3M General Offices

3M Center
St. Paul, MN 55144-1000
612 733 1110

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FYI-00-001378

3M

April 28, 2000

Contains No CBI

MR 36097

Mr. Oscar Hernandez
US EPA/OPPT/CCD (7405)
401 M Street, SW
Room E615B
Washington, DC 20460

8500000005

Dear Oscar:

As part of the ongoing voluntary submission of data and information on perfluorooctane sulfonic acid (PFOS) to EPA by 3M, enclosed is information on use and exposure relating to PFOS (Attachment 1). This information is presented following the format of a "Use and Exposure Information Profile" (UEIP) as recommended to 3M by EPA OPPT management. One UEIP form was prepared to cover the chemical perfluorooctane sulfonic acid (CAS #1763-23-1) and four of its salt forms (CAS #29081-56-9, 29457-72-5, 70225-14-8, 2795-39-3) that are manufactured from the perfluorooctane sulfonic acid.

It is important to emphasize the following points:

- The majority of 3M's fluorochemical production and product commercialization involves higher molecular weight functionalized derivatives made from perfluorooctane sulfonyl fluoride. A relatively small amount of perfluorooctane sulfonic acid and its salts are actually commercialized as finished products (<200,000 lbs/year).

- The secondary reactions producing all of these derivatives are single or sequential batch processes that do not necessarily produce pure products. There may be varying amounts of fluorochemical residuals (unreacted or partially reacted starting materials or intermediates) that are carried forward to the final product. Typically, where present, these residuals can be found at a concentration of 1-2% or less in final products and, in the aggregate, represent roughly 1-2% of total fluorochemical production volume. 3M has implemented an aggressive program to reduce or eliminate such manufacturing residuals in the production of commercialized products. Some of these fluorochemical residuals in 3M products have the potential to degrade or metabolize to PFOS. In addition, during some product use or disposal, the non-fluorochemical moieties added to the sulfonyl fluoride group of POSF can also be removed through a variety of degradation processes (chemical, environmental and metabolic). In such instances, the fluorochemical species ultimately produced as a result of such degradation will generally be PFOS. Therefore, there are other potential

sources of PFOS exposure or release than the actual production of perfluorooctane sulfonic acid or its salts.

- 3M does have data demonstrating the stability of high molecular weight fluorochemical polymers and fluorochemical phosphate esters to various mechanisms of degradation. Therefore, it is believed that degradation of these materials as commercialized products is not the principle source of PFOS to human or environmental exposure. 3M has provided to EPA as a supplemental submission (TSCA Section 8(e) – Perfluorooctane Sulfonate – Docket Numbers 8EHQ-1180-373; 8EHQ-1180-374) the white paper entitled "Sulfonated Perfluorochemicals in the Environment: Sources, Dispersion, Fate and Effects". The information in that paper contains worse case estimates of potential exposure and waste generation. That analysis assumed all fluorochemical products could completely degrade to PFOS and represented that quantitatively as "PFOS equivalents". Our current understanding is that these conservative estimates of PFOS equivalents overstate exposure potential to PFOS.

- EPA received biomonitoring data from 3M on April 24, 2000 indicating that most employees at the Decatur, AL manufacturing site have PFOS found in their serum. The attached UEIP document shows that most PFOS is manufactured at Cottage Grove, MN with only small numbers of exposed employees. The exposure experienced by employees at the Decatur, AL site is to fluorochemical materials that are metabolized or hydrolyzed to PFOS.

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

Best regards,

William A. Weppner

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

Attachment(s)
- Voluntary Use and Exposure Information Profile – Perfluorooctane Sulfonic Acid and Its Salt Forms

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 listed salts summarize the designated Tier I perfluorochemicals that are all considered perfluorooctane 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		0
29081-56-9	Less Than	0
70225-14-8	200,000 lb/yr.	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

$$C_8H_{17}SO_2F + 17\,HF \xrightarrow[ECF]{\text{Energy}} C_8F_{17}SO_2F + 17\,H_2$$

1-Octanesulfonyl fluoride — Perfluorooctanesulfonyl fluoride

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.

