Scientific Literature Review

Dimethicone Crosspolymers
Ingredients as Used in Cosmetics

February 16, 2012

All interested persons are provided 60 days from the above date to comment on this Scientific Literature Review and to identify additional published data that should be included or provide unpublished data which can be made public and included.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 All unpublished data submitted to CIR will be discussed in open meetings, will be available at the CIR office for review by any interested party and may be cited in a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. F. Alan Andersen.

The 2012 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 F. Alan Andersen, Ph.D. This report was prepared by Lillian C. Becker, Scientific Analyst/Writer.

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INTRODUCTION

This is a review of the available published and unpublished relevant to assessing the safety of 62 dimethicone crosspolymers as used in cosmetics. As given in the *International Cosmetic Ingredient Dictionary and Handbook*,[1] t hese ingredients mostly function as absorbents, bulking agents, film formers, hair-conditioning agents, emollient skin-conditioning agents, slip modifiers, surface modifiers, and nonaqueous viscosity increasing agents. The ingredients included in this report are:

- acrylates/bis-hydroxypropyl dimethicone crosspolymer
- behenyl dimethicone/bis-vinyldimethicone crosspolymer
- bis-phenylisopropyl phenylisopropyl dimethicone/vinyl dimethicone crosspolymer
- bis-vinyldimethicone/bis-isobutyl PPG-20 crosspolymer
- bis-vinyldimethicone crosspolymer
- bis-vinyldimethicone/ PEG-10 dimethicone crosspolymer
- bis-vinyldimethicone/PPG-20 crosspolymer
- butyldimethicone methacrylate/methyl methacrylate crosspolymer
- C30-45 alkyl cetearyl dimethicone crosspolymer
- C4-24 alkyl dimethicone/divinyldimethicone crosspolymer
- C30-45 alkyl dimethicone/polycyclohexene oxide crosspolymer
- cetearyl dimethicone crosspolymer
- cetearyl dimethicone/vinyl dimethicone crosspolymer
- cetyl dimethicone/bis-vinyldimethicone crosspolymer
- cetyl hexacosyl dimethicone/bis-vinyldimethicone crosspolymer
- crotonic acid/vinyl C8-12 isoalkyl esters/VA/bis-vinyldimethicone crosspolymer
- dimethicone/bis-isobutyl PPG-20 crosspolymer
- dimethicone/bis-vinyldimethicone/ silsesquioxane crosspolymer
- dimethicone crosspolymer
- dimethicone crosspolymer-3
- dimethicone/divinyldimethicone/silsesquioxane crosspolymer
- dimethicone/lauryl dimethicone/bis-vinyldimethicone crosspolymer
- dimethicone/PEG-10 crosspolymer
- dimethicone/PEG-10/15 crosspolymer
- dimethicone/PEG-15 crosspolymer
- dimethicone/phenyl vinyl dimethicone crosspolymer
- dimethicone/polyglycerin-3 crosspolymer
- dimethicone/PPG-20 crosspolymer
- dimethicone/titanate crosspolymer
- dimethicone/vinyl dimethicone crosspolymer
- dimethicone/vinyltrimethylsiloxysilicate crosspolymer
- diphenyl dimethicone crosspolymer
- diphenyl dimethicone/vinyl diphenyl dimethicone/silsesquioxane crosspolymer
- divinyldimethicone/dimethicone crosspolymer
- hydroxypropyl dimethicone/polysorbate 20 crosspolymer
- isopropyl titanium triisostearate/ triethoxysilylethyl polydimethylsiloxyethyl dimethicone crosspolymer
- lauryl dimethicone PEG-15 crosspolymer
- lauryl dimethicone/polyglycerin-3 crosspolymer
- lauryl polydimethylsiloxyethyl dimethicone/bis-vinyldimethicone crosspolymer
- PEG-10 dimethicone crosspolymer
- PEG-12 dimethicone crosspolymer
- PEG-8 dimethicone/polysorbate 20 crosspolymer
- PEG-12 dimethicone/bis-isobutyl PPG-20 crosspolymer
- PEG-12 dimethicone/PPGS-20 crosspolymer
- PEG-10 dimethicone/vinyl dimethicone crosspolymer
- PEG-10/lauryl dimethicone crosspolymer
- PEG-15/lauryl dimethicone crosspolymer
- PEG-15/lauryl polydimethylsiloxyethyl dimethicone crosspolymer
- perfluorononyl dimethicone/methicone/ amodimethicone crosspolymer
- polydimethylsiloxyethyl dimethicone/bis-vinyldimethicone crosspolymer
- polyglyceryl-3/lauryl polydimethylsiloxyethyl dimethicone crosspolymer
- silicone quaternium-16/glycidoxy dimethicone crosspolymer
- styrene/acrylates/dimethicone acrylate crosspolymer
- trifluoropropyl dimethicone/PEG-10 crosspolymer
- trifluoropropyl dimethicone/trifluoropropyl divinyldimethicone crosspolymer
- trifluoropropyl dimethicone/vinyl trifluoropropyl dimethicone/silsesquioxane crosspolymer
- trimethylsiloxysilicate/dimethicone crosspolymer
- vinyl dimethicone/lauryl/behenyl dimethicone crosspolymer
- vinyl dimethicone/lauryl dimethicone crosspolymer
- vinyl dimethicone/methicone silsesquioxane crosspolymer
- vinyldimethyl/trimethylsiloxysilicate/ dimethicone crosspolymer
- vinyldimethyl/trimethylsiloxysilicate stearyl dimethicone crosspolymer

CHEMISTRY

Overview

Definitions, functions and CAS nos. are provided in Table 1. Idealized structures are shown in Figure 1.

These cosmetic ingredients are silicone elastomers comprised of dimethicone copolymers crosslinked with a bi-functional agent. For use in cosmetics, these crosspolymers are typically supplied to finishing houses as swollen gels (i.e., tradename mixtures) that contain various oils (e.g., silicone oils such as dimethicone).[2] The addition of hydrophilic components (e.g., addition of polyethylene glycol [PEG] chains to produce dimethicone/PEG-10 crosspolymer) or hydrophobic components (e.g., addition of long alkyl chains to produce behenyl dimethicone/bis-vinyldimethicone crosspolymer) affects both the chemical and rheological properties of the resultant ingredient. Accordingly, dimethicone crosspolymers represent a wide variety of materials ranging from liquids to elastomeric solids.

The majority of the ingredients in this review are produced by crosslinking dimethicone polymeric chains via a hydrosilation reaction.[2] This reaction consists of the addition of silicon hydride bonds (SiH) within the dimethicone polymer backbones across vinyl bonds within the selected crosslinking agents (Figure 2). These reactions usually require a catalyst, such as platinum. The reactions are rapid and produce chemically stable products. Since these reactions are net additions across a double bond, the only expected by-products are the starting materials, particularly the catalysts.

In some silicone polymers such as dimethicone, that has no silicone-hydrogen bonds, some amount of silicon hydride may exist. However, a silicone precursor polymer is made in order to add the silicon hydride groups, utilized for the crosslinking process.[2] For example, a dimethicone precursor polymer is made by the copolymerization of dimethyl siloxane units with methylhydrogen siloxane units. Accordingly, even though we define dimethicone crosspolymer as "a polymer of dimethicone crosslinked with a C3 to C20 alkyl group," it is more likely that dimethicone crosspolymer is a methicone/dimethicone copolymer (methicone has one methyl and one hydrogen on each silicone in the polymer backbone, whereas dimethicone has two methyl groups on each silicone in the polymer backbone) that is crosslinked with an α,ω-diene (i.e., the double bonds are at the ends of the chain), that is three to twenty carbons long.

Physical and Chemical Properties

Available information on the physical and chemical properties is provided in Table 2. Other data are provided below.

CROTONIC ACID/VINYL C8-12 ISOALKYL ESTERS/VA/BIS-VINYLDIMETHICONE CROSSPOLYMER

Crotonic acid/vinyl C8-12 isoalkyl esters/VA/bis-vinyldimethicone crosspolymer is stable at < 20°C in a sealed container protected from light for at least 12 months.[3]

DIMETHICONE/DIVINYLDIMETHICONE/SILSESQUIOXANE CROSSPOLYMER

Dimethicone/divinyldimethicone/silsesquioxane crosspolymer is stable at room temperature for 36 months.[4]

PEG-12 DIMETHICONE CROSSPOLYMER

PEG-12 Dimethicone is an amphiphilic molecule.[5] The PEG-12 moiety is hydrophilic and the dimethicone moiety is lipophilic.

VINYLDIMETHYL/TRIMETHYLSILOXYSILICATE STEARYL DIMETHICONE CROSSPOLYMER

Vinyldimethyl/trimethylsiloxysilicate stearyl dimethicone crosspolymer (20% in isododecane) is stable for at least 1 year with no special storage requirements.[6]

Particle Size

Dimethicone/divinyldimethicone/silsesquioxane crosspolymer was reported in a patent to have a spherical shape with particle diameters ranging from 2 – 10 μm.[7] However, the significance of this observation is questionable, because it is not likely that this range represents aerodynamic equivalent diameters of particulates that wouldbe realeased in substantial quantities from aerosolized products containing this ingredient.

Impurities

CROTONIC ACID/VINYL C8-12 ISOALKYL ESTERS/VA/BIS-VINYLDIMETHICONE CROSSPOLYMER

Crotonic acid/vinyl C8-12 isoalkyl esters/VA/bis-vinyldimethicone crosspolymer is reported to not contain any heavy metals, polycyclic aromatic hydrocarbons organohalogens, or nitrosamines.[3] Residuals from manufacturing include tert-butanol (<100 ppm), iso-dodecane (< 1000 ppm), vinyl acetate (≤ 100 ppm), vinyl-tert, decanoate (≤ 2000 ppm), crotonic acid (≤ 200 ppm), and trace amounts of isopropanol and ethyl acetate.

DIMETHICONE/DIVINYLDIMETHICONE/SILSESQUIOXANE CROSSPOLYMER

Dimethicone/divinyldimethicone/silsesquioxane crosspolymer was reported to be 100% pure by a manufacturer.[4] The same manufacture reported the content of heavy metals to be <20 ppm, arsenic < 2 ppm.[8]

DIMETHICONE/VINYLTRIMETHYLSILOXYSILICATE CROSSPOLYMER

Dimethicone/vinyltrimethylsiloxysilicate dimethicone crosspolymer (20% in cyclopentasiloxane) is reported to not contain any heavy metals, polycyclic aromatic hydrocarbons, organohalogen compounds, or nitrosamines.[9] Residuals from manufacturing include platinum (catalyst, < 25 ppm) and cyclotetrasiloxane (maximum 0.1%).

VINYLDIMETHYL/TRIMETHYLSILOXYSILICATE STEARYL DIMETHICONE CROSSPOLYMER

Vinyldimethyl/trimethylsiloxysilicate stearyl dimethicone crosspolymer (20% in isododecane) is reported to not contain any heavy metals, polycyclic aromatic hydrocarbons, organohalogen compounds, or nitrosamines.[6] Residuals from manufacturing include Pt (catalyst, < 25 ppm) and cyclotetrasiloxane (maximum < 1%).

USE

Cosmetic

Data on ingredients usage are provided by manufacturers to the Food and Drug Administration's (FDA) Voluntary Cosmetic Registration Program (VCRP).[10] The VCRP reports that behenyl dimethicone/bis-vinyldimethicone crosspolymer was used in 3 eyeliners (Table 3). C30-45 alkyl cetearyl dimethicone crosspolymer was reported to be used in 23 leave-on and 2 rinse-off products (including 5 eye products). C4-24 alkyl dimethicone/ divinyldimethicone crosspolymer was reported to be used in 1 leave-on product. Cetearyl dimethicone crosspolymer was reported to be used in 7 leave-on products. Dimethicone crosspolymer was reported to be used in 376 leave-on products (including 32 eye products, 9 lipsticks and 11 deodorants). Dimethicone crosspolymer-3 was reported to be used in 41 leave-on products (including 13 eye products). Dimethicone/phenyl vinyl dimethicone crosspolymer was reported to be used in 9 leave-on products. Dimethicone/vinyl dimethicone crosspolymer was reported to be used in 413 leave-on products (including 1 baby product, 65 eye products, 9 lipsticks, and 55 products that could be inhaled) and 12 rinse-off products. Divinyldimethicone/dimethicone crosspolymer was reported to be used in 4 leave-on products. Isopropyl titanium triisostearate/ triethoxysilylethyl polydimethylsiloxyethyl dimethicone crosspolymer was reported to be used in 5 leave-on products. PEG-12 dimethicone crosspolymer was reported to be used in 22 leave-on products (including 17 deodorants) and 3 rinse-off products. PEG-10 dimethicone/vinyl dimethicone crosspolymer was reported to be used in 7 leave-on products. PEG-15/lauryl dimethicone crosspolymer was reported to be used in 3 leave-on and 3 rinse-off products. Silicone quaternium-16/glycidoxy dimethicone crosspolymer was reported to be used in 2 leave-on and 4 rinse-off products. Vinyl dimethicone/lauryl dimethicone crosspolymer was reported to be used in 1 makeup base.

Dimethicone crosspolymer, dimethicone/vinyl dimethicone crosspolymer, and PEG-12 dimethicone crosspolymer are used in cosmetic sprays, including hair and deodorant products, and could possibly be inhaled. In practice, 95% - 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 below 10 μm compared with pump sprays.[11,12] Therefore, most droplets/particles incidentally inhaled from cosmetic sprays would be deposited in the nasopharyngeal region and would not be respirable (i.e., they would not enter the lungs) to any appreciable amount.[13,14] However, the potential for inhalation toxicity is not limited to respirable droplets/ particles deposited in the lungs. Inhaled droplets/particles deposited in the nasopharyngeal and thoracic regions of the respiratory tract may cause toxic effects depending on their chemical and other properties. There is some evidence indicating that deodorant spray products can release substantially larger fractions of particlates having aerodynamic equivalent diameters in the range considered to be respirable.[15] 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.

There were no reported uses for:

- acrylates/bis-hydroxypropyl dimethicone crosspolymer
- bis-phenylisopropyl phenylisopropyl dimethicone/vinyl dimethicone crosspolymer
- bis-vinyldimethicone/bis-isobutyl PPG-20 crosspolymer
- bis-vinyldimethicone crosspolymer
- bis-vinyldimethicone/ PEG-10 dimethicone crosspolymer
- bis-vinyldimethicone/PPG-20 crosspolymer
- butyldimethicone methacrylate/methyl methacrylate crosspolymer
- C30-45 alkyl dimethicone/polycyclohexene oxide crosspolymer
- cetearyl dimethicone/vinyl dimethicone crosspolymer
- cetyl dimethicone/bis-vinyldimethicone crosspolymer
- cetyl hexacosyl dimethicone/bis-vinyldimethicone crosspolymer
- crotonic acid/vinyl C8-12 isoalkyl esters/VA/bis-vinyldimethicone crosspolymer
- dimethicone/bis-isobutyl PPG-20 crosspolymer
- dimethicone/bis-vinyldimethicone/ silsesquioxane crosspolymer
- dimethicone/divinyldimethicone/silsesquioxane crosspolymer
- dimethicone/lauryl dimethicone/bis-vinyldimethicone crosspolymer
- dimethicone/PEG-10 crosspolymer
- dimethicone/PEG-10/15 crosspolymer
- dimethicone/PEG-15 crosspolymer
- dimethicone/polyglycerin-3 crosspolymer
- dimethicone/PPG-20 crosspolymer
- dimethicone/titanate crosspolymer
- dimethicone/vinyltrimethylsiloxysilicate crosspolymer
- diphenyl dimethicone crosspolymer
- diphenyl dimethicone/vinyl diphenyl

dimethicone/silsesquioxane crosspolymer
- hydroxypropyl dimethicone/polysorbate 20 crosspolymer
- lauryl dimethicone PEG-15 crosspolymer
- lauryl dimethicone/polyglycerin-3 crosspolymer
- lauryl polydimethylsiloxyethyl dimethicone/bis-vinyldimethicone crosspolymer
- PEG-10 dimethicone crosspolymer
- PEG-8 dimethicone/polysorbate 20 crosspolymer
- PEG-12 dimethicone/bis-isobutyl PPG-20 crosspolymer
- PEG-12 dimethicone/PPGS-20 crosspolymer
- PEG-10/lauryl dimethicone crosspolymer
- PEG-15/lauryl polydimethylsiloxyethyl dimethicone crosspolymer
- perfluorononyl dimethicone/methicone/ amodimethicone crosspolymer
- polydimethylsiloxyethyl dimethicone/bis-vinyldimethicone crosspolymer
- polyglyceryl-3/lauryl polydimethylsiloxyethyl dimethicone crosspolymer
- styrene/acrylates/dimethicone acrylate crosspolymer
- trifluoropropyl dimethicone/PEG-10 crosspolymer
- trifluoropropyl dimethicone/trifluoropropyl divinyldimethicone crosspolymer
- trifluoropropyl dimethicone/vinyl trifluoropropyl dimethicone/silsesquioxane crosspolymer
- trimethylsiloxysilicate/dimethicone crosspolymer
- vinyl dimethicone/lauryl/behenyl dimethicone crosspolymer
- vinyl dimethicone/methicone silsesquioxane crosspolymer
- vinyldimethyl/trimethylsiloxysilicate/ dimethicone crosspolymer
- vinyldimethyl/trimethylsiloxysilicate stearyl dimethicone crosspolymer

TOXICOKINETICS

Absorption, Distribution, Metabolism, and Excretion

Dermal/Percutaneous

CROTONIC ACID/VINYL C8-12 ISOALKYL ESTERS/VA/BIS-VINYLDIMETHICONE CROSSPOLYMER

According to a supplier of a trade name mixture, based on physico-chemical characteristics and data on similar polymers, crotonic acid/vinyl C8-12 isoalkyl esters/VA/bis-vinyldimethicone crosspolymer is unlikely to have any skin absorption due to the polymeric nature of the chemical.[16] No further data on the "similar polymers" were provided.

DIMETHICONE/VINYLTRIMETHYLSILOXYSILICATE CROSSPOLYMER

According to a supplier of a trade name mixture, based on physico-chemical characteristics and data on similar polymers, dimethicone/vinyltrimethylsiloxysilicate crosspolymer is unlikely to penetrate the skin.[9] No further data on the "similar polymers" were provided.

VINYLDIMETHYL/TRIMETHYLSILOXYSILICATE STEARYL DIMETHICONE CROSSPOLYMER

According to a supplier of a trade name mixture, based on physico-chemical characteristics and data on similar polymer, vinyldimethyl/trimethylsiloxysilicate stearyl dimethicone crosspolymer is unlikely to penetrate the skin.[6] No further data on the "similar polymers" were provided.

Oral and Inhalation

No data were discovered on the oral or inhalation toxicokinetics of these ingredients.

TOXICOLOGICAL STUDIES

Acute Toxicity

Dermal – Non-Human

CROTONIC ACID/VINYL C8-12 ISOALKYL ESTERS/VA/BIS-VINYLDIMETHICONE CROSSPOLYMER

According to a supplier of a trade name mixture, based on physico-chemical characteristics and data on similar polymers, the acute dermal LD_{50} for crotonic acid/vinyl C8-12 isoalkyl esters/VA/bis-vinyldimethicone crosspolymer for rats was estimated to be > 2000 mg/kg.[3] No further data on the "similar polymers" were provided.

DIMETHICONE/VINYLTRIMETHYLSILOXYSILICATE CROSSPOLYMER

According to a supplier of a trade name mixture, based on physico-chemical characteristics and data on similar polymer, the acute dermal LD_{50} for dimethicone/vinyltrimethylsiloxysilicate crosspolymer for rats was estimated to be > 2000 mg/kg.[6] No further data on the "similar polymers" were provided.

VINYLDIMETHYL/TRIMETHYLSILOXYSILICATE STEARYL DIMETHICONE CROSSPOLYMER

According to a supplier of a trade name mixture, based on physico-chemical characteristics and data on similar polymers, the acute dermal LD_{50} of vinyldimethyl/ trimethylsiloxysilicate stearyl dimethicone crosspolymer for rats was expected to be > 2000 mg/kg.[6] No further data on the "similar polymers" were provided.

Oral – Non-Human

CROTONIC ACID/VINYL C8-12 ISOALKYL ESTERS/VA/BIS-VINYLDIMETHICONE CROSSPOLYMER

According to a supplier of a trade name mixture, based on physico-chemical characteristics and data on similar polymers, the acute oral LD_{50} of crotonic acid/vinyl C8-12 isoalkyl esters/VA/bis-vinyldimethicone crosspolymer for rats is estimated to be > 2000 mg/kg.[3] No further data on the "similar polymers" were provided.

DIMETHICONE/VINYLTRIMETHYLSILOXYSILICATE CROSSPOLYMER

According to a supplier of a trade name mixture, based on physico-chemical characteristics and data on similar polymers, the acute oral LD_{50} for dimethicone/ vinyltrimethylsiloxysilicate crosspolymer for rats is estimated to be > 5000 mg/kg.[9] No further data on the "similar polymers" were provided.

VINYLDIMETHYL/TRIMETHYLSILOXYSILICATE STEARYL DIMETHICONE CROSSPOLYMER

According to a supplier of a trade name mixture, based on physico-chemical characteristics and data on similar polymers, the acute oral LD_{50} of vinyldimethyl/trimethylsiloxysilicate stearyl dimethicone crosspolymer for rats is expected to be > 2000 mg/kg.[6] No further data on the "similar polymers" were provided.

Inhalation – Non-Human

CROTONIC ACID/VINYL C8-12 ISOALKYL ESTERS/VA/BIS-VINYLDIMETHICONE CROSSPOLYMER

The acute inhalation LC_{50} of crotonic acid/vinyl C8-12 isoalkyl esters/VA/bis-vinyldimethicone crosspolymer (10% in ethanol/water, 4 h) for rats is > 5.29 mg/L.[3]

In Vitro

DIMETHICONE/BIS-VINYLDIMETHICONE/SILSESQUIOXANE CROSSPOLYMER

In an agar diffusion cytotoxicity test, dimethicone/bis-vinyldimethicone/silsesquioxane crosspolymer (concentration not provided, 100% assumed) was not cytotoxic to mammal cell cultures (type of cell not provided).[17]

Repeated Dose Toxicity

Dermal

No repeated dose dermal toxicity studies were discovered for these ingredients.

