
Safety Assessment of Polysilsesquioxanes as Used in Cosmetics

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All interested persons are provided 60 days from the above date to comment on this safety assessment and to identify additional published data that should be included or provide unpublished data which can be made public and included. Information may be submitted without identifying the source or the trade name of the cosmetic product containing the ingredient. All unpublished data submitted to CIR will be discussed in open meetings, will be available at the CIR office for review by any interested party and may be cited in a peer-reviewed scientific journal. Please submit data, comments, or requests to the CIR Director, Dr. Lillian J. Gill.

The 2017 Cosmetic Ingredient Review Expert Panel members are: Chair, Wilma F. Bergfeld, M.D., F.A.C.P.; Donald V. Belsito, M.D.; Ronald A. Hill, Ph.D.; Curtis D. Klaassen, Ph.D.; Daniel C. Liebler, Ph.D.; James G. Marks, Jr., M.D.; Ronald C. Shank, Ph.D.; Thomas J. Slaga, Ph.D.; and Paul W. Snyder, D.V.M., Ph.D. The CIR Director is Lillian J. Gill, D.P.A.
This report was prepared by Lillian C. Becker, Scientific Analyst/Writer.

INTRODUCTION

This is a review of the available scientific literature and unpublished data relevant to assessing the safety of 18 polysilsesquioxanes as used in cosmetics. The ingredients in this group comprise the polymeric ingredients resulting from the hydrolysis and condensation of alkylalkoxysilanes and typically comprise three-dimensional frameworks. According to the *Cosmetic Ingredient Dictionary and Handbook (Dictionary)*, the polysilsesquioxanes listed below mostly function as film formers and nail conditioning agents ([Table 1](#)).¹

Polymethylsilsesquioxane	Methacryloyloxypropyl Polysilsesquioxane
Acryloyloxypropyl Polysilsesquioxane	Polycaprylylsilsesquioxane
C26-28 Alkyldimethylsilyl Polypropylsilsesquioxane	Polydimethylsiloxy PEG/ PPG-24/19 Butyl Ether Silsesquioxane
C30-45 Alkyldimethylsilyl Polypropylsilsesquioxane	Polydimethylsiloxy PPG-13 Butyl Ether Silsesquioxane
Dimethicone/Silsesquioxane Copolymer	Polymethylsilsesquioxane/Trimethylsiloxy silicate
Dimethiconol/Caprylylsilsesquioxane/Silicate Crosspolymer	Polypropylsilsesquioxane
Ethyl Polysilsesquioxane	Trimethylpentyl Polysilsesquioxane
Hydrogen Dimethicone/Octyl Silsesquioxane Copolymer	Isobutyl/Methoxy PEG-10 Polysilsesquioxane
Isobutyl Polysilsesquioxane	Methoxy PEG-10 Polysilsesquioxane

There are several related ingredients that have been reviewed by the CIR Expert Panel (Panel); these ingredients are cited in [Table 2](#). These previously reviewed polymers were all found to be safe as used. Some of the precursors and monomers were also reviewed by the Panel and are also cited in [Table 2](#).

CHEMISTRY

Definition and Structure

The ingredients in this group comprise the polymeric ingredients resulting from the hydrolysis and condensation of alkylalkoxysilanes. These siloxy polymers typically comprise three-dimensional frameworks.

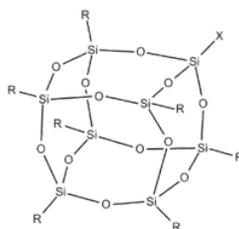


Figure 1. Example of a polysilsesquioxane framework or cage. “R” represents an alkylalkoxy substituent and “X” represents either a continuation of the siloxy framework or a hydroxyl group (i.e. together with the silicon atom, “X” represents a silanol).