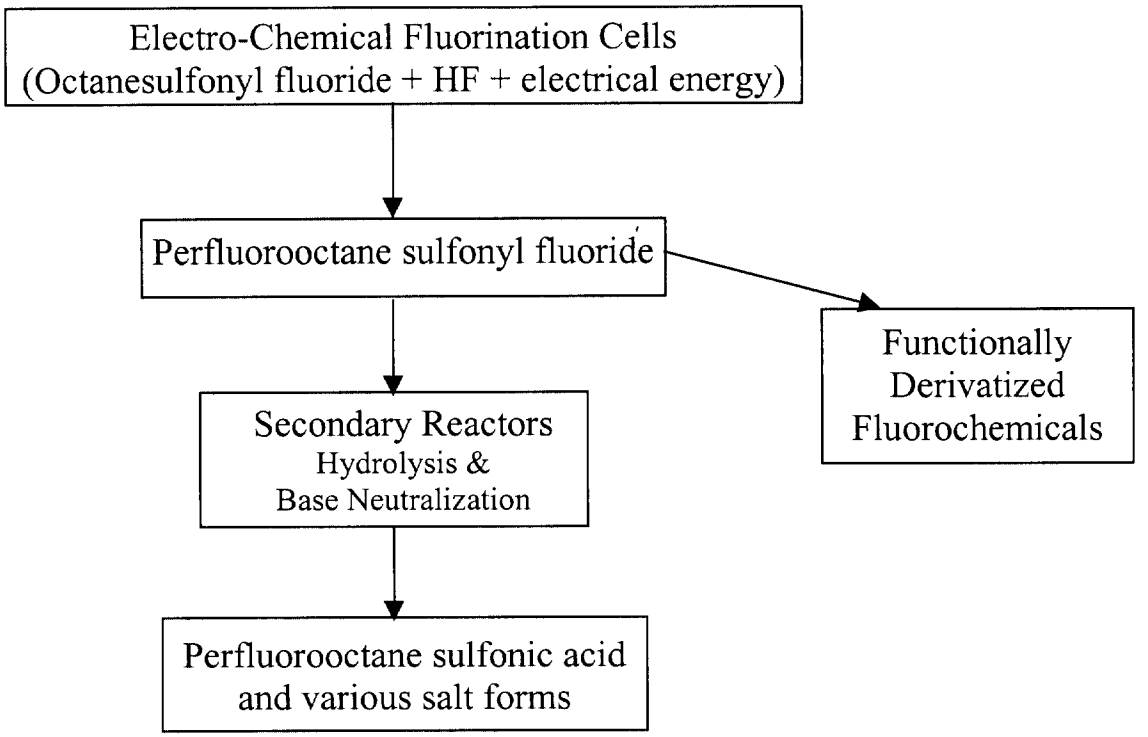
During production, byproducts and waste products are formed. The volatile waste products, such as perfluoromethane, have been vented to the atmosphere in the past, but improvements are underway to capture and destroy these releases by thermal oxidation. The tars are incinerated at an in-house, hazardous 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 is either landfilled or land-incorporated. Some of the non-POSF byproducts are recovered and sold for secondary uses.

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 – Perfluorooctane sulfonic acid and its salts are not listed on TRI.

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

A. ON-SITE AIR RELEASES FROM DECATUR, AL AND COTTAGE GROVE, MN

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

Comments:

Physical chemical property information and industrial hygiene monitoring support that PFOS salts would not be in the form of volatile air emissions. Some industrial hygiene testing at Cottage Grove, MN has shown the presence of PFOS in work areas, however the industrial hygiene personnel have indicated that this material is believed to be in the form of dried particulate dust. Although dispersed PFOS has been detected in the work area, the concentrations do not indicate significant contributions to annual site air emissions.

Industrial hygiene data for PFOS salts has not been generated in Decatur, AL because they are in a liquid slurry versus particle form.

Fugitive air emissions testing for the Decatur wastewater treatment system was conducted in late 1999. Results are still under review and no final report is available. However, no PFOS was detected in air samples.