Oral – Non-Human

No repeated dose oral toxicity studies were discovered for these ingredients.

Inhalation – Non-Human

No repeated dose inhalation studies were discovered for these ingredients.

REPRODUCTIVE AND DEVELOPMENTAL TOXICITY

No primary reproductive or developmental toxicity studies were discovered.

DIMETHICONE/VINYLTRIMETHYLSILOXYSILICATE CROSSPOLYMER

According to a supplier of a trade name mixture, based on chemical structure, dimethicone/vinyltrimethylsiloxysilicate crosspolymer is not expected to be a reproductive toxicant.[9]

GENOTOXICITY

No genotoxicity studies were discovered for these ingredients.

In Vitro

CROTONIC ACID/VINYL C8-12 ISOALKYL ESTERS/VA/BIS-VINYLDIMETHICONE CROSSPOLYMER

According to a supplier of a trade name mixture, based on physico-chemical characteristics and data on similar polymers, crotonic acid/vinyl C8-12 isoalkyl esters/VA/bis-vinyldimethicone crosspolymer is not expected to be mutagenic.[3] No further data on the "similar polymers" were provided.

DIMETHICONE/VINYLTRIMETHYLSILOXYSILICATE CROSSPOLYMER

According to a supplier of a trade name mixture, based on physic-chemical characteristics and data on similar polymer, dimethicone/vinyltrimethylsiloxysilicate crosspolymer is not expected to be mutagenic.[9] No further data on the "similar polymers" were provided.

VINYLDIMETHYL/TRIMETHYLSILOXYSILICATE STEARYL DIMETHICONE CROSSPOLYMER

According to a supplier of a trade name mixture, based on physic-chemical characteristics and data on similar polymer, vinyldimethyl/trimethylsiloxysilicate stearyl dimethicone crosspolymer is not expected to be mutagenic.[6] No further data on the "similar polymers" were provided.

CARCINOGENICITY

No carcinogenicity studies were discovered on these ingredients.

DIMETHICONE/VINYLTRIMETHYLSILOXYSILICATE CROSSPOLYMER

According to a supplier of a trade name mixture, based on chemical structure, dimethicone/ vinyltrimethylsiloxysilicate crosspolymer is not expected to be carcinogenic.[9] No further data on the "similar polymers" were provided.

IRRITATION AND SENSITIZATION

Irritation

Dermal – Non-Human

CROTONIC ACID/VINYL C8-12 ISOALKYL ESTERS/VA/BIS-VINYLDIMETHICONE CROSSPOLYMER

According to a supplier of a trade name mixture, based on physico-chemical characteristics and data on similar polymer, crotonic acid/vinyl C8-12 isoalkyl esters/VA/bis-vinyldimethicone crosspolymer is not expected to be dermally irritating.[3] No further data on the "similar polymers" were provided.

DIMETHICONE/VINYLTRIMETHYLSILOXYSILICATE CROSSPOLYMER

Dimethicone/vinyltrimethylsiloxysilicate crosspolymer was not dermally irritating to rabbits.[9] No further information was provided.

Dermal – Human

No human dermal irritation tests were discovered for these ingredients.

Mucosal

No mucosal irritation data were discovered for these ingredients.

Ocular

DIMETHICONE/PHENYL VINYL DIMETHICONE CROSSPOLYMER

In a Skin ZK-1200 (tissue equivalent) ocular assay, dimethicone/phenyl vinyl dimethicone crosspolymer (25 µL) was not predicted to by an ocular irritant after 30 min of exposure.[18]

DIMETHICONE/VINYLTRIMETHYLSILOXYSILICATE CROSSPOLYMER

Dimethicone/vinyltrimethylsiloxysilicate crosspolymer was not an ocular irritant to rabbits.[9] No further information was provided.

Sensitization

Dermal – Non-Human

CROTONIC ACID/VINYL C8-12 ISOALKYL ESTERS/VA/BIS-VINYLDIMETHICONE CROSSPOLYMER

According to a supplier of a trade name mixture, based on physico-chemical characteristics and data on similar polymers, crotonic acid/vinyl C8-12 isoalkyl esters/VA/bis-vinyldimethicone crosspolymer is not expected to be sensitizing.[3]

DIMETHICONE/VINYLTRIMETHYLSILOXYSILICATE CROSSPOLYMER

According to a supplier of a trade name mixture, based on physic-chemical characteristics and data on similar polymer, dimethicone/vinyltrimethylsiloxysilicate crosspolymer is not expected to be sensitizing.[9]

VINYLDIMETHYL/TRIMETHYLSILOXYSILICATE STEARYL DIMETHICONE CROSSPOLYMER

Vinyldimethyl/trimethylsiloxysilicate stearyl dimethicone crosspolymer (concentration not provided) was not sensitizing to guinea pigs.[6]

Dermal – Human

DIMETHICONE/DIVINYLDIMETHICONE/SILSESQUIOXANE CROSSPOLYMER

In a human repeated insult patch test (HRIPT; n = 55) of dimethicone/divinyldimethicone/silsesquioxane crosspolymer (30% in corn oil), there were no adverse reactions of any kind during the course of this study.[19]

Phototoxicity

No phototoxicity studies were discovered for these ingredients.

SUMMARY

This is a safety assessment of 62 dimethicone crosspolymers as used in cosmetics. These ingredients function as absorbents, bulking agents, film formers, hair conditioning agents, skin-conditioning agents-emollient, slip modifiers, surface modifiers, and viscosity increasing agents-nonaqueous. The dimethicone crosspolymer ingredients in this report are silicone elastomers comprised of dimethicone copolymers that are crosslinked with a bi-functional agent.

Dimethicone/divinyldimethicone/silsesquioxane crosspolymer has a spherical shape with a particle diameter ranging from 2 – 10 µm.

Dimethicone crosspolymers are reported to not contain any heavy metals, polycyclic aromatic hydrocarbons, organohalogen compounds, or nitrosamines. Residuals from manufacturing include platinum and cyclotetrasiloxane.

The VCRP reports that behenyl dimethicone/bis-vinyldimethicone crosspolymer was used in 3 eyeliners; C30-45 alkyl cetearyl dimethicone crosspolymer in 23 leave-on and 2 rinse-off products; C4-24 alkyl dimethicone/ divinyldimethicone crosspolymer in 1 leave-on product; cetearyl dimethicone crosspolymer in 7 leave-on products; dimethicone crosspolymer in 376 leave-on products; dimethicone crosspolymer-3 in 41 leave-on products; dimethicone/ phenyl vinyl dimethicone crosspolymer in 9 leave-on products; dimethicone/vinyl dimethicone crosspolymer in 413 leave-on products and 12 rinse-off products; divinyldimethicone/dimethicone crosspolymer in 4 leave-on products; isopropyl titanium triisostearate/triethoxysilylethyl polydimethylsiloxyethyl dimethicone crosspolymer in 5 leave-on products; PEG-12 dimethicone crosspolymer in 22 leave-on products and 3 rinse-off products; PEG-10 dimethicone/vinyl dimethicone crosspolymer in 7 leave-on products; PEG-15/lauryl dimethicone crosspolymer in 3 leave-on and 3 rinse-off products; silicone quaternium-16/glycidoxy dimethicone crosspolymer in 2 leave-on and 4 rinse-off products; vinyl dimethicone/lauryl dimethicone crosspolymer was reported to be used in 1 makeup base.

The acute inhalation LC_{50} of crotonic acid/vinyl C8-12 isoalkyl esters/VA/bis-vinyldimethicone crosspolymer (10% in ethanol/water, 4 h) for rats was > 5.29 mg/L.

In a Skin ZK-1200 ocular assay, dimethicone/phenyl vinyl dimethicone crosspolymer was not predicted to be an ocular irritant. Dimethicone/vinyltrimethylsiloxysilicate crosspolymer was not an ocular irritant to rabbits.

Vinyldimethyl/trimethylsiloxysilicate stearyl dimethicone crosspolymer was not sensitizing to guinea pigs.

In an HRIPT of dimethicone/divinyldimethicone/silsesquioxane crosspolymer at 30%, there were no adverse reactions of any kind during the course of this study.

DATA NEEDS

Cosmetic Ingredient Review requests that interested parties submit any available data on these dimethicone crosspolymers. In particular toxicokinetics data, results of toxicology studies (including genotoxicity), and dermal irritation and sensitization data are needed.

CIR also requests that the formulations depicted in Figure 1 be confirmed.

TABLES AND FIGURES

Table 1. Definitions and functions of the ingredients in this safety assessment.[1]
(The *italicized text* below represents additions made by CIR staff.)

Ingredient CAS No.	Definition	Function
Acrylates/Bis-Hydroxypropyl Dimethicone Crosspolymer	Acrylates/Bis-Hydroxypropyl Dimethicone Crosspolymer is a crosslinked polymer of bis-hydroxypropyl dimethicone, and one or more monomers consisting of acrylic acid, methacrylic acid, or one of their simple esters. *Herein, simple esters means methyl, ethyl, propyl, or butyl esters.*	Absorbent, film former, skin protectant, viscosity increasing agent-nonaqueous
Behenyl Dimethicone/Bis-Vinyldimethicone Crosspolymer	*Behenyl Dimethicone/Bis-Vinyldimethicone Crosspolymer is a copolymer of behenyl dimethicone crosslinked with divinyl dimethicone.*	Skin-conditioning agent-emollient
Bis-Phenylisopropyl Phenylisopropyl Dimethicone/ Vinyl Dimethicone Crosspolymer	Bis-Phenylisopropyl Phenylisopropyl Dimethicone/Vinyl Dimethicone Crosspolymer is a copolymer of phenylisopropyl dimethicone crosslinked with vinyl dimethicone.	Humectant
Bis-Vinyldimethicone/Bis-Isobutyl PPG-20 Crosspolymer	Bis-Vinyldimethicone/Bis-Isobutyl PPG-20 Crosspolymer is a crosslinked polymer of Bis-Vinyldimethicone partially crosslinked with methylhydrogen cyclic siloxanes and then further crosslinked with bis-methallyl PPG-20.	
Bis-Vinyldimethicone Crosspolymer	*Bis-Vinyldimethicone Crosspolymer is a copolymer of Dimethicone crosslinked with divinyl dimethicone.*	None listed
Bis-Vinyldimethicone/PEG-10 Dimethicone Crosspolymer	Bis-Vinyldimethicone/PEG-10 Dimethicone Crosspolymer is a copolymer of PEG-10 Dimethicone crosslinked with Vinyl Dimethicone.	Emulsion stabilizer, film former, skin-conditioning agent-miscellaneous, slip modifier, viscosity increasing agent-nonaqueous
Bis-vinyldimethicone/PPG-20 crosspolymer	Bis-vinyldimethicone/PPG-20 crosspolymer is a crosslinked polymer of bis-vinyldimethicone partially crosslinked with methylhydrogen cyclic siloxanes and the further crosslinked with bis-ally PPG-20.	Skin-conditioning agent-emollient; viscosity increasing agent-nonaqueous
Butyldimethicone Methacrylate/Methyl Methacrylate Crosspolymer	Butyldimethicone Methacrylate/Methyl Methacrylate Crosspolymer is a copolymer of butyl dimethicone methacrylate and methyl methacrylate monomers crosslinked with ethylene glycol dimethacrylate.	Film former, hair conditioning agent, skin-conditioning agent-emollient
C30-45 Alkyl Cetearyl Dimethicone Crosspolymer 443892-05-5	C30-45 Alkyl Cetearyl Dimethicone Crosspolymer is a copolymer of C30-45 alkyl cetearyl dimethicone crosslinked with vinyl cyclohexene oxide.	Dispersing agent-nonsurfactant, film former, skin-conditioning agent-occlusive, slip modifier, viscosity increasing agent-nonaqueous
C4-24 Alkyl Dimethicone/ Divinyldimethicone Crosspolymer	C4-24 Alkyl Dimethicone/Divinyldimethicone Crosspolymer is a copolymer of C4-24 alkyl dimethicone crosslinked with divinyldimethicone.	Dispersing agent-nonsurfactant, film former, skin-conditioning agent-occlusive, slip modifier, viscosity increasing agent-nonaqueous
C30-45 Alkyl Dimethicone/ Polycyclohexene Oxide Crosspolymer 330809-27-3 389082-70-6	C30-45 Alkyl Dimethicone/Polycyclohexene Oxide Crosspolymer is C30-45 Alkyl Dimethicone cross-linked with a polyether made from vinyl cyclohexene oxide.	Dispersing agent-nonsurfactant, film former, skin-conditioning agent-occlusive, slip modifier, viscosity increasing agent-nonaqueous
Cetearyl Dimethicone Crosspolymer 756876-51-4	Cetearyl Dimethicone Crosspolymer is a copolymer of cetearyl dimethicone crosslinked with vinyl cyclohexene oxide.	Film former; hair fixative
Cetearyl Dimethicone/Vinyl Dimethicone Crosspolymer	Cetearyl Dimethicone/Vinyl Dimethicone Crosspolymer is a copolymer of cetearyl dimethicone crosslinked with vinyl dimethylpolysiloxane.	Film former; hair fixative
Cetyl Dimethicone/Bis-Vinyldimethicone Crosspolymer	*Cetyl Dimethicone/Bis-Vinyldimethicone Crosspolymer is a copolymer of cetyl dimethicone crosslinked with divinyl dimethicone.*	Skin-conditioning agent-emollient
Cetyl Hexacosyl Dimethicone/ Bis-Vinyldimethicone Crosspolymer	Cetyl Hexacosyl Dimethicone/Bis-Vinyldimethicone Crosspolymer is a crosslinked polymer of cetyl hexacosyl dimethicone and bis-vinyldimethicone.	Skin-conditioning agent-emollient
Crotonic Acid/Vinyl C8-12 Isoalkyl Esters/VA/Bis-Vinyldimethicone Crosspolymer	Crotonic Acid/Vinyl C8-12 Isoalkyl Esters/VA/Bis-Vinyldimethicone Crosspolymer is a copolymer of crotonic acid, vinyl C8-12 isoalkyl esters and vinyl acetate crosslinked with bis-vinyldimethicone.	Film former; hair conditioning agent; hair fixative
Dimethicone/Bis-Isobutyl PPG-20 Crosspolymer	Dimethicone/Bis-Isobutyl PPG-20 Crosspolymer is a crosslinked polymer of Hydrogen Dimethicone crosslinked with bis-methallyl PPG-20.	Skin-conditioning agents-emollient; viscosity increasing agent-nonaqueous

Table 1. Definitions and functions of the ingredients in this safety assessment.[1]
(The *italicized text* below represents additions made by CIR staff.)

Ingredient CAS No.	Definition	Function
Dimethicone/Bis-Vinyldimethicone/ Silsesquioxane Crosspolymer	Dimethicone/Bis-Vinyldimethicone/Silsesquioxane Crosspolymer is a copolymer of dimethicone, bis-vinyldimethicone and silsesquioxane monomers.	Skin-conditioning agent-miscellaneous
Dimethicone Crosspolymer 213629-14-2 [*CAS No. is specific to C5*]	Dimethicone Crosspolymer is a polymer of dimethicone crosslinked with a C3 to C20 alkyl group.	Dispersing agent-nonsurfactant; emulsion stabilizer; hair fixative; viscosity increasing agent-nonaqueous
Dimethicone Crosspolymer-3	*Dimethicone Crosspolymer-3 is a polymer of dimethicone, crosslinked with ethylene linkages to form cyclized-like repeat units.*	Skin-conditioning agent-miscellaneous; slip modifier
Dimethicone/ Divinyldimethicone/ Silsesquioxane Crosspolymer	Dimethicone/Divinyldimethicone/Silsesquioxane Crosspolymer is a crosslinked copolymer of dimethicone, divinyldimethicone, and silsesquioxane monomers.	Anticaking agent; humectant; skin protectant; viscosity increasing agent-nonaqueous
Dimethicone/Lauryl Dimethicone/Bis-Vinyldimethicone Crosspolymer	Dimethicone/Lauryl Dimethicone/Bis-Vinyldimethicone Crosspolymer is a copolymer of dimethicone and lauryl dimethicone crosslinked with bis-vinyl dimethicone.	Emulsion stabilizer; skin-conditioning agent-miscellaneous; viscosity increasing agent-nonaqueous
Dimethicone/ PEG-10 Crosspolymer	Dimethicone/PEG-10 Crosspolymer is a copolymer of dimethylpolysiloxane crosslinked with diallyl PEG-10.	Skin-conditioning agent-emollient; surfactant-dispersing agent; surfactant-emulsifying agent; viscosity increasing agent-aqueous
Dimethicone/ PEG-10/15 Crosspolymer	Dimethicone/PEG-10/15 Crosspolymer is a copolymer of dimethicone crosslinked with a mixture of PEG-10 and PEG-15 diallyl ethers.	None reported
Dimethicone/ PEG-15 Crosspolymer	Dimethicone/PEG-15 Crosspolymer is a polymer of dimethicone crosslinked with PEG-15 diallyl ether.	Deodorant agent; emulsion stabilizer; skin-conditioning agent-miscellaneous; sunscreen agent; surfactant-dispersing agent; surfactant-emulsifying agent; viscosity increasing agent-aqueous
Dimethicone/ Phenyl Vinyl Dimethicone Crosspolymer	Dimethicone/Phenyl Vinyl Dimethicone Crosspolymer is a copolymer of dimethylpolysiloxane crosslinked with phenyl vinyl dimethylpolysiloxane.	Viscosity increasing agent-nonaqueous
Dimethicone/Polyglycerin-3 Crosspolymer	Dimethicone/Polyglycerin-3 Crosspolymer is the polymer of dimethicone crosslinked with diallyl polyglycerin-3.	Skin-conditioning agent-miscellaneous; surfactant-cleansing agent; surfactant-emulsifying agent; surfactant-solubilizing agent; viscosity increasing agent-nonaqueous
Dimethicone/PPG-20 Crosspolymer	Dimethicone/PPG-20 Crosspolymer is a crosslinked polymer of hydrogen dimethicone crosslinked with bis-allyl PPG-20.	Skin-conditioning agent-emollient; viscosity increasing agent-nonaqueous
Dimethicone/Titanate Crosspolymer	Dimethicone/Titanate Crosspolymer is the crosslinked polymer formed by the reaction of titanium tetraisopropoxide and methoxy dimethicone.	Bulking agent
Dimethicone/Vinyl Dimethicone Crosspolymer	Dimethicone/Vinyl Dimethicone Crosspolymer is a copolymer of dimethylpolysiloxane crosslinked with vinyl dimethylpolysiloxane.	Viscosity increasing agent-nonaqueous
Dimethicone/ Vinyltrimethylsiloxysilicate Crosspolymer	Dimethicone/Vinyltrimethylsiloxysilicate Crosspolymer is a copolymer of dimethylpolysiloxane crosslinked with vinyltrimethylsiloxysilicate.	Film former; viscosity increasing agent-nonaqueous
Diphenyl Dimethicone Crosspolymer	Diphenyl Dimethicone Crosspolymer is crosslinked Diphenyl Dimethicone. *Wherein the crosslinking agent is not disclosed.*	Skin-conditioning agent-miscellaneous; slip modifier
Diphenyl Dimethicone/Vinyl Diphenyl Dimethicone/ Silsesquioxane Crosspolymer	Diphenyl Dimethicone/Vinyl Diphenyl Dimethicone/Silsesquioxane Crosspolymer is a crosslinked copolymer of diphenyl dimethicone, vinyl diphenyl dimethicone and silsesquioxane monomers.	Viscosity increasing agent-nonaqueous
Divinyldimethicone/ Dimethicone Crosspolymer	Divinyldimethicone/Dimethicone Crosspolymer is dimethicone crosslinked with divinyldimethicone.	Film former; skin-conditioning agent-miscellaneous; viscosity increasing agent-nonaqueous
Hydroxypropyl Dimethicone/ Polysorbate 20 Crosspolymer	Hydroxypropyl Dimethicone/Polysorbate 20 Crosspolymer is a copolymer of hydroxypropyldimethicone and polysorbate 20 crosslinked with succinic acid.	Hair fixatives
Isopropyl Titanium Triisostearate/ Triethoxysilylethyl Polydimethylsiloxyethyl Dimethicone Crosspolymer	Isopropyl Titanium Triisostearate/Triethoxysilylethyl Polydimethylsiloxyethyl Dimethicone Crosspolymer is a complex polymer formed by the hydrolysis and condensation of isopropyl titanium triisostearate with triethoxysilylethyl polydimethylsiloxyethyl dimethicone.	Surface modifier

Table 1. Definitions and functions of the ingredients in this safety assessment.[1]
(The *italicized text* below represents additions made by CIR staff.)