Many of the monomers used in the manufacture of these polymeric ingredients are multi-functional monomers, which result in extensive branching, crosslinking, and cage-like structures in the final ingredient product. The degree of polymerization of these ingredients can be controlled to obtain a product having a desired functionality, such as an emulsifying agent. Accordingly, the molecular weights and molecular volumes of these ingredients can vary widely, unless otherwise noted in use specifications. These polymers, by virtue of their monomers, contain both hydrophilic and hydrophobic groups. The ratio of hydrophilic and hydrophobic groups of the components of each ingredient within a single ingredient name may vary. In the absence of explicit ingredient specifications, estimating some of the chemical and physical properties of these ingredients is challenging. However, the cage-like structures of many of these ingredients encompass large molecular volumes, which likely decrease the potential for these ingredients to penetrate the skin significantly.

Physical and Chemical Properties

Physical and chemical properties are cited in [Table 3](#).

Polymethylsilsesquioxane is reported to have a bulk density of 0.35 and is stable for 24 months when stored at 60°C.² A supplier reported that Polymethylsilsesquioxane is available as a powder of spherical-shaped particles, with particle sizes of 2 or 5 μm .³

C30-45 Alkyldimethylsilyl Polypropylsilsesquioxane is stable for 24 months when stored $\leq 32^{\circ}\text{C}$.⁴

Method of Manufacture

While these types of polymers typically result from the hydrolysis and condensation of alkylalkoxysilanes, and the definitions of several of the polysilsesquioxanes polymers in this safety assessment give insight into possible methods of manufacture (Table 1), data on the actual methods of manufacture of these ingredients were not found in the published literature and no unpublished data were submitted.

Impurities/Constituents

Polymethylsilsesquioxane is reported to be 100% pure.²

USE

Cosmetic

The safety of the cosmetic ingredients included in this assessment is evaluated based on data received from the U.S. Food and Drug Administration (FDA) and the cosmetic industry on the expected use of these ingredients in cosmetics. Use frequencies of individual ingredients in cosmetics are collected from manufacturers and reported by cosmetic product category in FDA's Voluntary Cosmetic Registration Program (VCRP) database. Use concentration data are submitted by the cosmetic industry in response to surveys, conducted by the Personal Care Products Council (Council), of maximum reported use concentration by product category.

According to VCRP survey data received in 2017, Polymethylsilsesquioxane was reported to be used in 397 formulations, i.e., 374 in leave-on formulations, 22 in rinse-off formulations, and 1 diluted for the bath (Table 4).⁵ All other in-use ingredients were reported to be used in 14 formulations or fewer.

The results of the concentration of use survey conducted by the Council in 2016 indicate Polymethylsilsesquioxane has the highest reported maximum concentration of use; it is used at up to 55.2% (highest in the category of other makeup preparations).⁶ The rest of the in-use ingredients are reported to be used at 4.9% (C30-45 Alkyldimethylsilyl Polypropylsilsesquioxane in foundations) or less.

In some cases, reports of uses were received in the VCRP, but concentration of use data were not provided. For example, Dimethicone/Silsesquioxane Copolymer was reported to be used in 7 cosmetic formulations, but no use concentration data were reported. In other cases, no uses were reported in the VCRP, but concentration of use data were received from Industry; Polydimethylsiloxy PEG/PPG-24/19 Butyl Ether Silsesquioxane had no reported uses in the VCRP, but a use concentration in the category of hair spray was provided in the industry survey. Therefore, it should be presumed there is at least one use in every category for which a concentration is reported.

The ingredients not in use according to the VCRP and industry survey are listed in Table 5.

These ingredients are used in products that are used near the eye (e.g., Polymethylsilsesquioxane in the category of other eye makeup preparations at up to 55.2%), products that could possibly be ingested and products that come in contact with mucus membranes (e.g., Polymethylsilsesquioxane in lipstick at up to 20.7%).

