___ Aerosol
- ___ Dry Powder
- ___ Pellets or large crystals
- ___ Water or solvent – wet solid
- ___ Gas or vapor
- X Liquid solution
- ___ Other (Explain)

C 10

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