Ingredient CAS No.	Definition	Function
Lauryl Dimethicone PEG-15 Crosspolymer	Lauryl Dimethicone PEG-15 Crosspolymer is a crosslinked copolymer formed from *diallyl* PEG-15 and lauryl dimethicone.	Surfactant-dispersing agent; surfactant-emulsifying agent; viscosity increasing agent-aqueous
Lauryl Dimethicone/ Polyglycerin-3 Crosspolymer	Lauryl Dimethicone/Polyglycerin-3 Crosspolymer is a polymer of lauryl dimethicone crosslinked with diallyl polyglycerin-3.	Skin-conditioning agent-miscellaneous; surfactant-cleansing agent; surfactant-emulsifying agent; surfactant-solubilizing agent; viscosity increasing agent-nonaqueous
Lauryl Polydimethylsiloxyethyl Dimethicone/Bis-Vinyldimethicone Crosspolymer	Lauryl Polydimethylsiloxyethyl Dimethicone/Bis-Vinyldimethicone Crosspolymer is a copolymer of lauryl polydimethylsiloxyethyl dimethicone crosslinked by bis-vinyldimethicone	Viscosity increasing agent-nonaqueous
PEG-10 Dimethicone Crosspolymer	PEG-10 Dimethicone Crosspolymer is a crosslinked copolymer formed from *diallyl* PEG-10 and dimethicone	Viscosity increasing agent-nonaqueous
PEG-12 Dimethicone Crosspolymer	PEG-12 Dimethicone Crosspolymer is a copolymer of PEG-12 dimethicone crosslinked with a C3-20 diene.	Dispersing agent-nonsurfactant; emulsion stabilizer; surfactant-emulsifying agent; viscosity increasing agent-nonaqueous
PEG-8 Dimethicone/ Polysorbate 20 Crosspolymer	PEG-8 Dimethicone/Polysorbate 20 Crosspolymer is a copolymer of a complex mixture of esters formed from the reaction of PEG-8 dimethicone and polysorbate 20 crosslinked with succinic acid.	Emulsion stabilizer
PEG-12 Dimethicone/Bis-Isobutyl PPG-20 Crosspolymer	PEG-12 Dimethicone/Bis-Isobutyl PPG-20 Crosspolymer is a polymer of PEG-12 dimethicone crosslinked with bis-methallyl PPG-20.	None reported
PEG-12 Dimethicone/ PPG-20 Crosspolymer	PEG-12 Dimethicone/PPG-20 Crosspolymer is a crosslinked polymer of hydrogen dimethicone crosslinked with bis-allyl PPG-20.	Skin-conditioning agent-emollient
PEG-10 Dimethicone/ Vinyl Dimethicone Crosspolymer	PEG-10 Dimethicone/Vinyl Dimethicone Crosspolymer is PEG-10 dimethicone crosslinked with vinyl dimethicone	Skin protectants; viscosity increasing agents-nonaqueous
PEG-10/Lauryl Dimethicone Crosspolymer	PEG-10/Lauryl Dimethicone Crosspolymer is a copolymer of Lauryl Dimethicone crosslinked with diallyl PEG-10.	Surfactant-dispersing agent; viscosity increasing agent-aqueous
PEG-15/Lauryl Dimethicone Crosspolymer	PEG-15/Lauryl Dimethicone Crosspolymer is a copolymer of lauryl dimethicone crosslinked with diallyl PEG-15.	Viscosity increasing agent-aqueous
PEG-15/Lauryl Polydimethylsiloxyethyl Dimethicone Crosspolymer	PEG-15/Lauryl Polydimethylsiloxyethyl Dimethicone Crosspolymer is a copolymer of lauryl polydimethylsiloxyethyl dimethicone crosslinked with diallyl PEG-15.	Viscosity increasing agent-nonaqueous
Perfluorononyl Dimethicone/ Methicone/Amodimethicone Crosspolymer	Perfluorononyl Dimethicone/Methicone/Amodimethicone Crosspolymer is a crosslinked silicone polymer that is formed by reacting a copolymer of perfluorononyl dimethicone and methicone with methicone and amodimethicone	Slip modifier; surface modifier
Polydimethylsiloxyethyl Dimethicone/Bis-Vinyldimethicone Crosspolymer	Polydimethylsiloxyethyl Dimethicone/Bis-Vinyldimethicone Crosspolymer is a copolymer of polydimethylsiloxyethyl dimethicone crosslinked with bis-vinyldimethicone	Viscosity increasing agent-nonaqueous
Polyglyceryl-3/Lauryl Polydimethylsiloxyethyl Dimethicone Crosspolymer	Polyglyceryl-3/Lauryl Polydimethylsiloxyethyl Dimethicone Crosspolymer is a copolymer of lauryl polydimethylsiloxyethyl dimethicone crosslinked with an *di*allyl polyglyceryl-3.	Viscosity increasing agent-nonaqueous
Silicone Quaternium-16/ Glycidoxy Dimethicone Crosspolymer	Silicone Quaternium-16/Glycidoxy Dimethicone Crosspolymer is silicone quaternium-16 that has been crosslinked with glycidoxy dimethicone.	Hair conditioning agent; hair fixative
Styrene/Acrylates/ Dimethicone Acrylate Crosspolymer	Styrene/Acrylates/Dimethicone Acrylate Crosspolymer is a copolymer of styrene, dimethicone acrylate and one or more monomers of acrylic acid, methacrylic acid or one of their simple esters crosslinked with divinylbenzene. *Herein, simple esters means methyl, ethyl, propyl, or butyl esters*	Skin-conditioning agent-miscellaneous
Trifluoropropyl Dimethicone/ PEG-10 Crosspolymer	Trifluoropropyl Dimethicone/PEG-10 Crosspolymer is a polymer of trifluoropropyl dimethicone crosslinked with PEG-10 diallyl ether.	Skin-conditioning agent-miscellaneous; surfactant-dispersing agent; surfactant-emulsifying agent; viscosity increasing agent-nonaqueous

Table 1. Definitions and functions of the ingredients in this safety assessment.[1]
(The *italicized text* below represents additions made by CIR staff.)

Ingredient CAS No.	Definition	Function
Trifluoropropyl Dimethicone/ Trifluoropropyl Divinyldimethicone Crosspolymer	Trifluoropropyl Dimethicone/Trifluoropropyl Divinyldimethicone Crosspolymer is a copolymer of trifluoropropyl dimethicone crosslinked with trifluoropropyl divinyldimethicone.	Skin-conditioning agent-miscellaneous; surfactant-dispersing agent; viscosity increasing agent-nonaqueous
Trifluoropropyl Dimethicone/Vinyl Trifluoropropyl Dimethicone/ Silsesquioxane Crosspolymer	Trifluoropropyl Dimethicone/Vinyl Trifluoropropyl Dimethicone/Silsesquioxane Crosspolymer is a crosslinked copolymer of trifluoropropyl dimethicone, vinyl trifluoropropyl dimethicone and silsesquioxane monomers.	Viscosity increasing agent-nonaqueous
Trimethylsiloxysilicate/ Dimethicone Crosspolymer	Trimethylsiloxysilicate/Dimethicone Crosspolymer is the product of the reaction between dimethicone and trimethylsiloxysilicate under conditions that produce rearrangement, condensation, and crosslinking of the dimethicone polymer onto the trimethylsiloxysilicate resin.	Antifoaming agent
Vinyl Dimethicone/Lauryl/ Behenyl Dimethicone Crosspolymer	Vinyl Dimethicone/Lauryl/Behenyl Dimethicone Crosspolymer is lauryl/behenyl dimethicone crosslinked with divinyl dimethicone.	Skin-conditioning agent-miscellaneous
Vinyl Dimethicone/ Lauryl Dimethicone Crosspolymer	Vinyl Dimethicone/Lauryl Dimethicone Crosspolymer is lauryl dimethicone crosslinked with divinyl dimethicone.	Surfactant-dispersing agent; viscosity increasing agent-nonaqueous
Vinyl Dimethicone/ Methicone Silsesquioxane Crosspolymer	Vinyl Dimethicone/Methicone Silsesquioxane Crosspolymer is a copolymer of methicone silsesquioxane crosslinked with *bis*-vinyl dimethylpolysiloxane.	Viscosity increasing agent-nonaqueous
Vinyldimethyl/ Trimethylsiloxysilicate/ Dimethicone Crosspolymer	Monograph in development	None reported
Vinyldimethyl/ Trimethylsiloxysilicate Stearyl Dimethicone Crosspolymer	Vinyldimethyl/Trimethylsiloxysilicate Stearyl Dimethicone Crosspolymer is stearyl methicone crosslinked with *bis*-vinyldimethyl/trimethylsiloxysilicate.	Absorbent; bulking agent; film former; viscosity increasing agent-nonaqueous

Table 2. Chemical and physical properties of dimethicone crosspolymers

Property	Value	Reference
Acrylates/bis-hydroxypropyl dimethicone crosspolymer		
No data were discovered.		
Behenyl dimethicone/bis-vinyldimethicone crosspolymer		
No data were discovered.		
Bis-phenylisopropyl phenylisopropyl dimethicone/vinyl dimethicone crosspolymer		
No data were discovered.		
Bis-vinyldimethicone/bis-isobutyl ppg-20 crosspolymer		
No data were discovered.		
Bis-vinyldimethicone crosspolymer		
No data were discovered.		
Bis-vinyldimethicone/peg-10 dimethicone crosspolymer		
No data were discovered.		
Bis-vinyldimethicone/ppg-20 crosspolymer		
No data were discovered.		
Butyldimethicone methacrylate/methyl methacrylate crosspolymer		
No data were discovered.		
C30-45 alkyl cetearyl dimethicone crosspolymer		
No data were discovered.		

Table 2. Chemical and physical properties of dimethicone crosspolymers

Property	Value	Reference
C4-24 alkyl dimethicone/divinyldimethicone crosspolymer		
No data were discovered.		
C30-45 alkyl dimethicone/polycyclohexene oxide crosspolymer		
No data were discovered.		
Cetearyl dimethicone crosspolymer		
No data were discovered.		
Cetearyl dimethicone/vinyl dimethicone crosspolymer		
No data were discovered.		
Cetyl dimethicone/bis-vinyldimethicone crosspolymer		
Physical Form	Liquid	[20]
Water Solubility 1% & 10%	Insoluble	[20]
Other Solubility Isopropyl alcohol 1% & 10%	Insoluble	[20]
Mineral spirits 1% & 10%	Soluble	
Mineral Oil 1% & 10%	Soluble	
Aromatic Solvents 1% & 10%	Soluble	
Cyclo methicone 1% & 10%	Soluble	
Cetyl hexacosyl dimethicone/bis-vinyldimethicone crosspolymer		
No data were discovered.		
Crotonic acid/vinyl c8-12 isoalkyl esters/VA/bis-vinyldimethicone crosspolymer		
No data were discovered.		
Dimethicone/bis-isobutyl ppg-20 crosspolymer		
No data were discovered.		
Dimethicone/bis-vinyldimethicone/silsesquioxane crosspolymer		
No data were discovered.		
Dimethicone crosspolymer		
No data were discovered.		
Dimethicone crosspolymer-3		
No data were discovered.		
Dimethicone/divinyldimethicone/silsesquioxane crosspolymer		
Physical Form	Powder	[8]
Color	Off white	[8]
Odor	Typical	[8]
Vapor pressure mmHg@ 25ºC	<0.1	[4]
Boiling Point ºC	>300° (decomposes)	[4]
Water Solubility g/L @ ºC & pH	Insoluble	[4]
Dimethicone/lauryl dimethicone/bis-vinyldimethicone crosspolymer		
No data were discovered.		
Dimethicone/peg-10 crosspolymer		
No data were discovered.		
Dimethicone/peg-10/15 crosspolymer		
No data were discovered.		
Dimethicone/peg-15 crosspolymer		
No data were discovered.		

Table 2. Chemical and physical properties of dimethicone crosspolymers

Property	Value	Reference
Dimethicone/phenyl vinyl dimethicone crosspolymer		
No data were discovered.		
Dimethicone/polyglycerin-3 crosspolymer		
No data were discovered.		
Dimethicone/ppg-20 crosspolymer		
No data were discovered.		
Dimethicone/titanate crosspolymer		
No data were discovered.		
Dimethicone/vinyl dimethicone crosspolymer		
No data were discovered.		
Dimethicone/vinyltrimethylsiloxysilicate crosspolymer		
No data were discovered.		
Diphenyl dimethicone crosspolymer		
No data were discovered.		
Diphenyl dimethicone/vinyl diphenyl dimethicone/silsesquioxane crosspolymer		
No data were discovered.		
Divinyldimethicone/dimethicone crosspolymer		
No data were discovered.		
Hydroxypropyl dimethicone/polysorbate 20 crosspolymer		
No data were discovered.		
Isopropyl titanium triisostearate/triethoxysilylethyl polydimethylsiloxyethyl dimethicone crosspolymer		
No data were discovered.		
Lauryl dimethicone peg-15 crosspolymer		
No data were discovered.		
Lauryl dimethicone/polyglycerin-3 crosspolymer		
No data were discovered.		
Lauryl polydimethylsiloxyethyl dimethicone/bis-vinyldimethicone crosspolymer		
No data were discovered.		
PEG-10 dimethicone crosspolymer		
No data were discovered.		
PEG-12 dimethicone crosspolymer		
No data were discovered.		
PEG-8 dimethicone/polysorbate 20 crosspolymer		
No data were discovered.		
PEG-12 dimethicone/ppg-20 crosspolymer		
No data were discovered.		
PEG-12 dimethicone/ppg-20 crosspolymer		
No data were discovered.		
PEG-10/lauryl dimethicone crosspolymer		
No data were discovered.		
PEG-15/lauryl dimethicone crosspolymer		
No data were discovered.		

Table 2. Chemical and physical properties of dimethicone crosspolymers

Property	Value	Reference
PEG-15/lauryl polydimethylsiloxyethyl dimethicone crosspolymer		
No data were discovered.		
Perfluorononyl dimethicone/methicone/amodimethicone crosspolymer		
No data were discovered.		
Polydimethylsiloxyethyl dimethicone/bis-vinyldimethicone crosspolymer		
No data were discovered.		
Polyglyceryl-3/lauryl polydimethylsiloxyethyl dimethicone crosspolymer		
No data were discovered.		
Silicone quaternium-16/glycidoxy dimethicone crosspolymer		
No data were discovered.		
Styrene/acrylates/dimethicone acrylate crosspolymer		
No data were discovered.		
Trifluoropropyl dimethicone/peg-10 crosspolymer		
No data were discovered.		
Trifluoropropyl dimethicone/trifluoropropyl divinyldimethicone crosspolymer		
No data were discovered.		
Trifluoropropyl dimethicone/vinyl trifluoropropyl dimethicone/silsesquioxane crosspolymer		
No data were discovered.		
Trimethylsiloxysilicate/dimethicone crosspolymer		
No data were discovered.		
Vinyl dimethicone/lauryl/behenyl dimethicone crosspolymer		
No data were discovered.		
Vinyl dimethicone/lauryl dimethicone crosspolymer		
No data were discovered.		
Vinyl dimethicone/methicone silsesquioxane crosspolymer		
No data were discovered.		
Vinyldimethyl/trimethylsiloxysilicate/dimethicone crosspolymer		
No data were discovered.		
Vinyldimethyl/trimethylsiloxysilicate stearyl dimethicone crosspolymer		
No data were discovered.		

Table 3. Frequency of use according to duration and exposure.[10] The Council is conducting a survey of concentration of use.

Use type	Uses	Maximum Concentration (%)	Uses	Maximum Concentration (%)	Uses	Maximum Concentration (%)	Uses	Maximum Concentration (%)
	Behenyl dimethicone/bis-vinyldimethicone crosspolymer		**C30-45 alkyl cetearyl dimethicone crosspolymer**		**C4-24 alkyl dimethicone/ divinyldimethicone crosspolymer**		**Cetearyl dimethicone crosspolymer**	
Total/range	**3**		**25**		**1**		**7**	
Duration of use								
Leave-on	3		23		1		7	
Rinse-off	NR		2		NR			
Diluted for (bath) use	NR		NR		NR		NR	
Exposure type								
Eye area	3		5		NR		NR	
Incidental ingestion	NR		NR		NR		NR	
Incidental Inhalation-sprays	NR		NR		NR		NR	
Incidental inhalation-powders	NR		NR		NR		NR	
Dermal contact	3		25		1		7	
Deodorant (underarm)	NR		NR		NR		NR	
Hair-noncoloring	NR		NR		NR		NR	
Hair-coloring	NR		NR		NR		NR	
Nail	NR		NR		NR		NR	
Mucous Membrane	NR		NR		NR		NR	
Baby	NR		NR		NR		NR	

	Dimethicone crosspolymer	**Dimethicone crosspolymer-3**	**Dimethicone/phenyl vinyl dimethicone crosspolymer**	**Dimethicone/vinyl dimethicone crosspolymer**
Total/range	**385**	**41**	**9**	**425**
Duration of use				
Leave-on	376	41	9	413
Rinse-off	9	NR	NR	12
Diluted for (bath) use	NR	NR	NR	NR
Exposure type				
Eye area	32	13	NR	65
Incidental ingestion	9	NR	NR	9
Incidental Inhalation-sprays	25	6	NR	23
Incidental inhalation-powders	NR	NR	NR	32
Dermal contact	365	32	9	401
Deodorant (underarm)	11	NR	NR	NR
Hair-noncoloring	8	NR	NR	14
Hair-coloring	NR	NR	NR	NR
Nail	1	NR	NR	NR
Mucous Membrane	9	NR	NR	10
Baby	NR	NR	NR	1

Table 3. Frequency of use according to duration and exposure.[10] The Council is conducting a survey of concentration of use.

Use type	Uses	Maximum Concentration (%)	Uses	Maximum Concentration (%)	Uses	Maximum Concentration (%)	Uses	Maximum Concentration (%)
	Divinyldimethicone/ dimethicone crosspolymer		**Isopropyl titanium triisostearate/ triethoxysilylethyl polydimethylsiloxyethyl dimethicone crosspolymer**		**PEG-10 dimethicone crosspolymer**		**PEG-12 dimethicone crosspolymer**	
Total/range	**4**		**5**		**16**		**25**	
Duration of use								
Leave-on	4		5		16		22	
Rinse-off	NR		NR		NR		3	
Diluted for (bath) use	NR		NR		NR		NR	
Exposure type								
Eye area	3		4		1		1	
Incidental ingestion	NR		NR		NR		NR	
Incidental Inhalation-sprays	NR		NR		NR		19	
Incidental inhalation-powders	NR		5		NR		NR	
Dermal contact	4		NR		16		20	
Deodorant (underarm)	NR		NR		NR		17	
Hair-noncoloring	NR		NR		NR		5	
Hair-coloring	NR		NR		NR		NR	
Nail	NR		NR		NR		NR	
Mucous Membrane	NR		NR		NR		NR	
Baby	NR		NR		NR		NR	

	PEG-10 dimethicone/vinyl dimethicone crosspolymer	**PEG-15/lauryl dimethicone crosspolymer**	**Silicone quaternium-16/ glycidoxy dimethicone crosspolymer**	**Vinyl dimethicone/ lauryl dimethicone crosspolymer**
Total/range	**7**	**6**	6	1
Duration of use				
Leave-on	7	3	2	1
Rinse-off	NR	3	4	NR
Diluted for (bath) use	NR	NR	NR	NR
Exposure type				
Eye area	1	NR	NR	NR
Incidental ingestion	NR	NR	NR	NR
Incidental Inhalation-sprays	NR	NR	NR	NR
Incidental inhalation-powders	NR	NR	NR	NR
Dermal contact	7	6	NR	1
Deodorant (underarm)	NR	NR	NR	NR
Hair-noncoloring	NR	NR	6	NR
Hair-coloring	NR	NR	NR	NR
Nail	NR	NR	NR	NR
Mucous Membrane	NR	NR	NR	NR
Baby	NR	NR	NR	NR

NR = Not Reported; Totals = Rinse-off + Leave-on Product Uses.
Note: Because each ingredient may be used in cosmetics with multiple exposure types, the sum of all exposure type uses may not equal the sum total uses.

Figure 1. Idealized structures of the dimethicone crosspolymers ingredients in this safety assessment. These idealized structures are merely generalized, two-dimensional estimations of the true three-dimensional frameworks that comprise theses polymers. Though monomer units are drawn sequentially, by necessity, this by no means implies that these are block-type polymers. Instead, these structures are meant to represent only one example of the multitude of potentially produced connectivities found within these macromolecules.

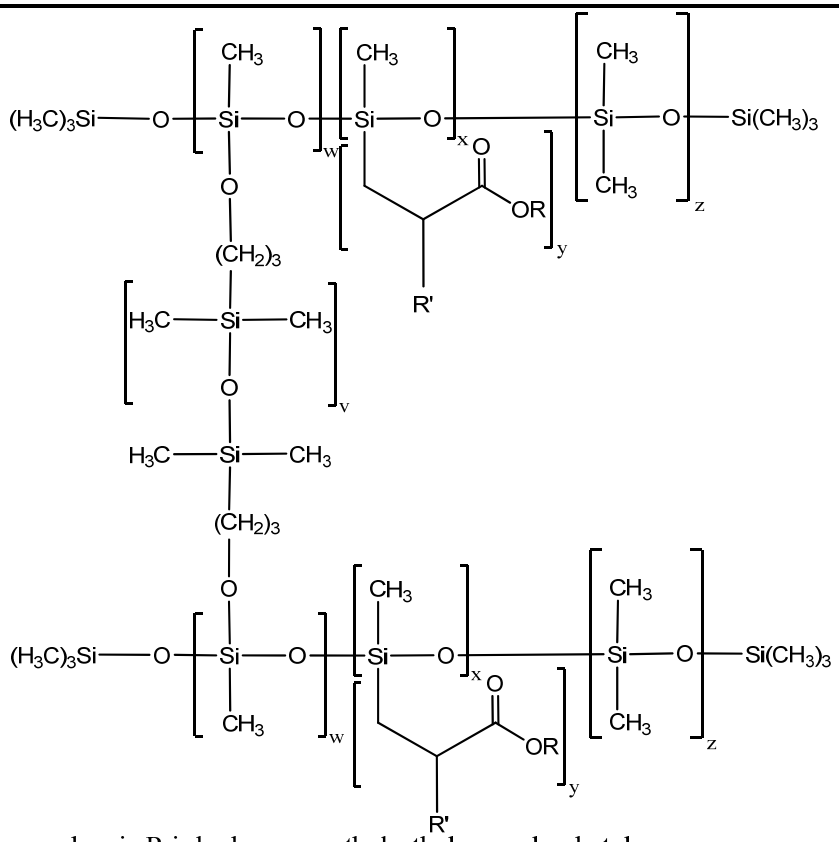
Ingredient	Idealized structure
Acrylates/bis-hydroxypropyl dimethicone crosspolymer	 wherein R is hydrogen, methyl, ethyl, propyl or butyl wherein R' is hydrogen or another dimethicone chain

Figure 1. Idealized structures of the dimethicone crosspolymers ingredients in this safety assessment. These idealized structures are merely generalized, two-dimensional estimations of the true three-dimensional frameworks that comprise theses polymers. Though monomer units are drawn sequentially, by necessity, this by no means implies that these are block-type polymers. Instead, these structures are meant to represent only one example of the multitude of potentially produced connectivities found within these macromolecules.