Additionally, some of the polysilsesquioxanes are used in cosmetic sprays and could possibly be inhaled; for example, Polymethylsilsesquioxane was reported to be used at 52% in perfumes. In practice, 95% to 99% of the droplets/particles released from cosmetic sprays have aerodynamic equivalent diameters >10 µm, with propellant sprays yielding a greater fraction of droplets/particles <10 µm compared with pump sprays.^{7,8} Therefore, most droplets/particles incidentally inhaled from cosmetic sprays would be deposited in the nasopharyngeal and thoracic regions of the respiratory tract and would not be respirable (i.e., they would not enter the lungs) to any appreciable amount.^{9,10} There is some evidence indicating that deodorant spray products can release substantially larger fractions of particulates having aerodynamic equivalent diameters in the range considered to be respirable.⁹ However, the information is not sufficient to determine whether significantly greater lung exposures result from the use of deodorant sprays, compared to other cosmetic sprays.

None of the polysilsesquioxanes named in the report are restricted from use in any way under the rules governing cosmetic products in the European Union.¹¹

Non-Cosmetic

Polymethylsilsesquioxane may be used as a surface lubricant or anti-blocking agent in films as basic components of single and repeated use food contact surfaces. [21CFR177.1520]

TOXICOKINETIC STUDIES

Dermal Penetration

Data on dermal penetration of polysilsesquioxanes ingredients were not found in the published literature and no unpublished data were submitted.

Absorption, Distribution, Metabolism, and Excretion (ADME)

Data on the ADME of polysilsesquioxanes ingredients were not found in the published literature and no unpublished data were submitted.

TOXICOLOGICAL STUDIES

Data on acute toxicity studies of polysilsesquioxanes ingredients were not found in the published literature and no unpublished data were submitted.

Short-Term Toxicity Studies

Dermal

A Polymethylsilsesquioxane emulsion (0 or 200 mg/kg/day; concentration of solids not specified; not known if cosmetic grade) was dermally administered to rabbits (n=10) for 28 days.¹² The rabbits were weighed prior to study initiation and on days 7, 14, 21, and 28. The rabbits were observed for mortality, behavioral changes, and adverse skin reactions throughout the study period and were killed on day 28 days for gross necropsy and histopathologically. The testes were weighed at necropsy and testes to body weight ratios were calculated. There were no significant treatment related changes in mortality, body weight, behavior, or gross pathology. In addition, there were no changes in mean testes weight or testes to body weight ratio. No abnormal histopathological findings were reported.

DEVELOPMENTAL AND REPRODUCTIVE TOXICITY (DART) STUDIES

Data on the DART of polysilsesquioxanes ingredients were not found in the published literature and no unpublished data were submitted.

GENOTOXICITY STUDIES

Data on the genotoxicity of polysilsesquioxanes ingredients were not found in the published literature and no unpublished data were submitted.

CARCINOGENICITY STUDIES

Data on the carcinogenicity of polysilsesquioxanes ingredients were not found in the published literature and no unpublished data were submitted.

DERMAL IRRITATION AND SENSITIZATION STUDIES

Irritation

A Polymethylsilsesquioxane emulsion (0 or 200 mg/kg/day; concentration of solids not specified; not known if cosmetic grade) was dermally administered to rabbits (n=10) for 28 days.¹² The only adverse effect reported was slight local erythema and dryness following 7 to 14 dermal applications of the Polymethylsilsesquioxane emulsion.

Sensitization

Data on the sensitization potential of polysilsesquioxanes ingredients were not found in the published literature and no unpublished data were submitted.

OCULAR IRRITATION STUDIES

Data on the ocular irritation potential of polysilsesquioxanes ingredients were not found in the published literature and no unpublished data were submitted.

CLINICAL STUDIES

Data on the clinical studies of polysilsesquioxanes ingredients were not found in the published literature and no unpublished data were submitted.

SUMMARY

This is a safety assessment of 18 polysilsesquioxanes as used in cosmetics. The ingredients in this group comprise the polymeric ingredients resulting from the hydrolysis and condensation of alkylalkoxysilanes. These siloxy polymers typically comprise three-dimensional frameworks. These polysilsesquioxanes mostly function as film formers and nail conditioning agents.

Polymethylsilsesquioxane was reported to be used in 397 formulations, i.e., 374 in leave-on formulations, 22 in rinse-off formulations, and 1 diluted for the bath. All other in-use ingredients were reported to be used in 14 formulations or fewer. Polymethylsilsesquioxane has the highest reported maximum concentration of use; it is used at up to 55.2% in the category of other makeup preparations. The rest of the in-use ingredients are reported to be used at 4.9% (C30-45 Alkyldimethylsilyl Polypropylsilsesquioxane in foundations) or less.