B. WATER RELEASES FROM SITE

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

Number of days/year release occurs: (See comments below)

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

NPDES Number: ALD004023164

Comments:

Although manufacturing of the salts listed on this form is associated with less than 10 wastewater discharges 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. A percentage of the discharges are from the PFOS salt manufacturing. There is not data to distinguish between PFOS discharge from PFOS salt manufacturing versus hydrolysis of other sulfonated compounds manufactured at this site to PFOS.

PFOS in wastewater discharge is not measured as specific salt compounds, but instead reflects the total amount of dissociated salts and compounds that hydrolyze to perfluorooctane sulfonate.

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: The discharge amount is based upon 'per batch estimates of releases'. Removal of the PFOS to the sludge from the Cottage Grove, MN wastewater system was calculated based upon the measured removal of PFOS from wastewater in the clarifiers at Decatur, AL.

C. ON-SITE LAND RELEASES

DECATUR, AL

	Estimated Total Annual Releases (lbs. 1997)	**Estimated % Accuracy of Estimate (optional)**
Landfill	0	
Land Treatment/Land Amendment	40,000	
Surface Impoundments	Not quantified	
Underground Injection	0	
Other (specify):		

Comments:

In 1997, land-amended sludges were held in an impoundment until weather permitted application to the field. The impoundment is no longer used as part of the normal wastewater treatment operation except during equipment downtime. A percentage of the PFOS land treatment is from the PFOS salt manufacturing. There is not data to distinguish between PFOS land treatment from PFOS salt manufacturing versus hydrolysis of other sulfonated compounds manufactured at this site for PFOS.

The land treatment of Decatur sludge was discontinued in early 1998. Sludge now is transported to an offsite landfills, after passing through a thickener and a sludge press.

Estimated PFOS levels in the sludge are based upon the reduction of PFOS in the wastewater stream as it passes through the clarifiers at the site. The PFOS levels in the sludge have been reduced by changes in the amount of materials being discharged to the sewer. Wastewater data from 1999 show that PFOS levels in the sludge were less than 20,000 pounds per year.

COTTAGE GROVE, MN

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

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

D1. Transfer to Publicly Owned Treatment Works (POTW)

Number of days/year the release occurs: Not applicable – waste is not sent to a POTW

Annual Transfer (lb): 0

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

POTW Name:	Not Applicable
Street Address:	Not Applicable
City: Not Applicable	**Country:** Not Applicable
State: Not Applicable	**Zip Code:** Not Applicable
NPDES Number: Not Applicable	

Comments:

D2. TRANSFERS TO OTHER OFF-SITE LOCATIONS

DECATUR, AL

	Estimated Total Annual Releases (lbs. 1997)	Estimated % Accuracy of Estimate (optional)
Incineration:	Not applicable	
Wastewater Treatment (Excluding POTW)	Not applicable	
Underground Injection	Not applicable	
Hazardous Waste (RCRA Subtitle C) landfill	Not applicable	
Other Landfill	Not applicable	
Recycle or Recovery	Not applicable	
Unknown or Other		

Comments:

COTTAGE GROVE, MN

	Estimated Total Annual Releases (lbs. 1997)	Estimated % Accuracy of Estimate (optional)
Incineration:	0 – See comment	
Wastewater Treatment (Excluding POTW)	Not applicable	
Underground Injection	Not applicable	
Hazardous Waste (RCRA Subtitle C) landfill	Not applicable	
Other Landfill	7400	
Recycle or Recovery	Not applicable	
Unknown or Other		

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

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

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 spray 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 a worker's name or social security number with any data submitted to EPA.**

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, inductively coupled plasma emission spectroscopy (for K+), or liquid chromatography analysis. The current method is an OSHA Versatile Sampler (OVS) tube analyzed by liquid chromatography/mass spectrometry. 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.

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.

3. **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.**

   No data available.

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:**

   The chemical (70225-14-8) is a clear, light colored solution containing 19-23% 70225-14-8. 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.**

   No data available.

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). 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.**

   No data available.

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). 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.**

   No data available.

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 (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.**

No 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 bait 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)