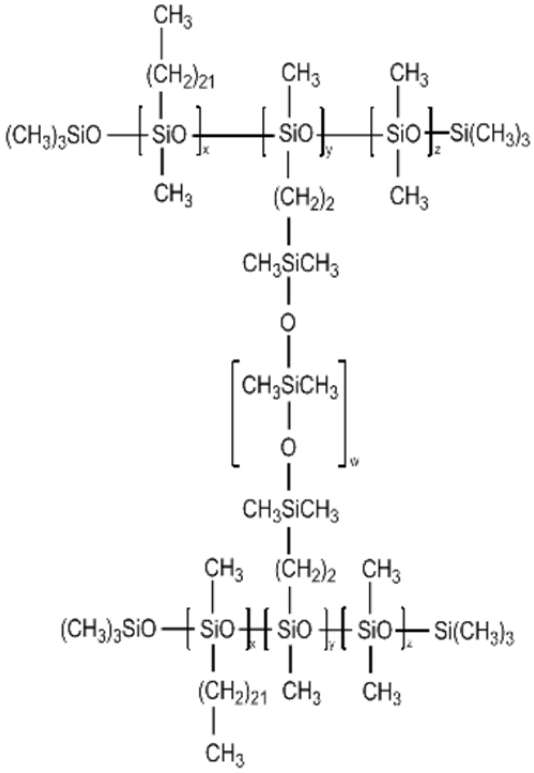
Ingredient	Idealized structure
Behenyl dimethicone/bis-vinyldimethicone crosspolymer	

Figure 1. Idealized structures of the dimethicone crosspolymers ingredients in this safety assessment. These idealized structures are merely generalized, two-dimensional estimations of the true three-dimensional frameworks that comprise theses polymers. Though monomer units are drawn sequentially, by necessity, this by no means implies that these are block-type polymers. Instead, these structures are meant to represent only one example of the multitude of potentially produced connectivities found within these macromolecules.

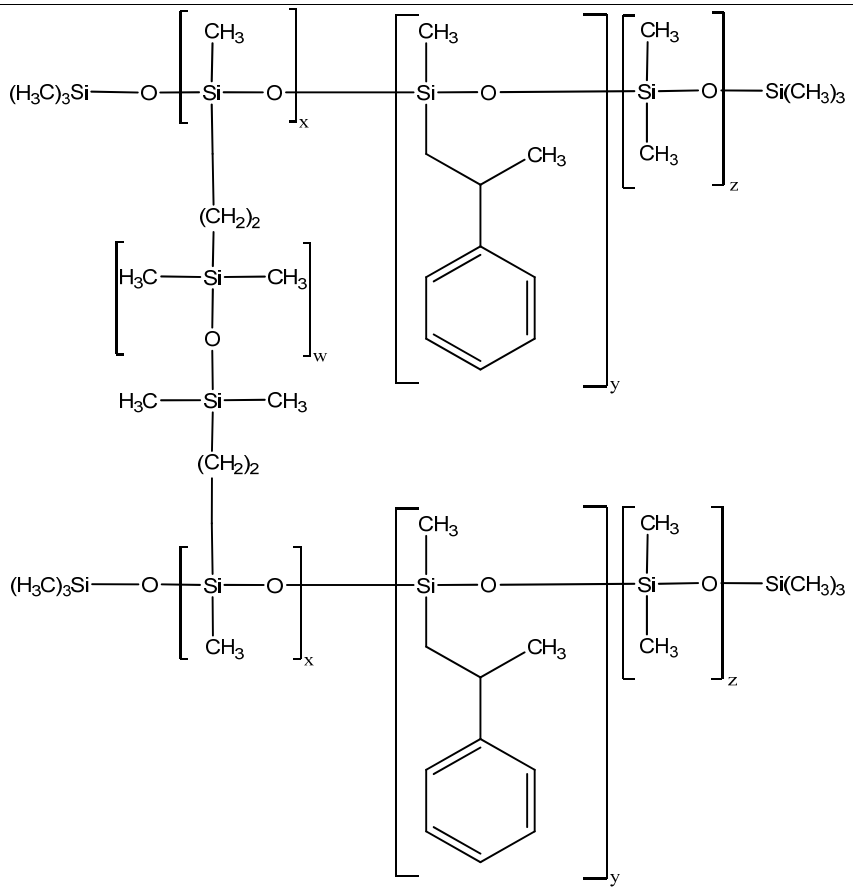
Ingredient	Idealized structure
Bis-phenylisopropyl phenylisopropyl dimethicone/vinyl dimethicone crosspolymer	

Figure 1. Idealized structures of the dimethicone crosspolymers ingredients in this safety assessment. These idealized structures are merely generalized, two-dimensional estimations of the true three-dimensional frameworks that comprise theses polymers. Though monomer units are drawn sequentially, by necessity, this by no means implies that these are block-type polymers. Instead, these structures are meant to represent only one example of the multitude of potentially produced connectivities found within these macromolecules.

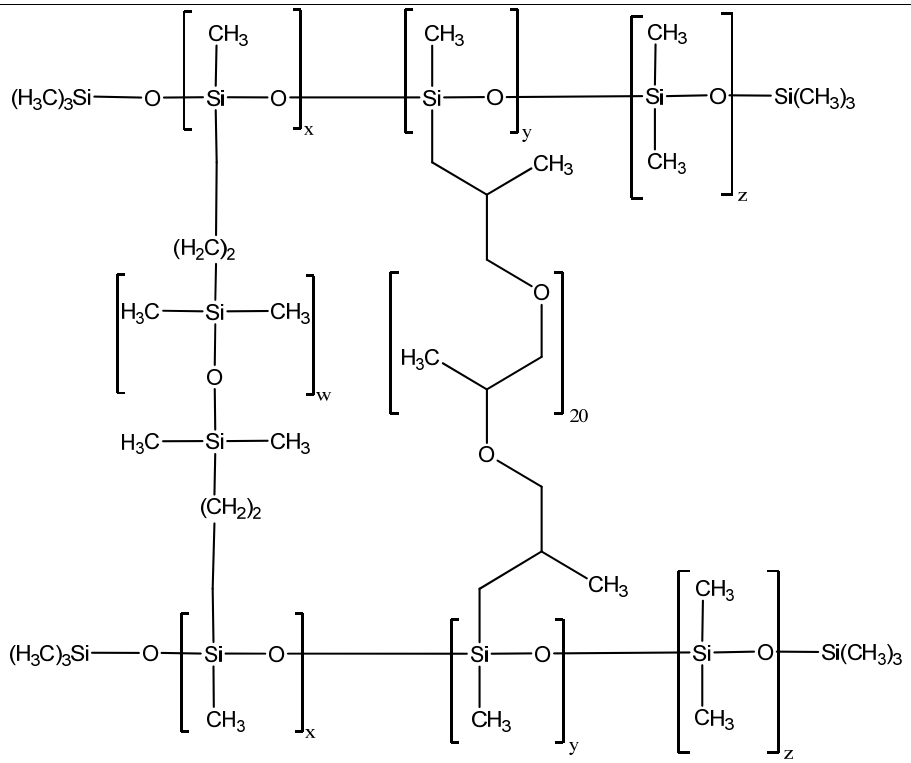
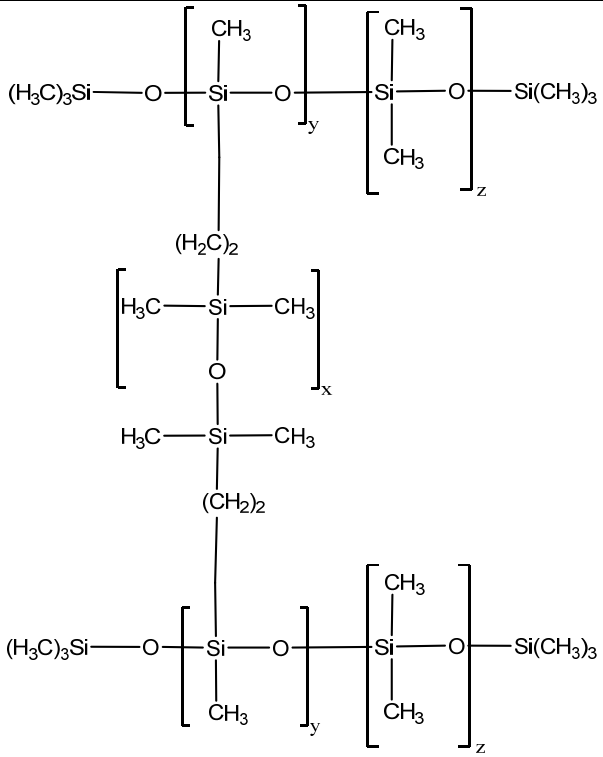
Ingredient	Idealized structure
Bis-vinyldimethicone/bis-isobutyl PPG-20 crosspolymer	
Bis-vinyldimethicone crosspolymer	
Bis-Vinyldimethicone/ PPG-20 Crosspolymer	Bis-Vinyldimethicone/PPG-20 Crosspolymer is a crosslinked polymer of Bis-Vinyldimethicone partially crosslinked with methylhydrogen cyclic siloxanes and then further crosslinked with bis-allyl PPG-20. *The immense connectivity variability added by "methylhydrogen cyclic siloxanes" makes a structural representation of this ingredient quite challenging.*

Figure 1. Idealized structures of the dimethicone crosspolymers ingredients in this safety assessment. These idealized structures are merely generalized, two-dimensional estimations of the true three-dimensional frameworks that comprise theses polymers. Though monomer units are drawn sequentially, by necessity, this by no means implies that these are block-type polymers. Instead, these structures are meant to represent only one example of the multitude of potentially produced connectivities found within these macromolecules.

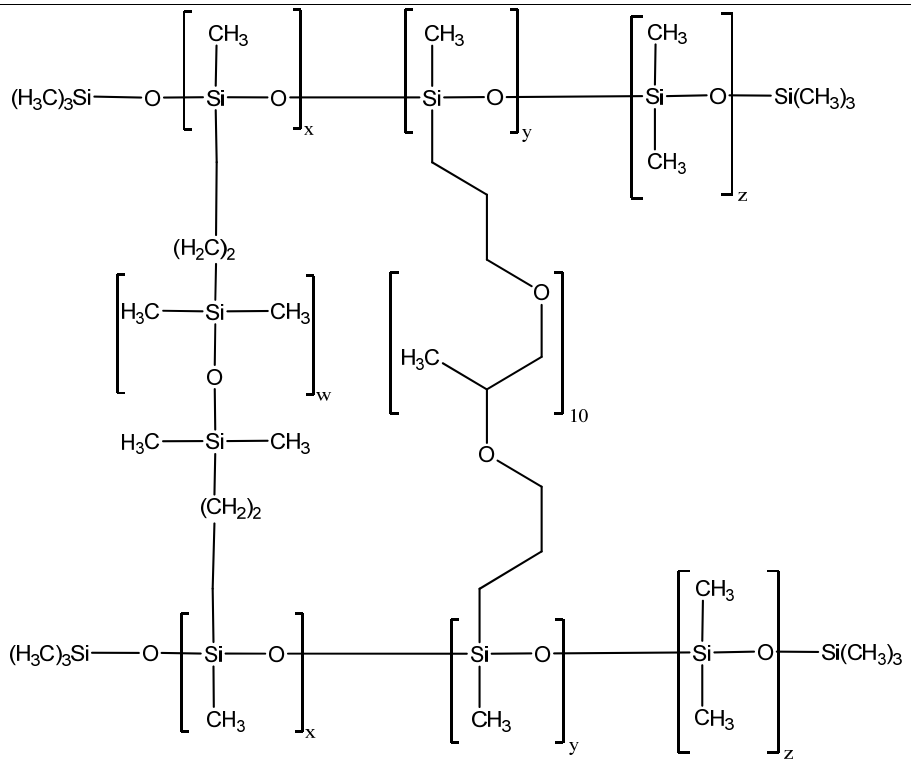
Ingredient	Idealized structure
Bis-vinyldimethicone/ PEG-10 dimethicone crosspolymer	

Figure 1. Idealized structures of the dimethicone crosspolymers ingredients in this safety assessment. These idealized structures are merely generalized, two-dimensional estimations of the true three-dimensional frameworks that comprise theses polymers. Though monomer units are drawn sequentially, by necessity, this by no means implies that these are block-type polymers. Instead, these structures are meant to represent only one example of the multitude of potentially produced connectivities found within these macromolecules.

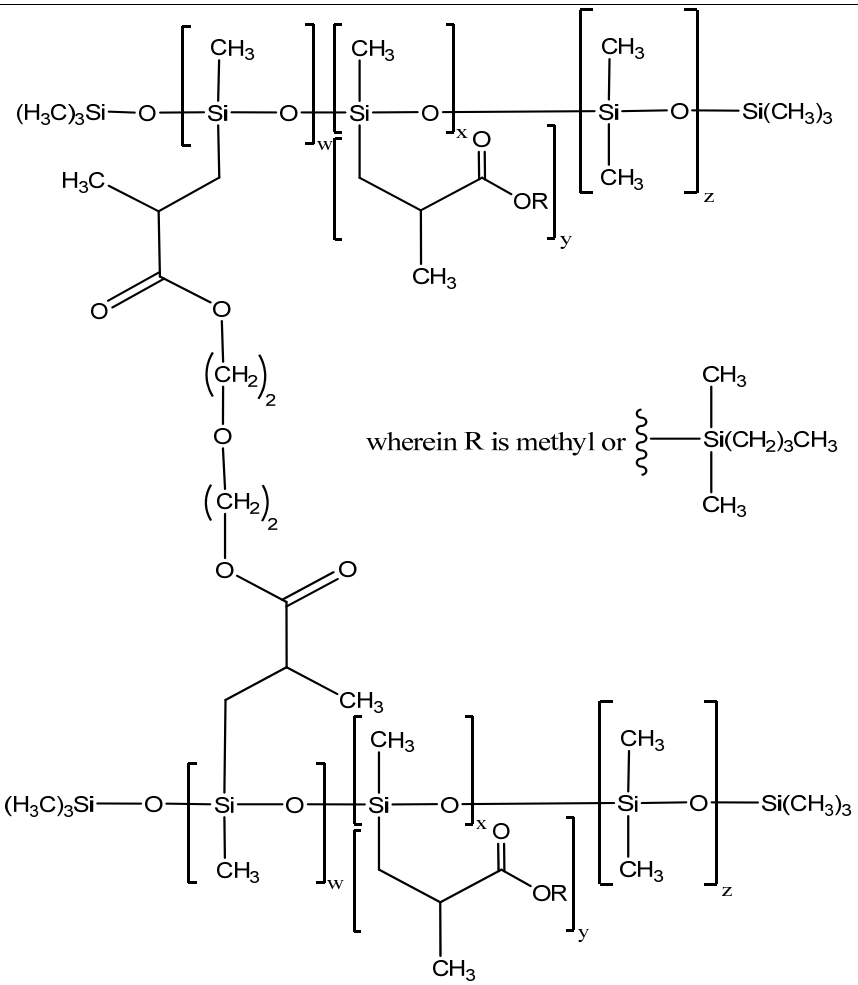
Ingredient	Idealized structure
Butyldimethicone methacrylate/methyl methacrylate crosspolymer	

Figure 1. Idealized structures of the dimethicone crosspolymers ingredients in this safety assessment. These idealized structures are merely generalized, two-dimensional estimations of the true three-dimensional frameworks that comprise theses polymers. Though monomer units are drawn sequentially, by necessity, this by no means implies that these are block-type polymers. Instead, these structures are meant to represent only one example of the multitude of potentially produced connectivities found within these macromolecules.

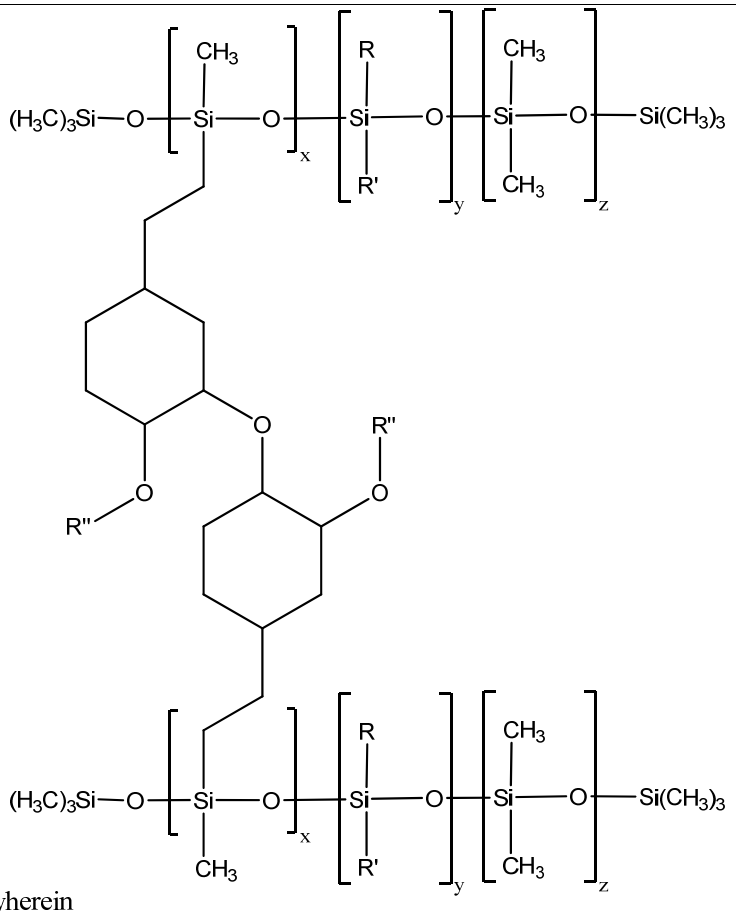
Ingredient	Idealized structure
C30-45 alkyl cetearyl dimethicone crosspolymer 443892-05-5	 wherein R represents an alkyl chain 30 to 45 carbons long R' repesents an alkyl chain 16 to 18 carbons long R" represents additional crosslinks through other vinyl cyclohexene oxide residues

Figure 1. Idealized structures of the dimethicone crosspolymers ingredients in this safety assessment. These idealized structures are merely generalized, two-dimensional estimations of the true three-dimensional frameworks that comprise theses polymers. Though monomer units are drawn sequentially, by necessity, this by no means implies that these are block-type polymers. Instead, these structures are meant to represent only one example of the multitude of potentially produced connectivities found within these macromolecules.

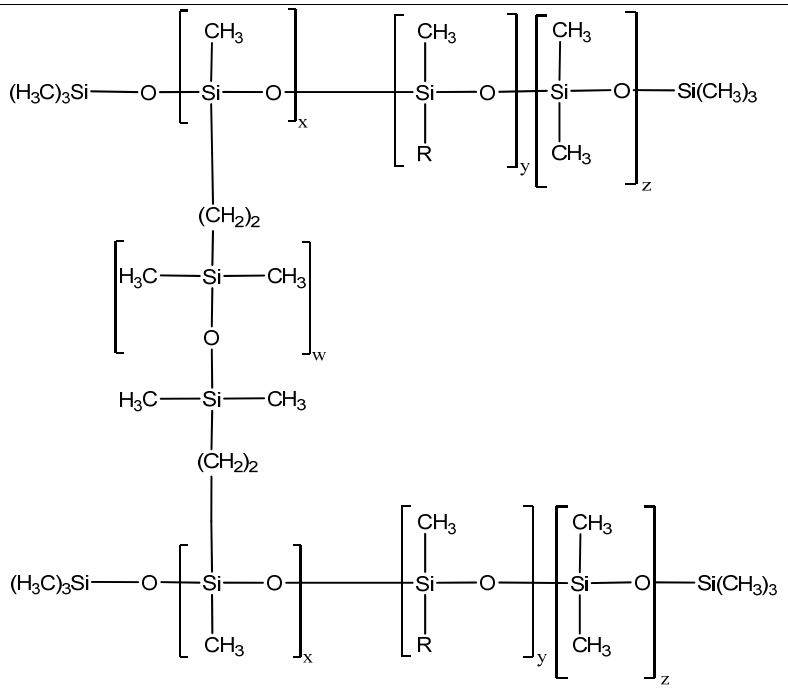
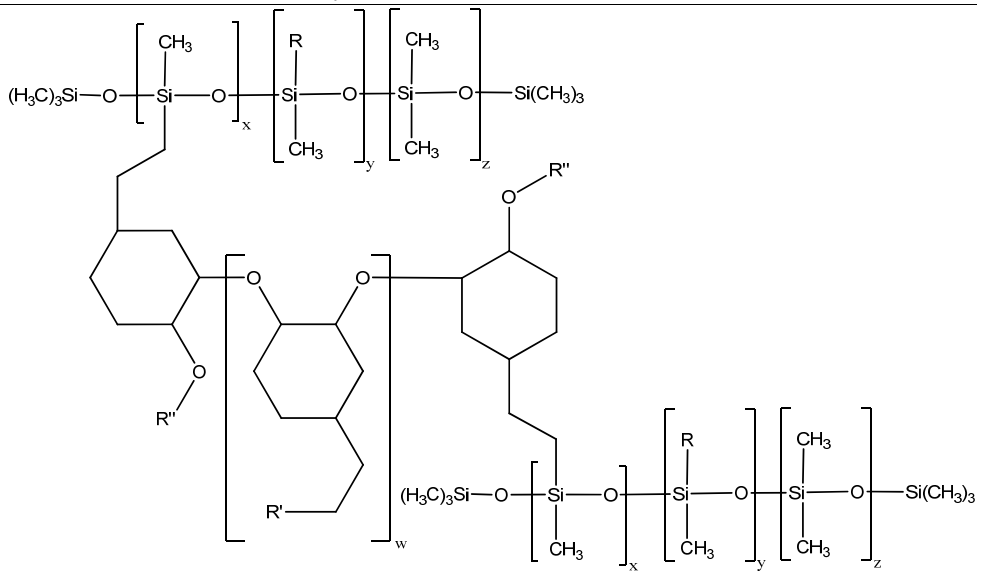
Ingredient	Idealized structure
C4-24 alkyl dimethicone/ divinyldimethicone crosspolymer	 wherein R represents an alkyl chain 4 to 24 carbons long
C30-45 alkyl dimethicone/ polycyclohexene oxide crosspolymer 330809-27-3 389082-70-6	 wherein R represents an alkyl chain 30 to 45 carbons long R' repesents additional dimethicone backbones R" represents additional crosslinks through other vinyl cyclohexene oxide residues

Figure 1. Idealized structures of the dimethicone crosspolymers ingredients in this safety assessment. These idealized structures are merely generalized, two-dimensional estimations of the true three-dimensional frameworks that comprise theses polymers. Though monomer units are drawn sequentially, by necessity, this by no means implies that these are block-type polymers. Instead, these structures are meant to represent only one example of the multitude of potentially produced connectivities found within these macromolecules.