In a 28-day dermal toxicity study of a Polymethylsilsesquioxane emulsion at 200 mg/kg/day using rabbits, there were no remarkable toxicological findings. There were slight local erythema and dryness following 7 to 14 dermal applications.

DATA NEEDS

CIR welcomes the submission of all toxicological data that pertains to these ingredients, especially from dermal exposure. Chemical and physical properties data are also desirable. The data requested include, but are not limited to:

- Chemical and physical properties, including mean molecular weight and molecular weight distribution
- Method of manufacture
- Impurity data, including residual monomer content
- Dermal penetration
- Chronic dermal toxicity
- Inhalation toxicity
- Carcinogenicity
- Dermal irritation and sensitization

TABLES

Table 1. Definitions, idealized structures, and functions of the ingredients in this safety assessment. (1; CIR Staff)

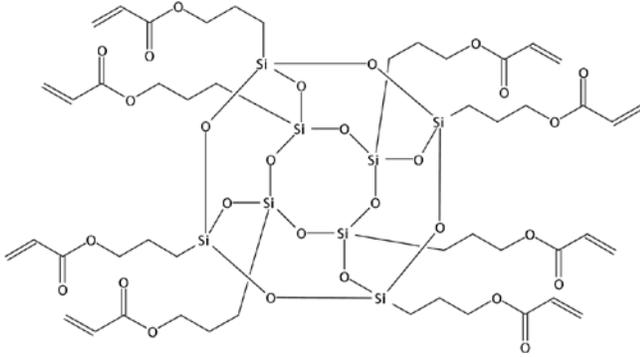
Ingredient CAS No.	Definition & Monomer Structures	Function(s)
Acryloyloxypropyl Polysilsesquioxane 1204591-17-2	<p>Acryloyloxypropyl Polysilsesquioxane is a resinous material composed of a mixture of three-dimensional siloxane polymers and oligomers with cage structures. For the oligomers, each silicon atom in the polysilsesquioxane is connected via oxygen atoms to three other silicon atoms and can be represented by the empirical formulation $RSiO_{3/2}$ where R represents the acryloyloxypropyl group. For the larger polymeric polysilsesquioxanes, some of the silicon atoms [siloxyl groups (SiO)] are not connected [through the oxygen atom] to other silicon atoms and instead [terminate as] have a silanol (SiOH) groups. Acryloyloxypropyl Polysilsesquioxane is prepared by the hydrolysis and condensation of acryloyloxy propyltrimethoxysilane.*</p> <div style="text-align: center;">  </div> <p>(for 1204591-17-2)¹³</p>	Nail conditioning agent
C26-28 Alkyldimethylsilyl Polypropylsilsesquioxane	<p>C26-28 Alkyldimethylsilyl Polypropylsilsesquioxane is the silicone compound that conforms generally to the formula:</p> $[CH_3CH_2CH_2SiO_{3/2}]_x [R(CH_3)_2SiO_{1/2}]_y$ <p style="text-align: center;">where R is $-(CH_2)_nCH_3$</p> <p style="text-align: center;">where n has a value between 25 and 27.</p>	Film former; viscosity increasing agent – nonaqueous
C30-45 Alkyldimethylsilyl Polypropylsilsesquioxane	<p>C30-45 Alkyldimethylsilyl Polypropylsilsesquioxane is the silicone compound that conforms generally to the formula:</p> $[CH_3CH_2CH_2SiO_{3/2}]_x [R(CH_3)_2SiO_{1/2}]_y$ <p style="text-align: center;">where R is $-(CH_2)_nCH_3$</p> <p style="text-align: center;">where n has a value between 29 and 44.</p>	Film former
Dimethicone/Silsesquioxane Copolymer 68440-84-6	<p>Dimethicone/Silsesquioxane Copolymer is a siloxane polymer consisting of methyl trimethoxysilane and dimethylsiloxane.</p>	Film former; hair conditioning agent; hair fixative
Dimethiconol/Caprylylsilsesquioxane/Silicate Crosspolymer 1802406-18-3	<p>Dimethiconol/Caprylylsilsesquioxane/Silicate Crosspolymer is a highly crosslinked silicone polymer that is made by the hydrolysis and condensation of tetraethyl orthosilicate and triethoxycaprylylsilane with dimethiconol.</p>	Opacifying agent
Ethyl Polysilsesquioxane	<p>Ethyl Polysilsesquioxane is a resinous material composed of a mixture of three-dimensional siloxane polymers and oligomers with cage structures. For the oligomers, each silicon atom in the polysilsesquioxane is connected via oxygen atoms to three other silicon atoms and can be represented by the empirical formulation $RSiO_{3/2}$, where R represents the ethyl group. For the larger polymeric polysilsesquioxanes, some of the silicon atoms [siloxyl groups (SiO)] are not connected [through the oxygen atom] to other silicon atoms and instead [terminate as] have a silanol (SiOH) group. Ethyl Polysilsesquioxane is prepared by the hydrolysis and condensation of ethyl trimethoxysilane.*</p>	Nail conditioning agent