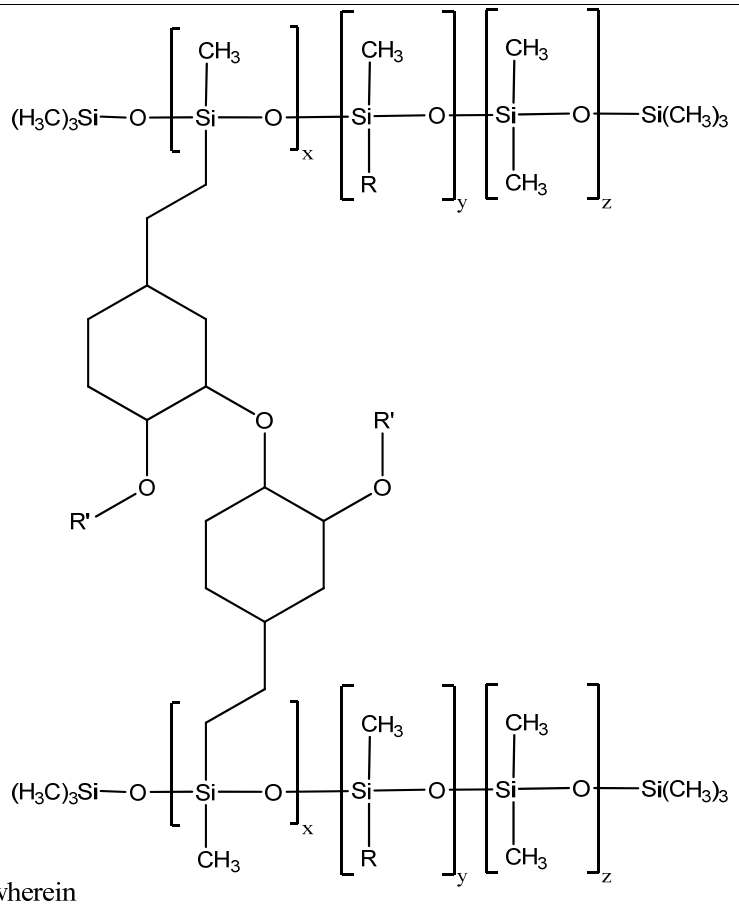
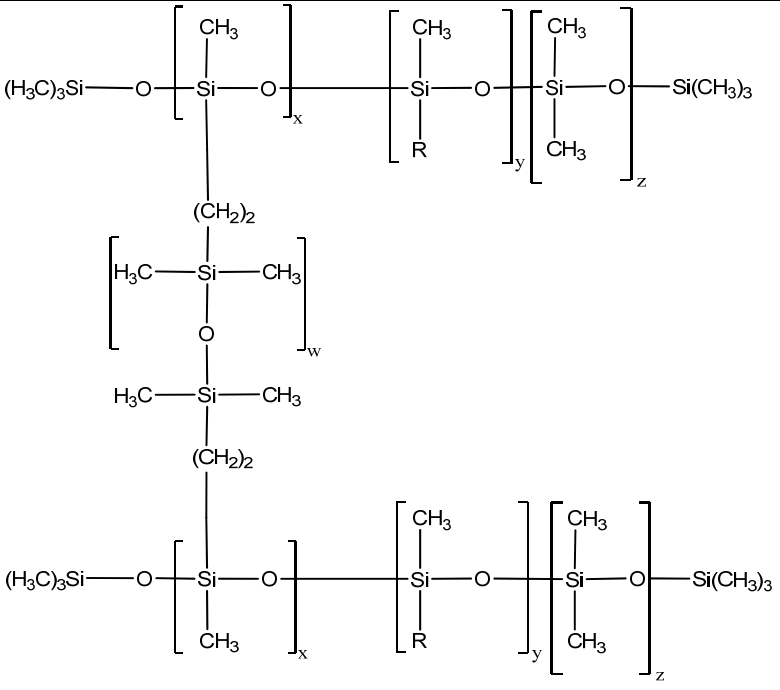
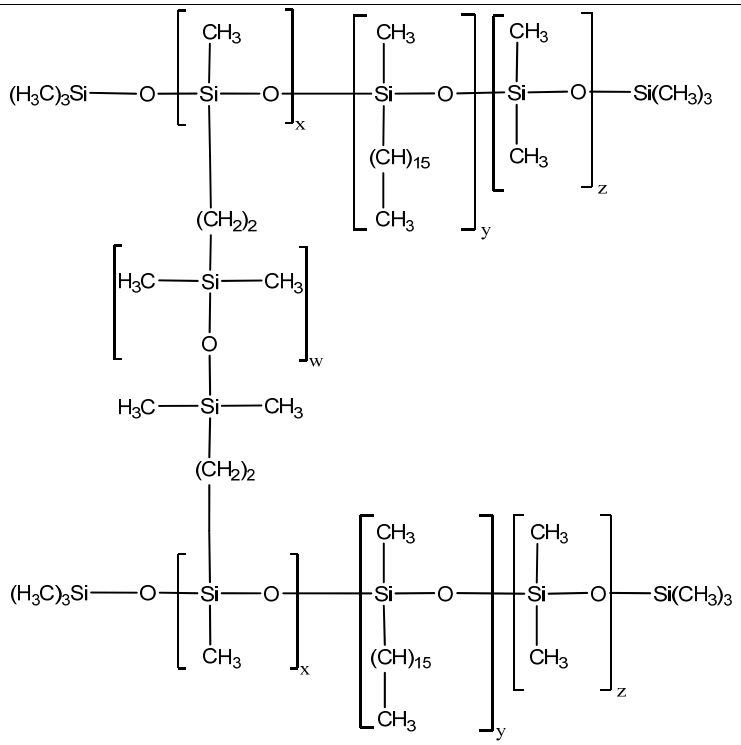
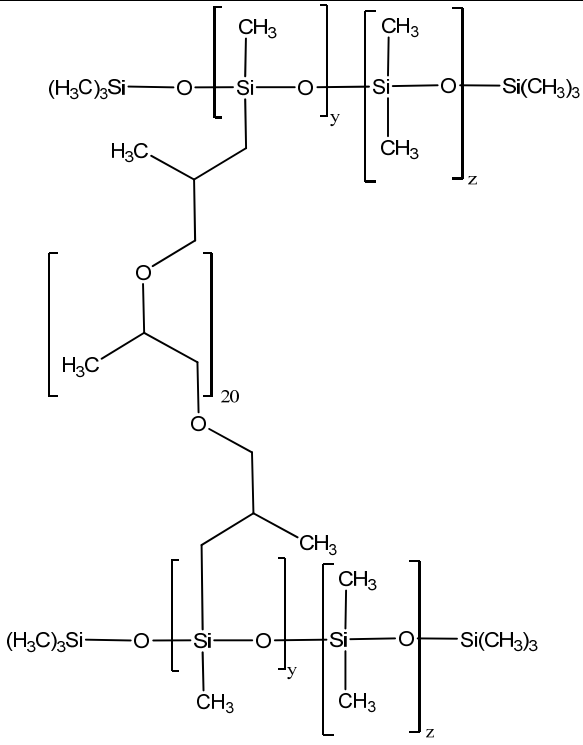
Ingredient	Idealized structure
Cetearyl dimethicone crosspolymer 756876-51-4	 wherein R repesents an alkyl chain 16 to 18 carbons long R' represents additional crosslinks through other vinyl cyclohexene oxide residues
Cetearyl dimethicone/ vinyl dimethicone crosspolymer	 wherein R represents an alkyl chain 16 to 18 carbons long

Figure 1. Idealized structures of the dimethicone crosspolymers ingredients in this safety assessment. These idealized structures are merely generalized, two-dimensional estimations of the true three-dimensional frameworks that comprise theses polymers. Though monomer units are drawn sequentially, by necessity, this by no means implies that these are block-type polymers. Instead, these structures are meant to represent only one example of the multitude of potentially produced connectivities found within these macromolecules.

Ingredient	Idealized structure
Cetyl dimethicone/bis-vinyldimethicone crosspolymer	
Cetyl hexacosyl dimethicone/ bis-vinyldimethicone crosspolymer	

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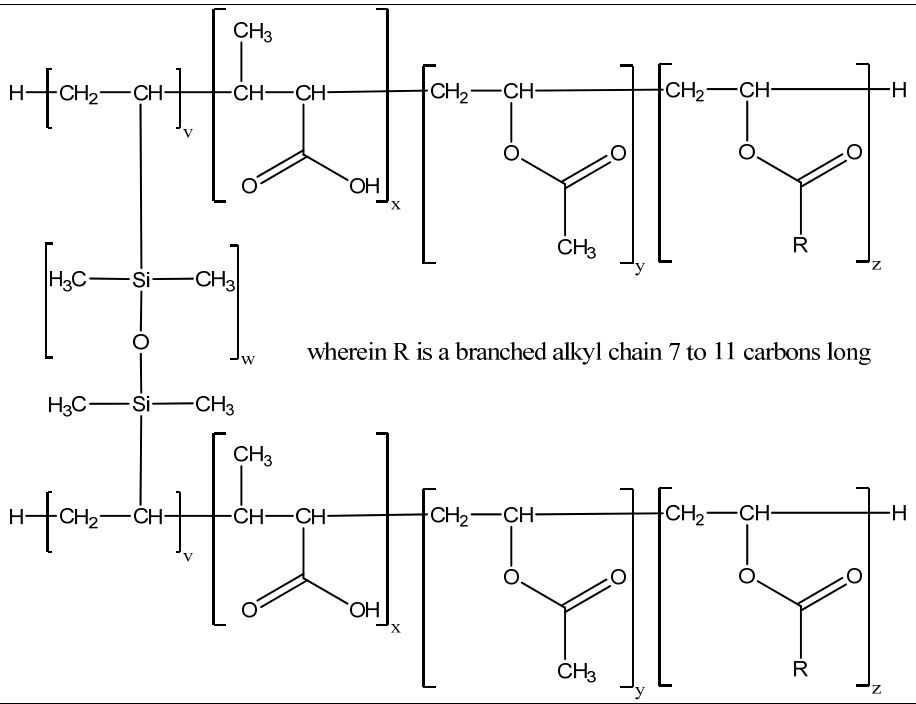
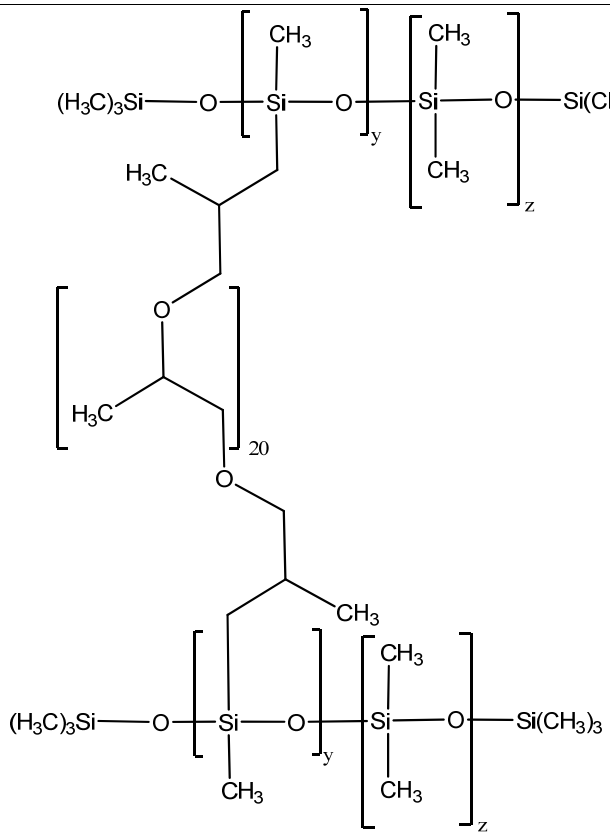
Ingredient	Idealized structure
Crotonic acid/vinyl C8-12 isoalkyl esters/ VA/bis-vinyldimethicone crosspolymer	 wherein R is a branched alkyl chain 7 to 11 carbons long
Dimethicone/bis-isobutyl PPG-20 crosspolymer	

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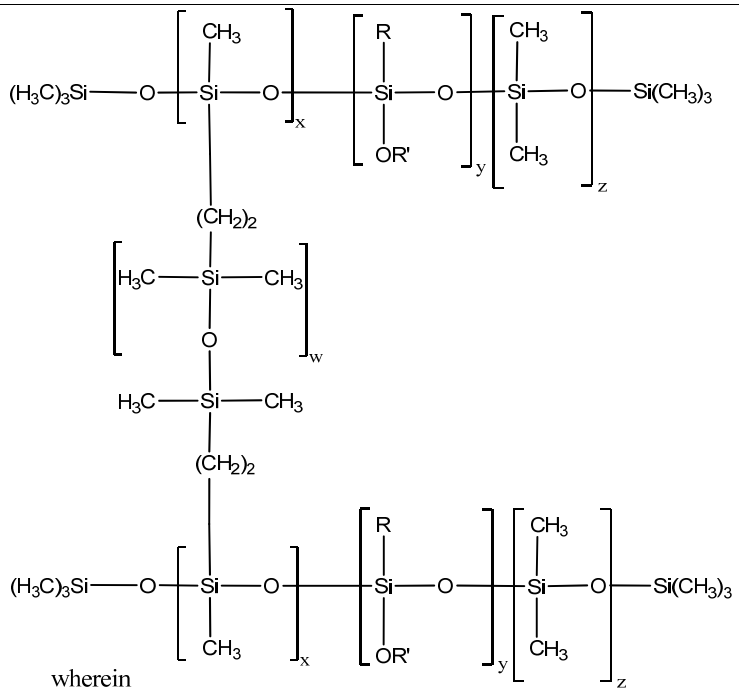
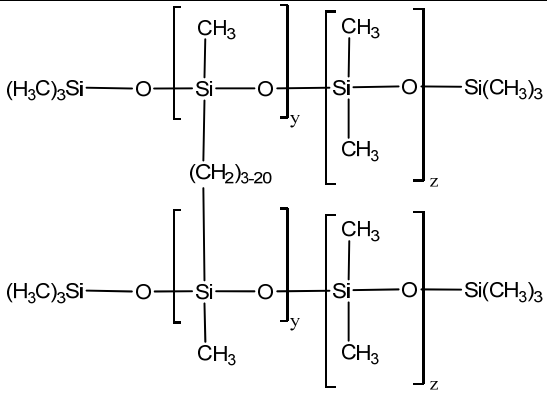
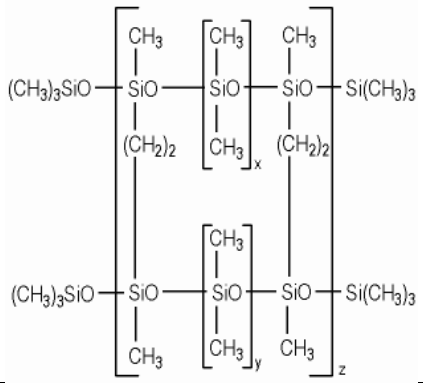
Ingredient	Idealized structure
Dimethicone/bis-vinyldimethicone/ silsesquioxane crosspolymer	 wherein R represents a hydrogen, alkyl, or aryl group R' represents crosslinks to other dimethicone backbones
Dimethicone crosspolymer 213629-14-2	
Dimethicone crosspolymer-3	

Figure 1. Idealized structures of the dimethicone crosspolymers ingredients in this safety assessment. These idealized structures are merely generalized, two-dimensional estimations of the true three-dimensional frameworks that comprise theses polymers. Though monomer units are drawn sequentially, by necessity, this by no means implies that these are block-type polymers. Instead, these structures are meant to represent only one example of the multitude of potentially produced connectivities found within these macromolecules.

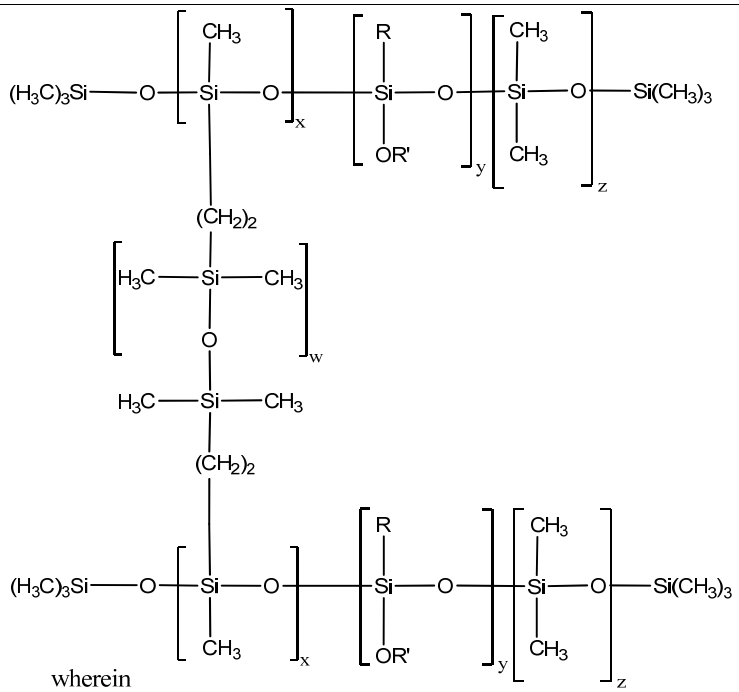
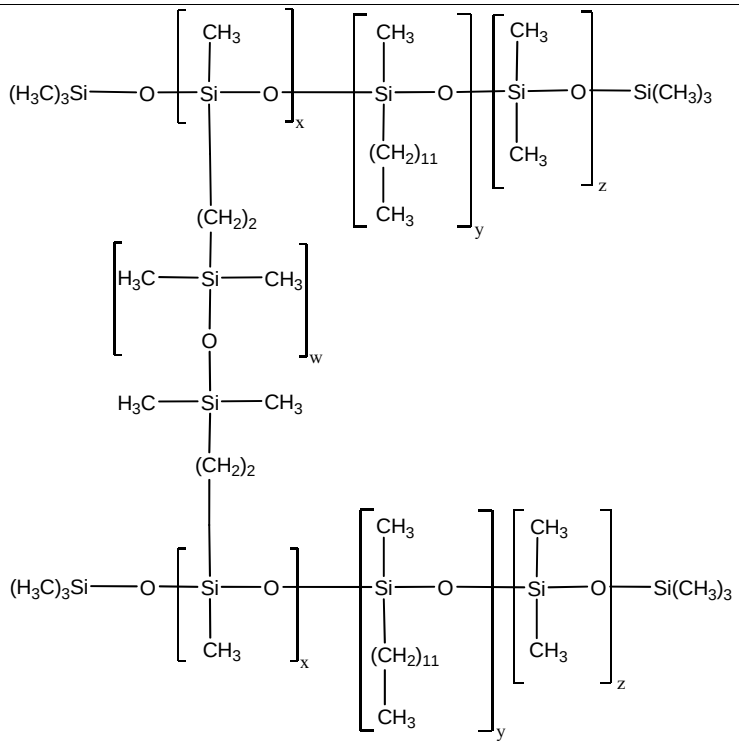
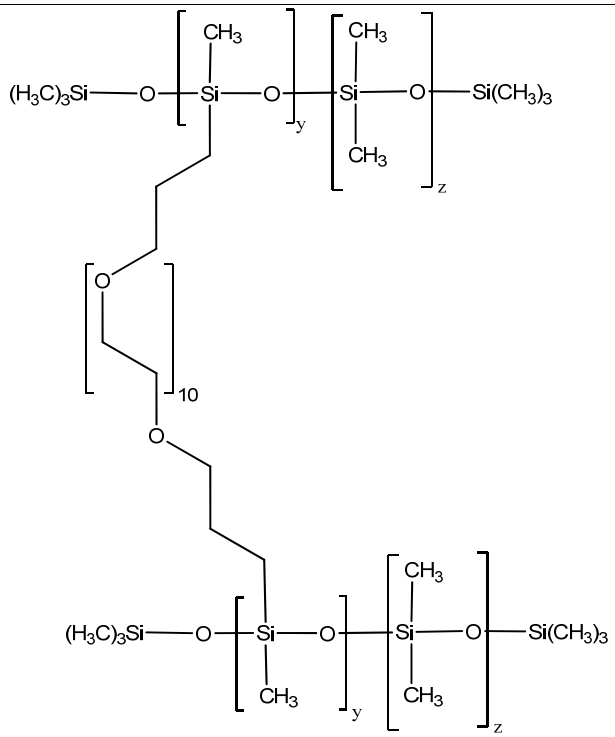
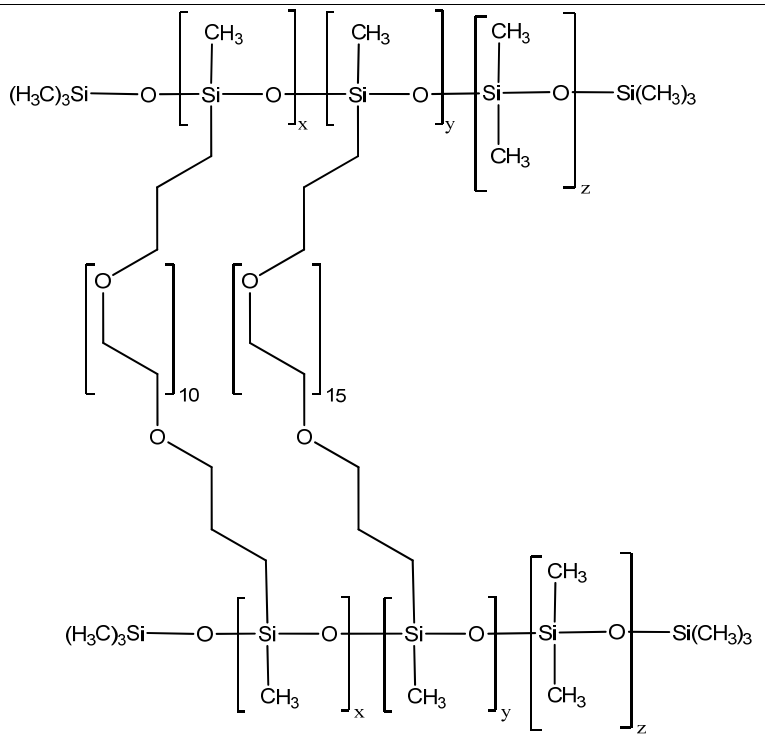
Ingredient	Idealized structure
Dimethicone/divinyldimethicone/silsesquioxane crosspolymer	 wherein R represents a hydrogen, alkyl, or aryl group R' represents crosslinks to other dimethicone backbones
Dimethicone/lauryl dimethicone/bis-vinyldimethicone crosspolymer	

Figure 1. Idealized structures of the dimethicone crosspolymers ingredients in this safety assessment. These idealized structures are merely generalized, two-dimensional estimations of the true three-dimensional frameworks that comprise theses polymers. Though monomer units are drawn sequentially, by necessity, this by no means implies that these are block-type polymers. Instead, these structures are meant to represent only one example of the multitude of potentially produced connectivities found within these macromolecules.

Ingredient	Idealized structure
Dimethicone/ PEG-10 crosspolymer	
Dimethicone/ PEG-10/15 crosspolymer	

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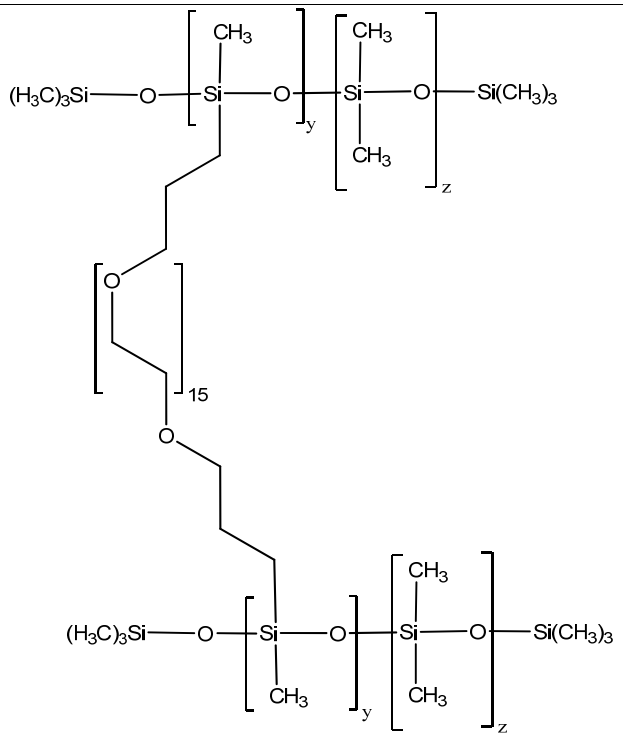
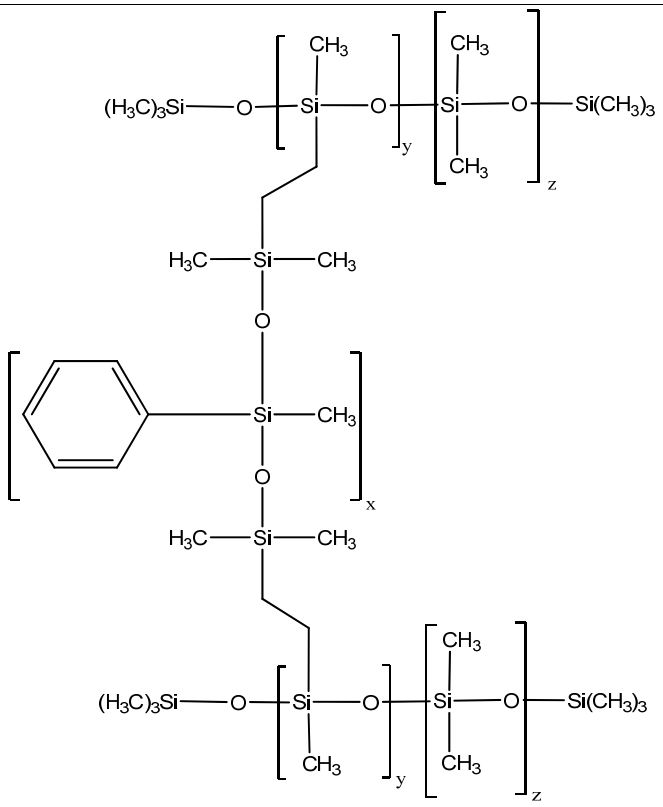
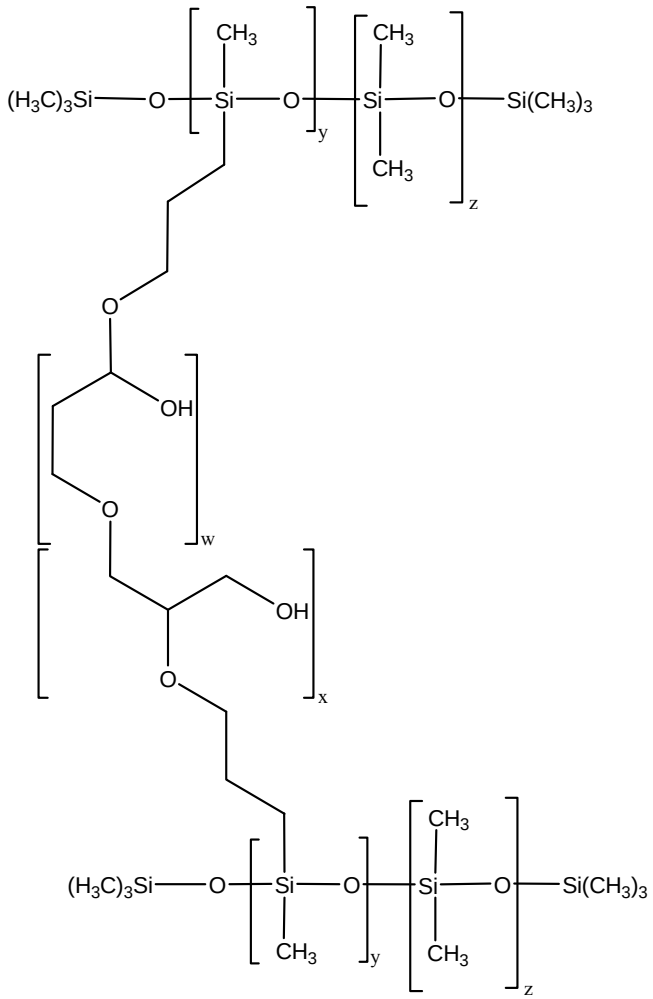
Ingredient	Idealized structure
Dimethicone/ PEG-15 crosspolymer	
Dimethicone/ phenyl vinyl dimethicone crosspolymer	

Figure 1. Idealized structures of the dimethicone crosspolymers ingredients in this safety assessment. These idealized structures are merely generalized, two-dimensional estimations of the true three-dimensional frameworks that comprise theses polymers. Though monomer units are drawn sequentially, by necessity, this by no means implies that these are block-type polymers. Instead, these structures are meant to represent only one example of the multitude of potentially produced connectivities found within these macromolecules.

Ingredient	Idealized structure
Dimethicone/polyglycerin-3 crosspolymer	

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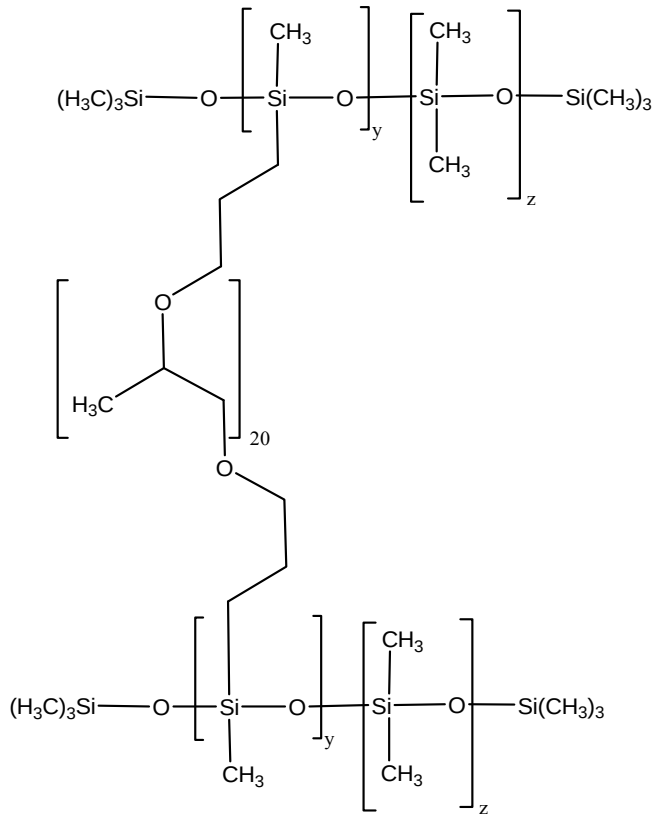
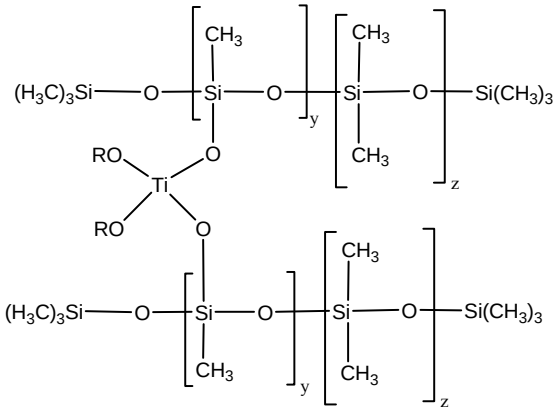
Ingredient	Idealized structure
Dimethicone/PPG-20 crosspolymer	
Dimethicone/titanate crosspolymer	 wherein R is isopropyl or an additional dimethicone crosslink

Figure 1. Idealized structures of the dimethicone crosspolymers ingredients in this safety assessment. These idealized structures are merely generalized, two-dimensional estimations of the true three-dimensional frameworks that comprise theses polymers. Though monomer units are drawn sequentially, by necessity, this by no means implies that these are block-type polymers. Instead, these structures are meant to represent only one example of the multitude of potentially produced connectivities found within these macromolecules.

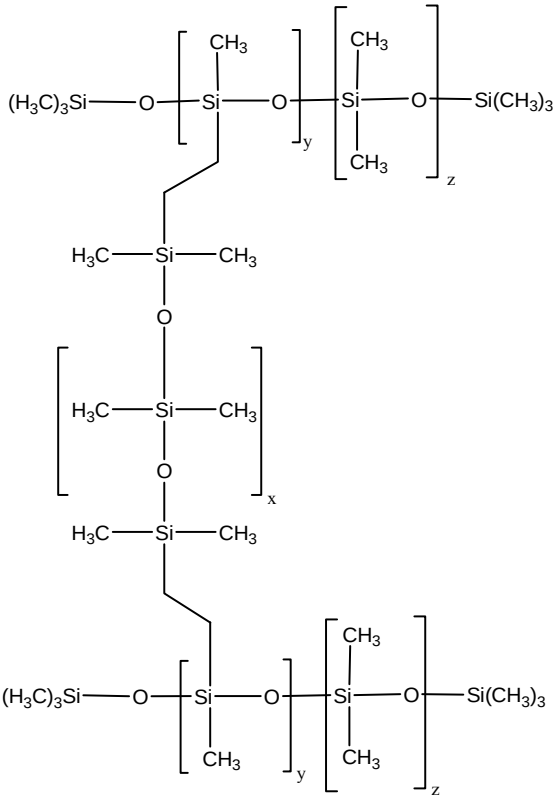
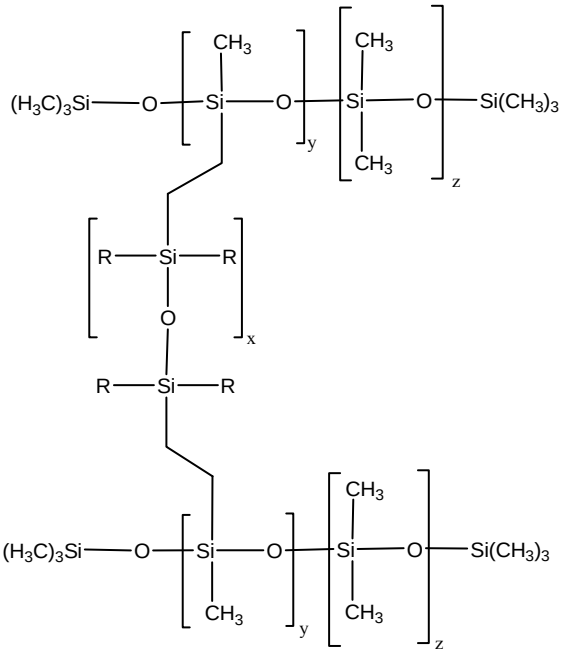
Ingredient	Idealized structure
Dimethicone/vinyl dimethicone crosspolymer	
Dimethicone/ vinyltrimethylsiloxysilicate crosspolymer	 wherein R represents a variable network of polysilicic acid units, which are endblocked with trimethylsilyl groups

Figure 1. Idealized structures of the dimethicone crosspolymers ingredients in this safety assessment. These idealized structures are merely generalized, two-dimensional estimations of the true three-dimensional frameworks that comprise theses polymers. Though monomer units are drawn sequentially, by necessity, this by no means implies that these are block-type polymers. Instead, these structures are meant to represent only one example of the multitude of potentially produced connectivities found within these macromolecules.

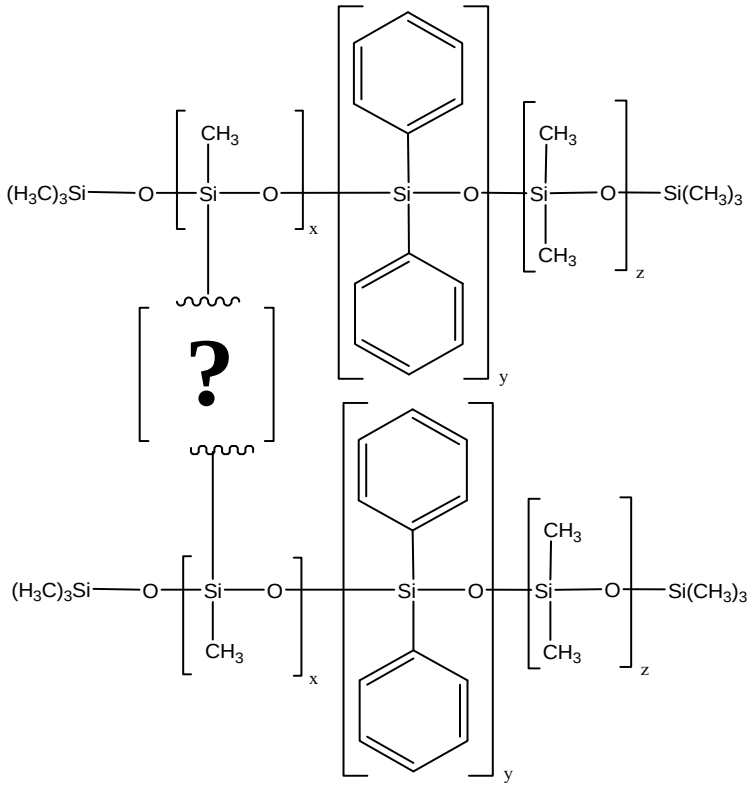
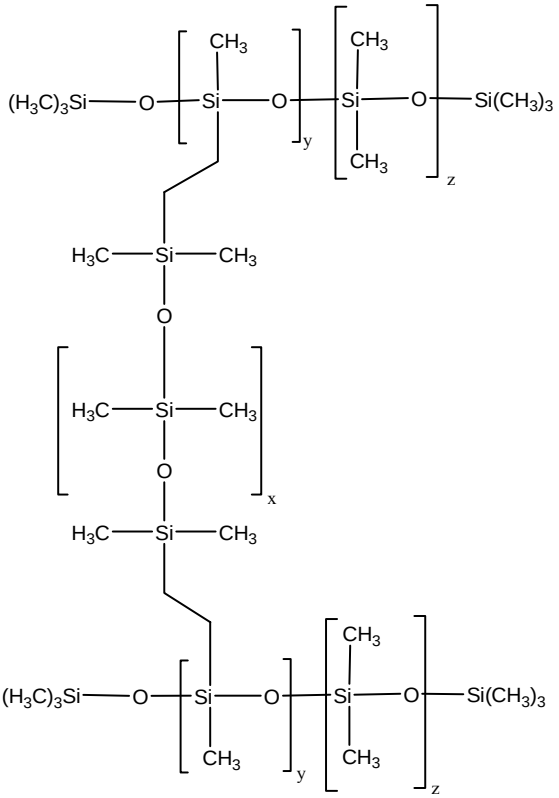
Ingredient	Idealized structure
Diphenyl dimethicone crosspolymer	
Diphenyl dimethicone/vinyl diphenyl dimethicone/ silsesquioxane crosspolymer	Diphenyl Dimethicone/Vinyl Diphenyl Dimethicone/Silsesquioxane Crosspolymer is a crosslinked copolymer of diphenyl dimethicone, vinyl diphenyl dimethicone and silsesquioxane monomers. *The crosslinking connectivity here is unclear.*
Divinyldimethicone/ dimethicone crosspolymer	

Figure 1. Idealized structures of the dimethicone crosspolymers ingredients in this safety assessment. These idealized structures are merely generalized, two-dimensional estimations of the true three-dimensional frameworks that comprise theses polymers. Though monomer units are drawn sequentially, by necessity, this by no means implies that these are block-type polymers. Instead, these structures are meant to represent only one example of the multitude of potentially produced connectivities found within these macromolecules.

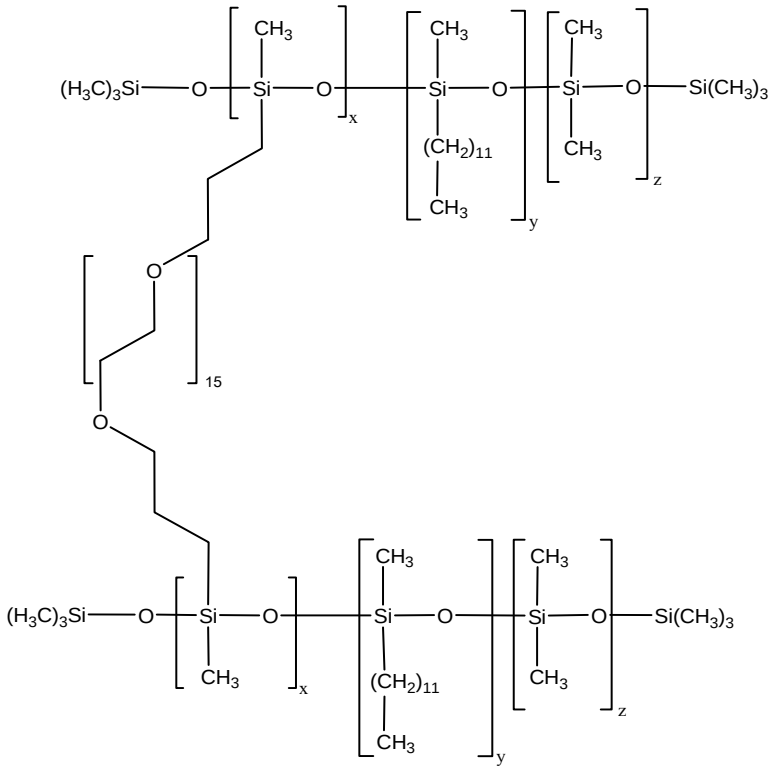
Ingredient	Idealized structure
Hydroxypropyl dimethicone/ polysorbate 20 crosspolymer	Hydroxypropyl Dimethicone/Polysorbate 20 Crosspolymer is a copolymer of Hydroxypropyldimethicone and Polysorbate 20 crosslinked with Succinic Acid. *The immense connectivity variability added by Polysorbate 20 makes a structural representation of this ingredient quite challenging.*
Isopropyl titanium triisostearate/triethoxysilyl-ethyl polydimethylsiloxyethyl dimethicone crosspolymer	Isopropyl Titanium Triisostearate/Triethoxysilylethyl Polydimethylsiloxyethyl Dimethicone Crosspolymer is a complex polymer formed by the hydrolysis and condensation of Isopropyl Titanium Triisostearate with Triethoxysilylethyl Polydimethylsiloxyethyl Dimethicone. *The immense connectivity variability in this polymer makes a structural representation of this ingredient quite challenging.*
Lauryl dimethicone PEG-15 crosspolymer	

Figure 1. Idealized structures of the dimethicone crosspolymers ingredients in this safety assessment. These idealized structures are merely generalized, two-dimensional estimations of the true three-dimensional frameworks that comprise theses polymers. Though monomer units are drawn sequentially, by necessity, this by no means implies that these are block-type polymers. Instead, these structures are meant to represent only one example of the multitude of potentially produced connectivities found within these macromolecules.