Table 1. Definitions, idealized structures, and functions of the ingredients in this safety assessment. (1; CIR Staff)

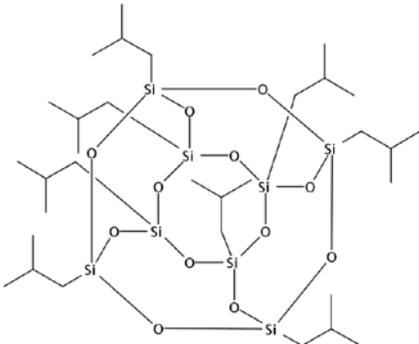
Ingredient CAS No.	Definition & Monomer Structures	Function(s)
Hydrogen Dimethicone/Octyl Silsesquioxane Copolymer 221326-46-1	Hydrogen Dimethicone/Octyl Silsesquioxane Copolymer is the silicone polymer that conforms generally to the formula:	Surface modifier
$\left[\begin{array}{c} \text{CH}_3 \\ \\ \text{CH}_3\text{SiO} \\ \\ \text{CH}_3 \end{array} \right]_w \left[\begin{array}{c} \text{CH}_3 \\ \\ \text{SiO} \\ \\ \text{CH}_3 \end{array} \right]_x \left[\begin{array}{c} \text{H} \\ \\ \text{SiO} \\ \\ \text{CH}_3 \end{array} \right]_y \left[\begin{array}{c} \text{C}_8\text{H}_{17} \\ \\ \text{SiO} \\ \\ \text{O} \end{array} \right]_z$		
Isobutyl Polysilsesquioxane 221326-46-1	Isobutyl Polysilsesquioxane is a resinous material composed of a mixture of three-dimensional siloxane polymers and oligomers with cage structures. For the oligomers, each silicon atom in the polysilsesquioxane is connected via oxygen atoms to three other silicon atoms and can be represented by the empirical formulation $\text{RSiO}_3/2$ where R represents the isobutyl group. For the larger polymeric polysilsesquioxanes, some of the silicon atoms [siloxo groups (SiO)] are not connected [through the oxygen atom] to other silicon atoms and instead [terminate as] have a silanol (SiOH) groups. Isobutyl Polysilsesquioxane is prepared by the hydrolysis and condensation of 2-methylpropyl trimethoxysilane.*	Nail conditioning agent
		