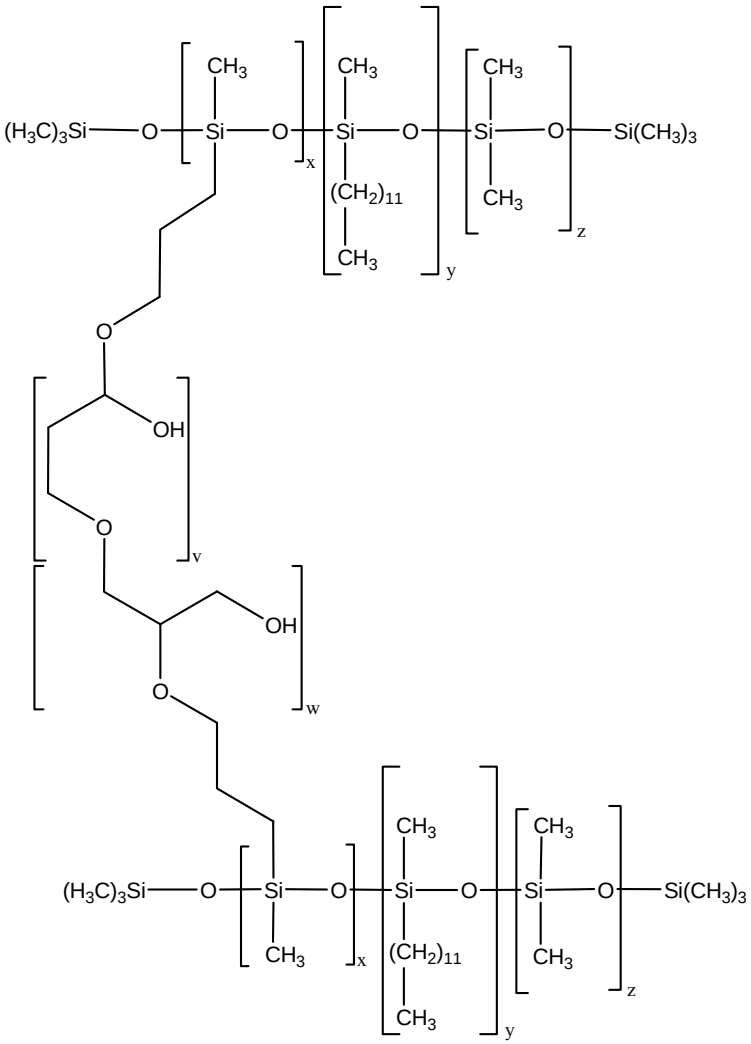
Ingredient	Idealized structure
Lauryl dimethicone/ polyglycerin-3 crosspolymer	 Wherein v + w = 3
Lauryl polydimethylsiloxyethyl dimethicone/bis-vinyldimethicone crosspolymer	Lauryl polydimethylsiloxyethyl dimethicone/bis-vinyldimethicone crosspolymer is a copolymer of lauryl polydimethylsiloxyethyl dimethicone crosslinked by bis-vinyldimethicone. *The immense connectivity variability in this polymer makes a structural representation of this ingredient quite challenging.*

Figure 1. Idealized structures of the dimethicone crosspolymers ingredients in this safety assessment. These idealized structures are merely generalized, two-dimensional estimations of the true three-dimensional frameworks that comprise theses polymers. Though monomer units are drawn sequentially, by necessity, this by no means implies that these are block-type polymers. Instead, these structures are meant to represent only one example of the multitude of potentially produced connectivities found within these macromolecules.

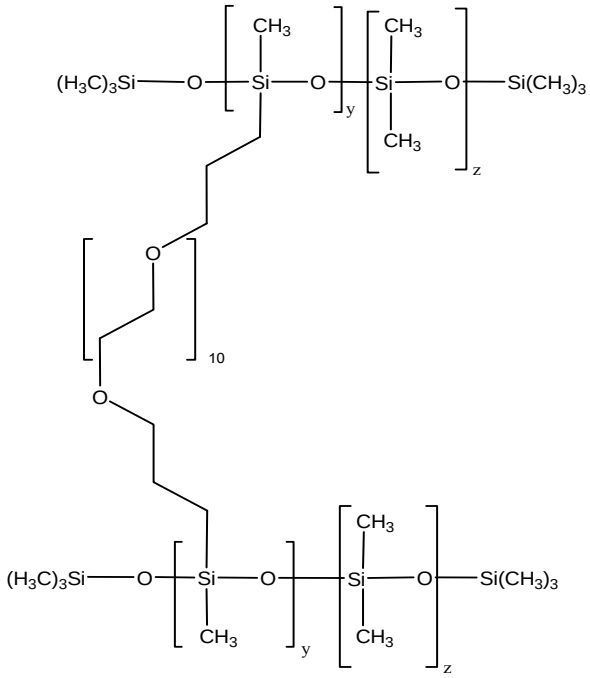
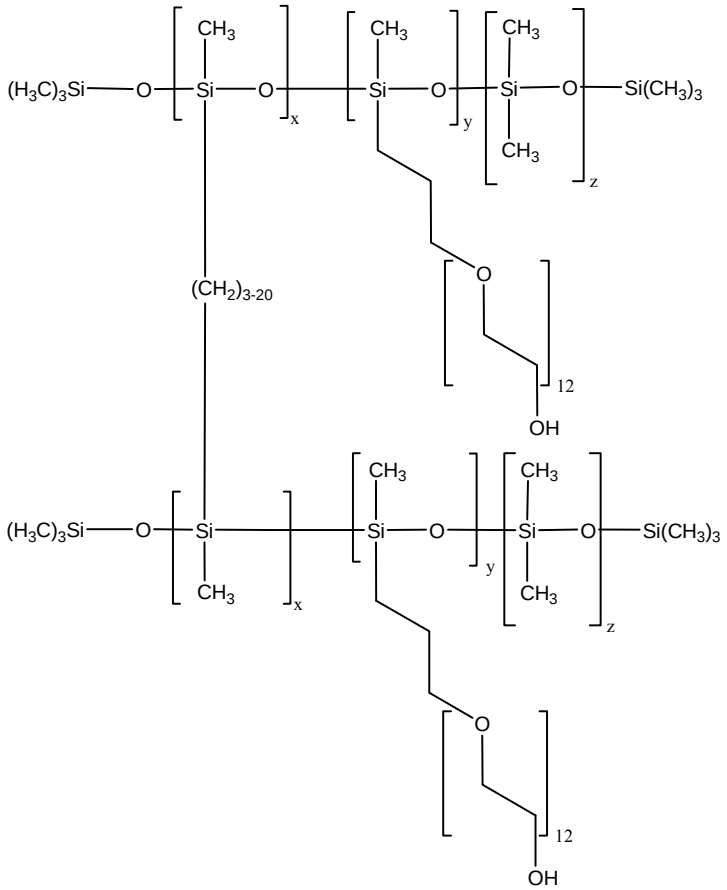
Ingredient	Idealized structure
PEG-10 dimethicone crosspolymer	
PEG-12 dimethicone crosspolymer	
PEG-8 dimethicone/ polysorbate 20 crosspolymer	PEG-8 dimethicone/polysorbate 20 crosspolymer is a copolymer of a complex mixture of esters formed from the reaction of PEG-8 dimethicone and polysorbate 20 crosslinked with Succinic Acid. *The immense connectivity variability added by Polysorbate 20 makes a structural representation of this ingredient quite challenging.*

Figure 1. Idealized structures of the dimethicone crosspolymers ingredients in this safety assessment. These idealized structures are merely generalized, two-dimensional estimations of the true three-dimensional frameworks that comprise theses polymers. Though monomer units are drawn sequentially, by necessity, this by no means implies that these are block-type polymers. Instead, these structures are meant to represent only one example of the multitude of potentially produced connectivities found within these macromolecules.

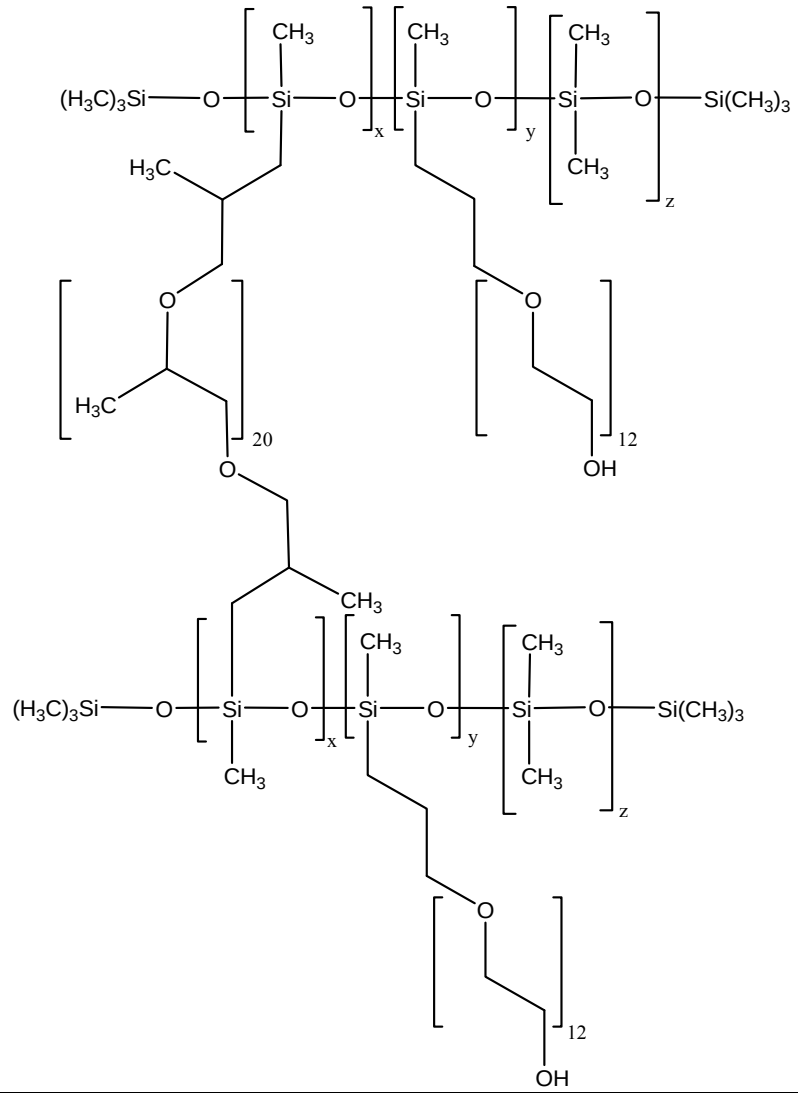
Ingredient	Idealized structure
PEG-12 dimethicone/bis-isobutyl PPG-20 crosspolymer	

Figure 1. Idealized structures of the dimethicone crosspolymers ingredients in this safety assessment. These idealized structures are merely generalized, two-dimensional estimations of the true three-dimensional frameworks that comprise theses polymers. Though monomer units are drawn sequentially, by necessity, this by no means implies that these are block-type polymers. Instead, these structures are meant to represent only one example of the multitude of potentially produced connectivities found within these macromolecules.

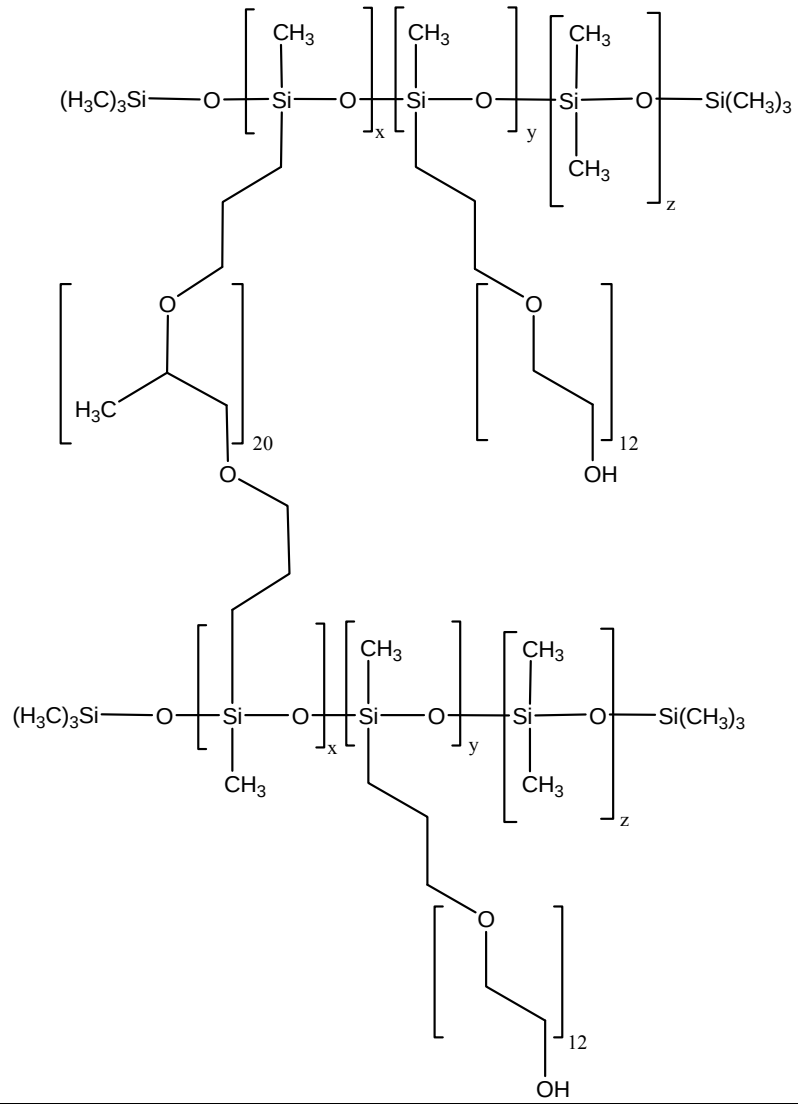
Ingredient	Idealized structure
PEG-12 dimethicone/PPG-20 crosspolymer	

Figure 1. Idealized structures of the dimethicone crosspolymers ingredients in this safety assessment. These idealized structures are merely generalized, two-dimensional estimations of the true three-dimensional frameworks that comprise theses polymers. Though monomer units are drawn sequentially, by necessity, this by no means implies that these are block-type polymers. Instead, these structures are meant to represent only one example of the multitude of potentially produced connectivities found within these macromolecules.

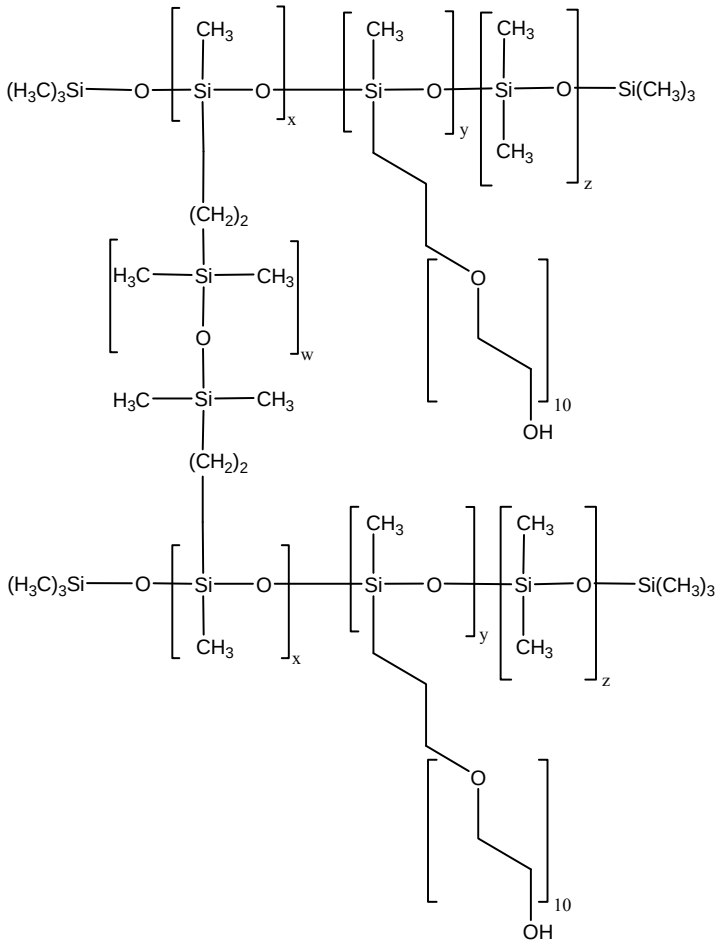
Ingredient	Idealized structure
PEG-10 dimethicone/vinyl dimethicone crosspolymer	

Figure 1. Idealized structures of the dimethicone crosspolymers ingredients in this safety assessment. These idealized structures are merely generalized, two-dimensional estimations of the true three-dimensional frameworks that comprise theses polymers. Though monomer units are drawn sequentially, by necessity, this by no means implies that these are block-type polymers. Instead, these structures are meant to represent only one example of the multitude of potentially produced connectivities found within these macromolecules.

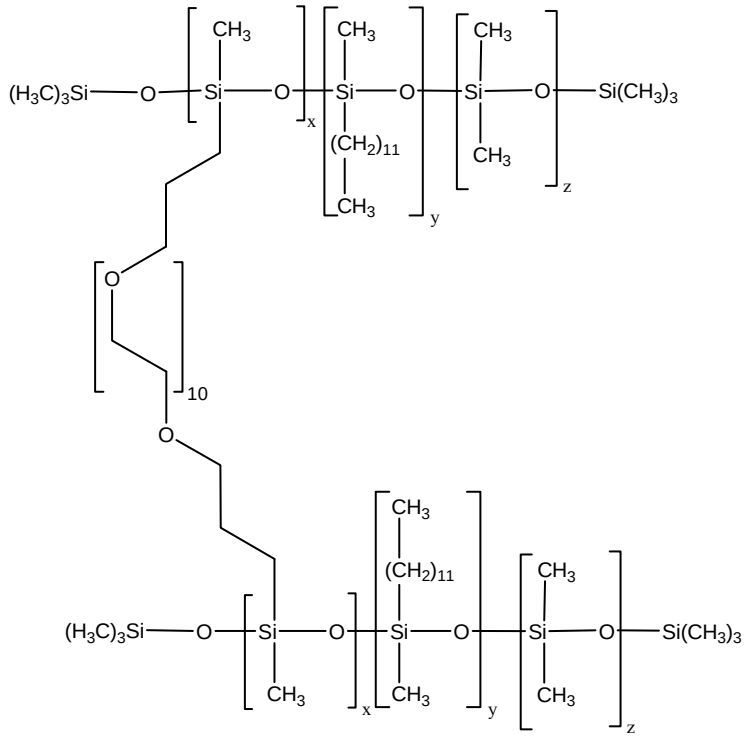
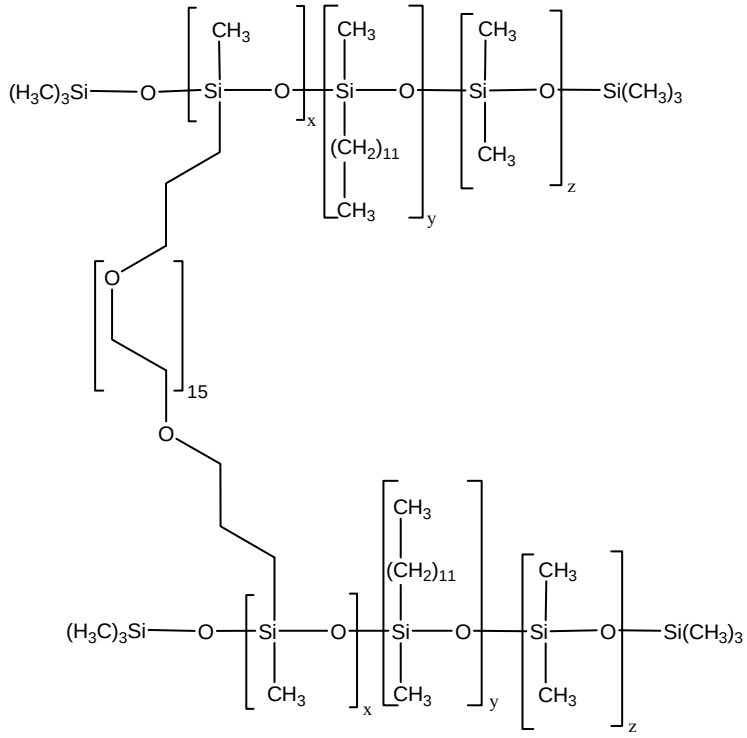
Ingredient	Idealized structure
PEG-10/lauryl dimethicone crosspolymer	
PEG-15/lauryl dimethicone crosspolymer	
PEG-15/lauryl polydimethylsiloxyethyl dimethicone crosspolymer	PEG-15/lauryl polydimethylsiloxyethyl dimethicone crosspolymer is a copolymer of lauryl polydimethylsiloxyethyl dimethicone crosslinked with diallyl PEG-15. *The immense connectivity variability in this polymer makes a structural representation of this ingredient quite challenging.*
Perfluorononyl dimethicone/ methicone/amodimethicone crosspolymer	Perfluorononyl dimethicone/methicone/amodimethicone crosspolymer is a crosslinked silicone polymer that is formed by reacting a copolymer of perfluorononyl dimethicone and methicone with methicone and amodimethicone.
Polydimethylsiloxyethyl	Polydimethylsiloxyethyl dimethicone/bis-vinyldimethicone crosspolymer is a copolymer of

Figure 1. Idealized structures of the dimethicone crosspolymers ingredients in this safety assessment. These idealized structures are merely generalized, two-dimensional estimations of the true three-dimensional frameworks that comprise theses polymers. Though monomer units are drawn sequentially, by necessity, this by no means implies that these are block-type polymers. Instead, these structures are meant to represent only one example of the multitude of potentially produced connectivities found within these macromolecules.