(for 221326-46-1) ¹⁴		
Methacryloyloxypropyl Polysilsesquioxane 160185-24-0	Methacryloyloxypropyl Polysilsesquioxane is a resinous material composed of a mixture of three-dimensional siloxane polymers and oligomers with cage structures. For the oligomers, each silicon atom in the polysilsesquioxane is connected via oxygen atoms to three other silicon atoms and can be represented by the empirical formulation $\text{RSiO}_3/2$ where R represents the methacryloyloxypropyl group. For the larger polymeric polysilsesquioxanes, some of the silicon atoms [siloxo groups (SiO)] are not connected [through the oxygen atom] to other silicon atoms and instead [terminate as] have a silanol (SiOH) groups. Methacryloyloxypropyl Polysilsesquioxane is prepared by the hydrolysis and condensation of methacryloyl propyltrimethoxysilane.*	Abrasive
Polycaprylylsilsesquioxane 1385031-14-0	Polycaprylylsilsesquioxane is a polymer formed by the hydrolysis and condensation of triethoxycaprylylsilane.	Anticaking agent; binder; opacifying agent; surface modifier
Polydimethylsiloxy PEG/ PPG-24/19 Butyl Ether Silsesquioxane 68554-65-4	Polydimethylsiloxy PEG/PPG-24/19 Butyl Ether Silsesquioxane is the silicone polymer that conforms generally to the formula:	Skin-conditioning agent – humectant; surfactant-cleansing agent; surfactant – dispersing agent; surfactant – emulsifying agent
$\left[\begin{array}{c} \text{CH}_3 \\ \\ \text{CH}_3\text{SiO} \\ \\ \text{SiO} \\ \\ \text{CH}_3 \end{array} \right]_x \left(\text{C}_2\text{H}_4\text{O} \right)_{24} \left(\text{C}_3\text{H}_6\text{O} \right)_{19} \left(\text{CH}_2 \right)_3 \text{CH}_3$		
Polydimethylsiloxy PPG-13 Butyl Ether Silsesquioxane	Polydimethylsiloxy PPG-13 Butyl Ether Silsesquioxane is the silicone polymer that conforms generally to the formula:	Hair conditioning agent; humectant; surfactant – cleansing agent; surfactant – dispersing agent; surfactant – emulsifying agent
$\left[\begin{array}{c} \text{CH}_3 \\ \\ \text{CH}_3\text{SiO} \\ \\ \text{SiO} \\ \\ \text{CH}_3 \end{array} \right]_x \left(\text{C}_3\text{H}_6\text{O} \right)_{13} \left(\text{CH}_2 \right)_3 \text{CH}_3$		
Polymethylsilsesquioxane 68554-70-1	Polymethylsilsesquioxane is a polymer formed by the hydrolysis and condensation of methyltrimethoxysilane.	Opacifying agent

Table 1. Definitions, idealized structures, and functions of the ingredients in this safety assessment. (1; CIR Staff)

Ingredient CAS No.	Definition & Monomer Structures	Function(s)
Polymethylsilsesquioxane/ Trimethylsiloxysilicate 1402155-47-8	Polymethylsilsesquioxane/Trimethylsiloxysilicate is the product of the hydrolysis and subsequent condensation polymerization of trialkoxymethylsilane, alkylorthosilicate and trimethylchlorosilane.	Film former
Polypropylsilsesquioxane 36088-62-7	Polypropylsilsesquioxane is a polymer formed by the hydrolysis and condensation of propyltrichlorosilane.	Binder; film former
Trimethylpentyl Polysilsesquioxane 190732-67-3 444619-08-3	Trimethylpentyl Polysilsesquioxane is a resinous material composed of a mixture of three-dimensional siloxane polymers and oligomers with cage structures. For the oligomers, each silicon atom in the polysilsesquioxane is connected via oxygen atoms to three other silicon atoms and can be represented by the empirical formulation $RSiO_{3/2}$ where R represents the trimethylpentyl group. For the larger polymeric polysilsesquioxanes, some of the silicon atoms [siloxyl groups (SiO)] are not connected [through the oxygen atom] to other silicon atoms and instead [terminate as] have a silanol (SiOH) groups. Trimethylpentyl Polysilsesquioxane is prepared by the hydrolysis and condensation of 2,4,4-trimethylpentyl trimethoxysilane.*	Nail conditioning agent
<p>(for 444619-08-3)¹⁵</p>		
<p>(for 190732-67-3)¹⁶</p>		
Isobutyl/Methoxy PEG-10 Polysilsesquioxane	Isobutyl/Methoxy PEG-10 Polysilsesquioxane is the Methoxy PEG-10 derivative of Isobutyl Polysilsesquioxane.	Viscosity decreasing agent
Methoxy PEG-10 Polysilsesquioxane 1838163-04-4	Methoxy PEG-10 Polysilsesquioxane is a resinous material composed of a mixture of three-dimensional siloxane polymers and oligomers with cage structures. For the oligomers, each silicon atom in the polysilsesquioxane is connected via oxygen atoms to three other silicon atoms and can be represented by the empirical formulation $RSiO_{3/2}$ where R represents the methoxy PEG-10 propyl moiety. For the larger polymeric polysilsesquioxanes, some of the silicon atoms [siloxyl groups (SiO)] are not connected [through the oxygen atom] to other silicon atoms and instead [terminate as] have a silanol (SiOH) groups. Methoxy PEG-10 Polysilsesquioxane is prepared by the hydrolysis and condensation of methoxy PEG-10 propyltrimethoxysilane.*	Skin-conditioning agent – humectant; surfactant – cleansing agent; surfactant – solubilizing agent

* Some of the definitions were edited by CIR staff for clarity. Words that are to be removed have a ~~strike through~~ and added language is in [brackets].

Table 2. Related cosmetic ingredients and precursors that have been reviewed by CIR.

Ingredient	Conclusion	Reference
Related Ingredients		
Dimethicone/Divinyldimethicone/Silsesquioxane Crosspolymer	Safe in the practices of use and concentration as given in this safety assessment.	17
Dimethicone/Bis-Vinyldimethicone/Silsesquioxane Crosspolymer	Safe in the practices of use and concentration as given in this safety assessment.	17
Dimethiconol/Silsesquioxane Copolymer	Safe as cosmetic ingredients in the present practices of use and concentration described in this safety assessment.	18
Methoxy PEG-13 Ethyl Polysilsesquioxane	Safe in cosmetics in the practices of use and concentration of this safety assessment.	19
Vinyl Dimethicone/Methicone Silsesquioxane Crosspolymer	Safe in the practices of use and concentration as given in this safety assessment.	17
Monomers/Precursors		
Dimethiconol	Safe as cosmetic ingredients in the present practices of use and concentration described in this safety assessment.	18
Methoxy PEG-10	Safe as used when formulated to be nonirritating.	20
Triethoxycaprylylsilane	Safe as cosmetic ingredients in the practices of use and concentration described in this safety assessment.	21

Table 3. Chemical and physical properties of polysilsesquioxanes.

Property	Value	Reference
Polymethylsilsesquioxane		
Physical Form	Solid; powder	2,3,22
Color	White	2,3,22
Odor	Characteristic	22
Specific Gravity @ 25°C	1.3	22
	1.32	2,3
Water Solubility	Insoluble	22
C30-45 Alkyldimethylsilyl Polypropylsilsesquioxane		
Physical Form	Solid, flakes	4
	Wax	23
Color	White to off-white	4,23
Odor	Characteristic	4
Specific Gravity	0.8	4
Melting Point °C	66	4
	63-71	23
Trimethylpentyl Polysilsesquioxane		
Physical Form	Liquid	24
Color	Colorless to pale yellow	24
Molecular Weight g/mol	1322.46	24

Table 3. Frequency of use according to duration and exposure of polysilsequioxanes.^{5,6}