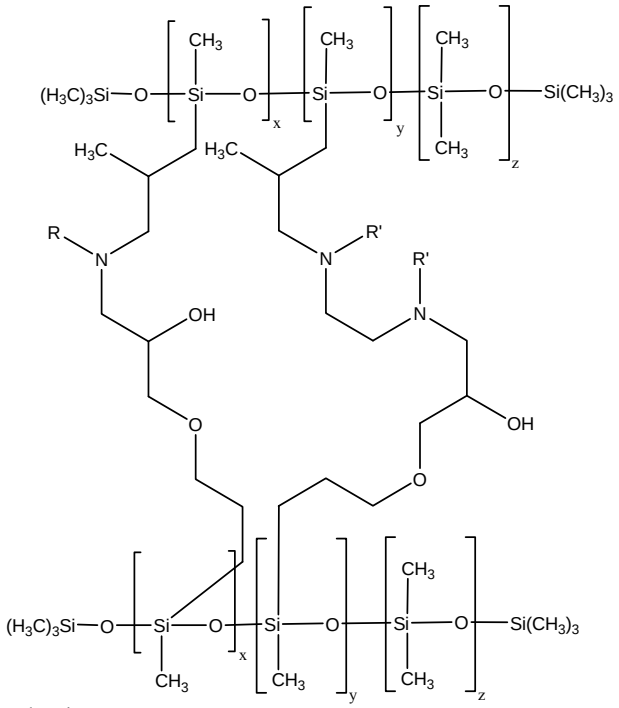
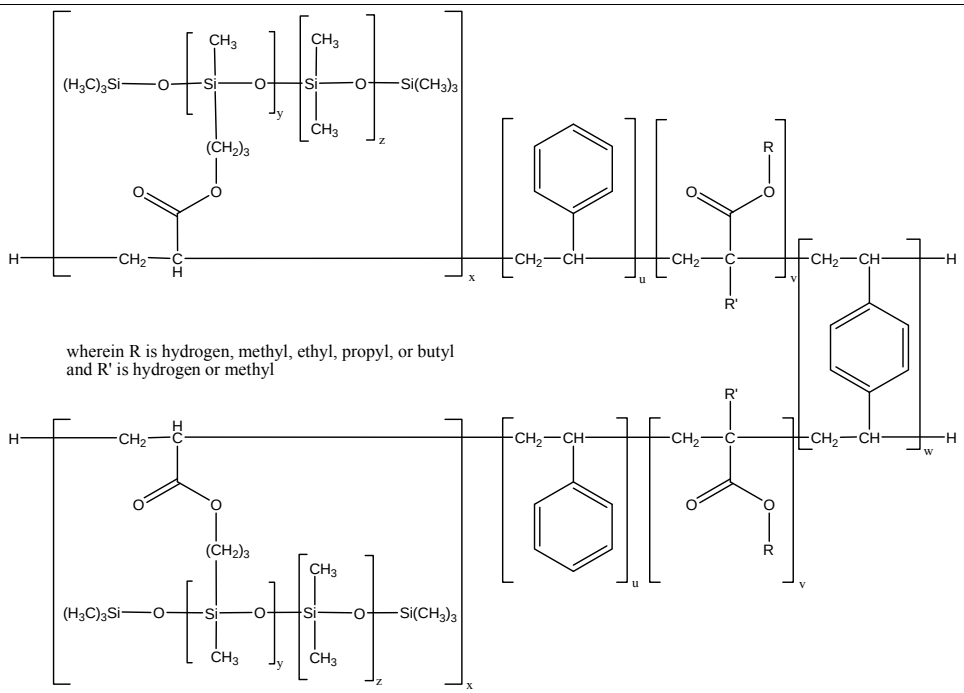
Ingredient	Idealized structure
dimethicone/bis-vinyldimethicone crosspolymer	polydimethylsiloxyethyl dimethicone crosslinked with bis-vinyldimethicone. *The immense connectivity variability in this polymer makes a structural representation of this ingredient quite challenging.*
Polyglyceryl-3/lauryl polydimethylsiloxyethyl dimethicone crosspolymer	Polyglyceryl-3/lauryl polydimethylsiloxyethyl dimethicone crosspolymer is a copolymer of lauryl polydimethylsiloxyethyl dimethicone crosslinked with an allyl polyglyceryl-3. *The immense connectivity variability in this polymer makes a structural representation of this ingredient quite challenging.*
Silicone quaternium-16/ glycidoxy dimethicone crosspolymer	
Styrene/acrylates/ dimethicone acrylate crosspolymer	

Figure 1. Idealized structures of the dimethicone crosspolymers ingredients in this safety assessment. These idealized structures are merely generalized, two-dimensional estimations of the true three-dimensional frameworks that comprise theses polymers. Though monomer units are drawn sequentially, by necessity, this by no means implies that these are block-type polymers. Instead, these structures are meant to represent only one example of the multitude of potentially produced connectivities found within these macromolecules.

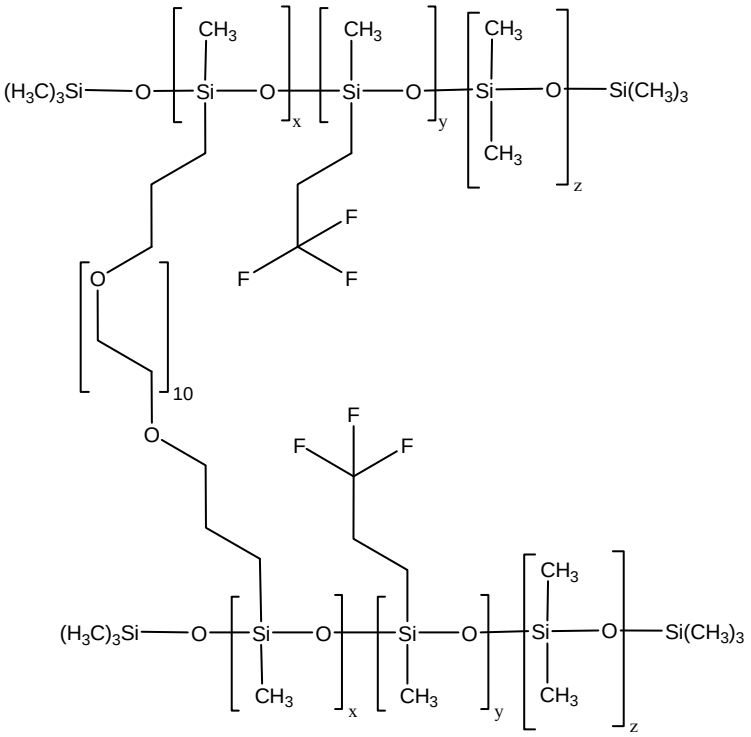
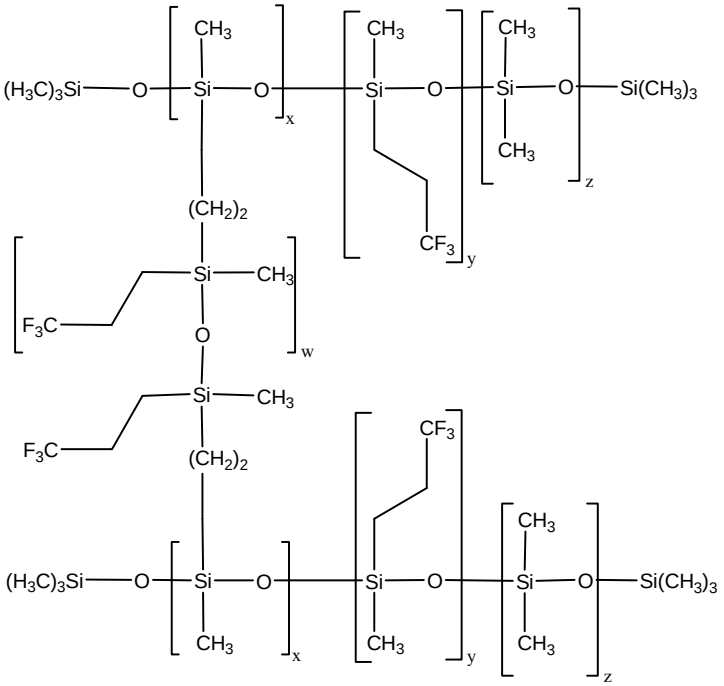
Ingredient	Idealized structure
Trifluoropropyl dimethicone/ PEG-10 crosspolymer	
Trifluoropropyl dimethicone/ trifluoropropyl divinyldimethicone crosspolymer	

Figure 1. Idealized structures of the dimethicone crosspolymers ingredients in this safety assessment. These idealized structures are merely generalized, two-dimensional estimations of the true three-dimensional frameworks that comprise theses polymers. Though monomer units are drawn sequentially, by necessity, this by no means implies that these are block-type polymers. Instead, these structures are meant to represent only one example of the multitude of potentially produced connectivities found within these macromolecules.

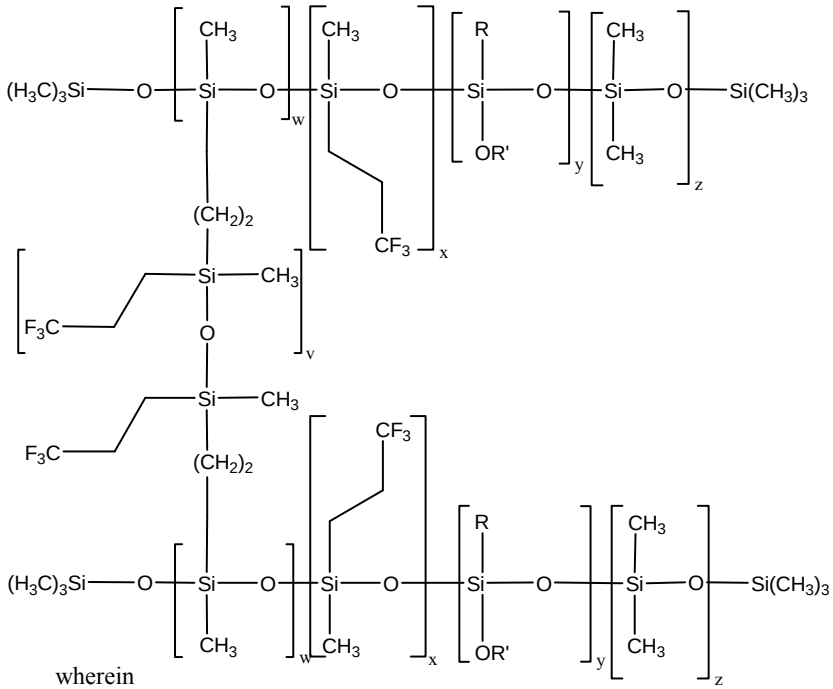
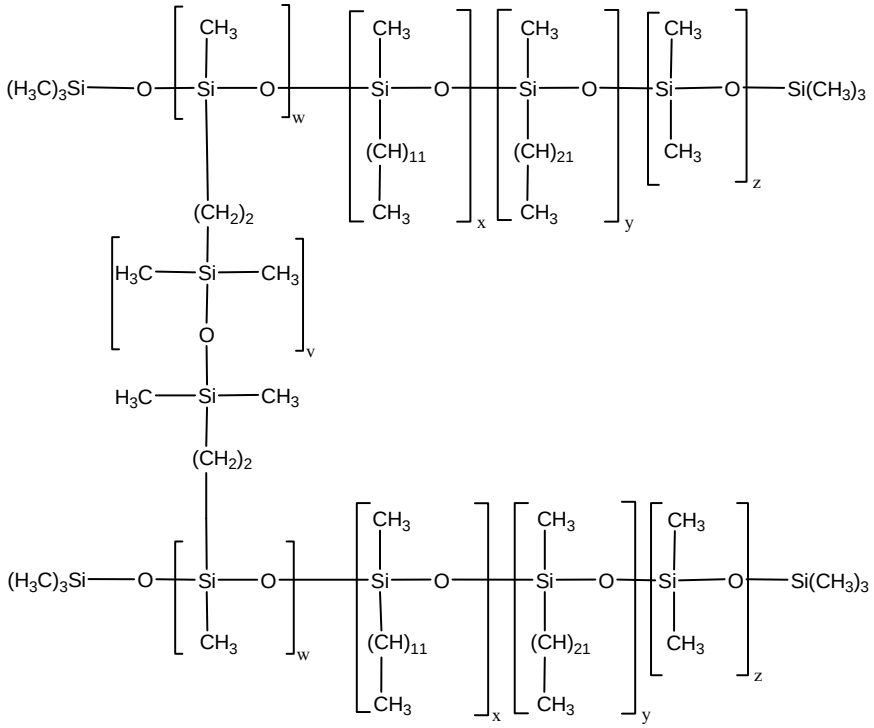
Ingredient	Idealized structure
Trifluoropropyl dimethicone/ vinyl trifluoropropyl dimethicone/silsesquioxane crosspolymer	 wherein R represents a hydrogen, alkyl, or aryl group R' represents crosslinks to other dimethicone backbones
Trimethylsiloxysilicate/ dimethicone crosspolymer	Trimethylsiloxysilicate/dimethicone crosspolymer is the product of the reaction between dimethicone and trimethylsiloxysilicate under conditions that produce rearrangement, condensation, and crosslinking of the dimethicone polymer onto the trimethylsiloxysilicate resin. *The immense connectivity variability in this polymer makes a structural representation of this ingredient quite challenging.*
Vinyl dimethicone/ lauryl/ behenyl dimethicone crosspolymer	

Figure 1. Idealized structures of the dimethicone crosspolymers ingredients in this safety assessment. These idealized structures are merely generalized, two-dimensional estimations of the true three-dimensional frameworks that comprise theses polymers. Though monomer units are drawn sequentially, by necessity, this by no means implies that these are block-type polymers. Instead, these structures are meant to represent only one example of the multitude of potentially produced connectivities found within these macromolecules.

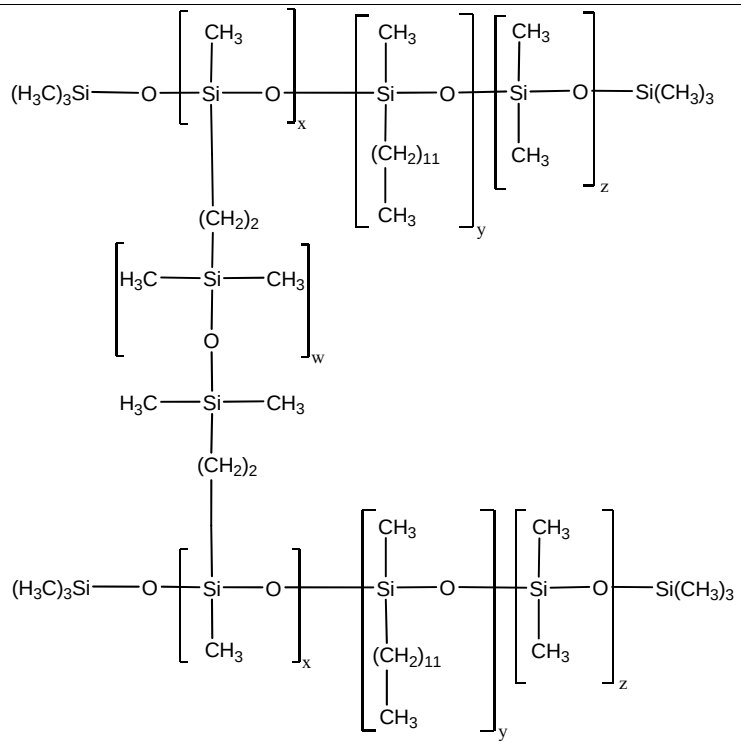
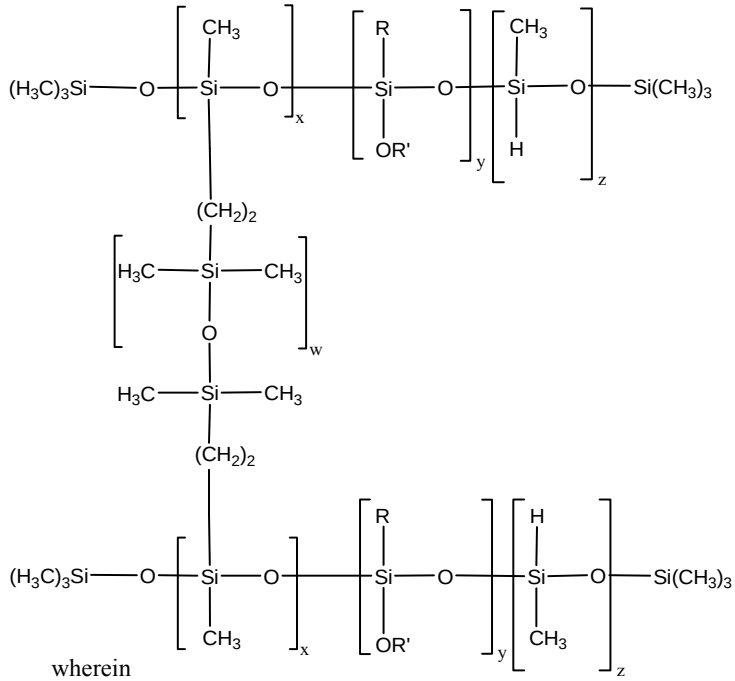
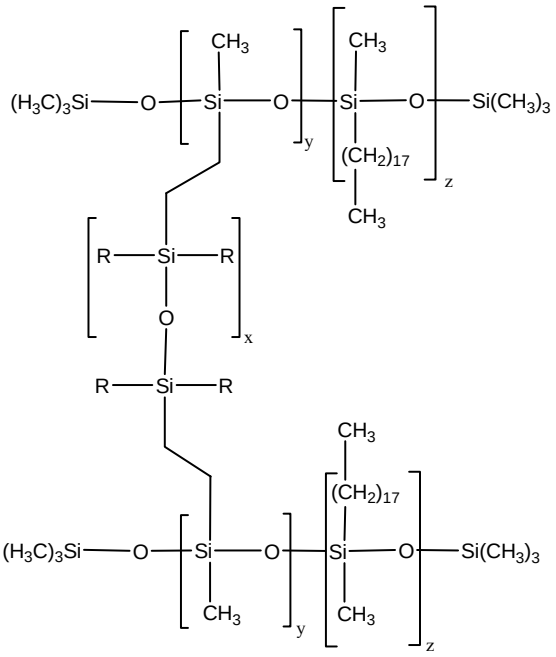
Ingredient	Idealized structure
Vinyl dimethicone/lauryl dimethicone crosspolymer	
Vinyl dimethicone/methicone silsesquioxane crosspolymer	 wherein R represents a hydrogen, alkyl, or aryl group R' represents crosslinks to other dimethicone backbones
Vinyldimethyl/ trimethylsiloxysilicate/ dimethicone crosspolymer	Monograph in development

Figure 1. Idealized structures of the dimethicone crosspolymers ingredients in this safety assessment. These idealized structures are merely generalized, two-dimensional estimations of the true three-dimensional frameworks that comprise theses polymers. Though monomer units are drawn sequentially, by necessity, this by no means implies that these are block-type polymers. Instead, these structures are meant to represent only one example of the multitude of potentially produced connectivities found within these macromolecules.

Ingredient	Idealized structure
Vinyldimethyl/ trimethylsiloxysilicate stearyl dimethicone crosspolymer	 wherein R represents methyl or a variable network of polysilicic acid units, which are endblocked with trimethylsilyl groups

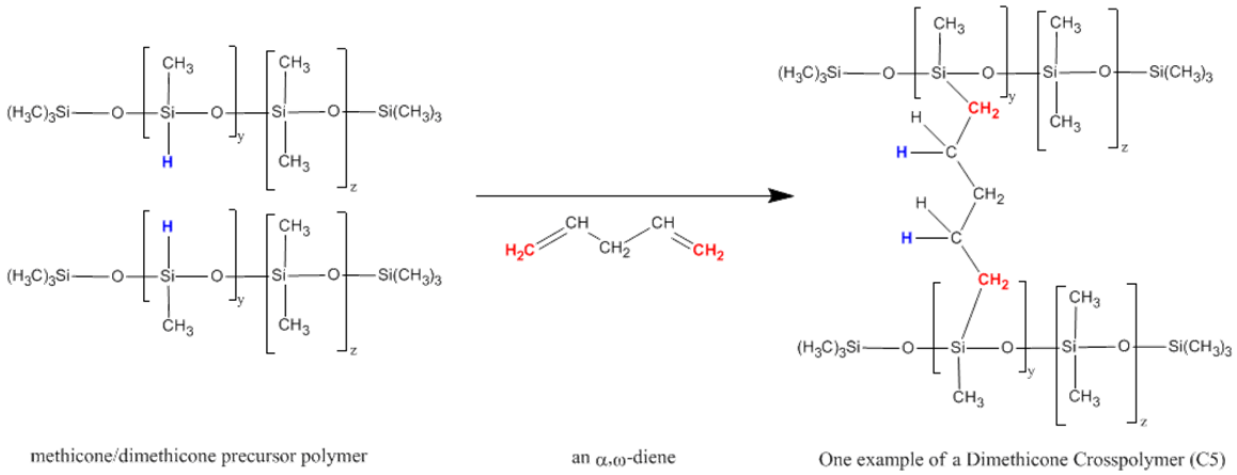


Figure 2. Example of the hydrosilation-crosslinking of a dimethicone precursor polymer.

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