Use type	Maximum Concentration (%)		Maximum Concentration (%)		Maximum Concentration (%)		Maximum Concentration (%)	
	Uses		Uses		Uses		Uses	
	Polymethylsilsequioxane		C30-45 Alkyldimethylsilyl Polypropylsilsequioxane		Dimethicone/Silsequioxane Copolymer		Hydrogen Dimethicone/Octyl Silsequioxane Copolymer	
Total/range	397	0.00001-55.2	12	0.2-4.9	7	NR	3	NR
<i>Duration of use^a</i>								
Leave-on	374	0.00001-55.2	12	0.2-4.9	7	NR	3	NR
Rinse-off	22	0.01-7.5	NR	NR	NR	NR	NR	NR
Diluted for (bath) use	1	NR	NR	NR	NR	NR	NR	NR
<i>Exposure type</i>								
Eye area	87	0.02-55.2	8	0.2-3.9	1	NR	NR	NR
Incidental ingestion	17	0.03-20.7	3	1	NR	NR	NR	NR
Incidental Inhalation-sprays	4; 60 ^b ; 65 ^c	0.08-52; 1.3-5.5 ^b	NR	NR	NR	NR	3 ^b	NR
Incidental inhalation-powders	38; 65 ^c	0.1-55.2; 0.01-28 ^d	NR	4.6	1	NR	NR	NR
Dermal contact	342	0.001-55.2	9	0.2-4.9	7	NR	3	NR
Deodorant (underarm)	NR	4 ^e	NR	NR	NR	NR	NR	NR
Hair-noncoloring	27	0.11-7	NR	NR	NR	NR	NR	NR
Hair-coloring	NR	NR	NR	NR	NR	NR	NR	NR
Nail	NR	0.00001-0.77	NR	NR	NR	NR	NR	NR
Mucous Membrane	20	0.03-20.7	3	1	NR	NR	NR	NR
Baby	NR	NR	NR	NR	NR	NR	NR	NR
	Polycaprylsilsequioxane		Polydimethylsiloxy PEG/PPG-24/19 Butyl Ether Silsequioxane		Polypropylsilsequioxane			
Total/range	3	0.0025-0.005	NR	0.023	14	0.8-2.4		
<i>Duration of use</i>								
Leave-on	3	0.0025-0.005	NR	0.023	14	0.8-2.4		
Rinse-off	NR	0.0025	NR	NR	NR	NR		
Diluted for (bath) use	NR	NR	NR	NR	NR	NR		
<i>Exposure type</i>								
Eye area	3	0.005	NR	NR	8	2		
Incidental ingestion	NR	NR	NR	NR	4	NR		
Incidental Inhalation-sprays	NR	NR	NR	0.023	NR	NR		
Incidental inhalation-powders	NR	NR	NR	NR	NR	NR		
Dermal contact	NR	NR	NR	NR	9	0.8-2.4		
Deodorant (underarm)	NR	NR	NR	NR	NR	NR		
Hair-noncoloring	NR	0.0025	NR	0.023	NR	NR		
Hair-coloring	NR	NR	NR	NR	NR	NR		
Nail	NR	NR	NR	NR	NR	NR		
Mucous Membrane	NR	NR	NR	NR	4	NR		
Baby	NR	NR	NR	NR	NR	NR		

NR = Not Reported; Totals = Rinse-off + Leave-on + Diluted for Bath Product Uses.

^a Because each ingredient may be used in cosmetics with multiple exposure types, the sum of all exposure types may not equal the sum of total uses.

^b It is possible these products may be sprays, but it is not specified whether the reported uses are sprays.

^c Not specified whether a powder or a spray, so this information is captured for both categories of incidental inhalation.

^d It is possible these products may be powders, but it is not specified whether the reported uses are powders.

^e Spray products.

Table 4. Polysilsesquioxane ingredients that have no reported uses in the VCRP or the Council survey.^{5,6}

Acryloyloxypropyl Polysilsesquioxane	C26-28 Alkyldimethylsilyl Polypropylsilsesquioxane
Dimethiconol/Caprylyl-silsesquioxane/Silicate Crosspolymer	Ethyl Polysilsesquioxane
Isobutyl/Methoxy PEG-10 Polysilsesquioxane*	Isobutyl Polysilsesquioxane
Methacryloyloxypropyl Polysilsesquioxane	Methoxy PEG-10 Polysilsesquioxane*
Polydimethylsiloxy PPG-13 Butyl Ether Silsesquioxane	Polymethylsilsesquioxane/Trimethylsiloxy silicate
Trimethylpentyl Polysilsesquioxane*	

* To be surveyed by the Council for concentration of use.

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