
Safety Assessment of Alkyl PEG/PPG Ethers as Used in Cosmetics

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ABSTRACT

The CIR Expert Panel assessed the safety of 131 alkyl PEG/PPG ethers as used in cosmetics, concluding that these ingredients are safe in the present practices of use and concentration described in this safety assessment when formulated to be non-irritating. Most of the alkyl PEG/PPG ethers included in this review are reported to function in cosmetics as surfactants, skin conditioning agents, and/or emulsifying agents. The alkyl PEG/PPG ethers share very similar physicochemical properties with another group of ingredients that has been reviewed previously by the CIR Expert Panel and found safe when formulated to be non-irritating, i.e., the alkyl PEG ethers. The only difference between these two families is the inclusion of PPG repeat units, which are used to fine-tune the surfactant properties of this group. The Panel relied heavily on data on analogous ingredients, extracted from the alkyl PEG ethers and PPG reports, when making its determination of safety.

INTRODUCTION

This report assesses the safety of 131 alkyl PEG/PPG ethers (listed in Table 1) as used in cosmetics. Most of the alkyl PEG/PPG ethers included in this review are reported to function in cosmetics as surfactants, skin conditioning agents, and/or emulsifying agents.¹

The alkyl PEG/PPG ethers are not expected to metabolize to individual components; therefore, incorporating information from existing Cosmetic Ingredient Review (CIR) safety assessments on the individual alcohols is not relevant in this safety assessment. However, knowing that the CIR Expert Panel found 369 alkyl PEG ethers (as well as future alkyl PEG ether cosmetic ingredients that vary from those 369 ethers only by the number of ethylene glycol repeat units), and polypropylene glycols (PPGs) ≥ 3 safe as used when formulated to be non-irritating^{2,3} is relevant because these ingredients share very similar physicochemical profiles, with an internal mixture of various hydrophobicities/hydrophilicities, as expected in these sorts of alkoxy-based, surfactant-like molecules.⁴ The only difference between alkyl PEG ethers and alkyl PEG/PPG ethers is the inclusion of PPG repeat units which is simply used to fine-tune the surfactant properties of these ingredients.

At first glance, it appears there are very little data available on the alkyl PEG/PPG ether ingredients. However, data on analogous ingredients provide a good indication of the lack of toxicity of these ingredients. Accordingly, summary data from the alkyl PEG ether² and PPG^{3,5} reports are included in this report as appropriate.

CHEMISTRY

Definition and Structure

Alkyl PEG/PPG ethers are the reaction products of an alkyl alcohol and one or more equivalents each of ethylene oxide and propylene oxide (forming repeats of polyethylene glycol (PEG) and polypropylene glycol (PPG), respectively).

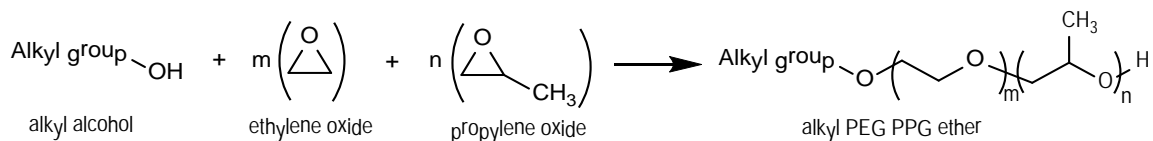


Figure 1. Alkyl PEG/PPG Ether synthesis

The definition of each ingredient, as given in the *International Cosmetic Ingredient Dictionary and Handbook*, is provided in Table 2.¹

PPG-2-Laureth-5 represents one of the simplest ingredients in this review as the reaction product of lauryl alcohol, five equivalents of ethylene oxide, and two equivalents of propylene oxide.

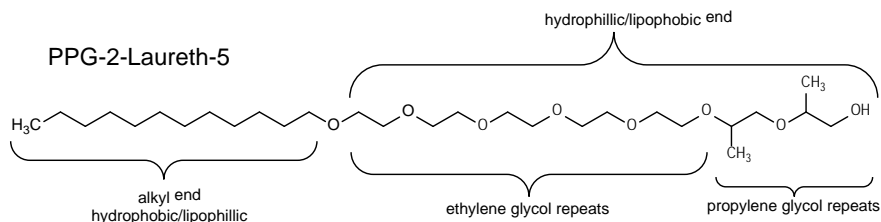


Figure 2. Alkyl PEG/PPG Ether structure – example: PPG-2-Laureth-5

Each of the alkyl PEG/PPG ethers is a surfactant-like molecule, with a chain structure that has a hydrophobic end and a hydrophilic end. Principally, these ingredients differ by variation of the alkyl chain length at the hydrophobic end and the number of alkoxide (PEG and PPG) repeat units at the poly-alkoxide, hydrophilic end. The structures in this report are drawn as block-type, alkoxide polymers only for simplicity's sake. The actual order of alkoxide repeats in each ingredient, and from each source of an ingredient, may be block, alternating, or random.

There are a number of nomenclature conventions to be aware of in this group. For example, PEG-4-PPG-7 C13/C15 alcohol is an ingredient wherein the alkyl chain is variably thirteen or fifteen carbons long ("C13/C15 alcohol") and the poly-alkoxide end consists of *an average* of four ethylene glycol repeats and seven propylene glycol repeats ("PEG-4-PPG-7"). PPG-2-laureth-5 is an ingredient (as shown in Figure 2) wherein the alkyl chain is derived from lauryl alcohol (i.e., is twelve carbons long; "laur") and the poly-alkoxide end consists of an average of five ethylene glycol repeats ("eth-5") and two propylene glycol repeats ("PPG-2"). As an example of a further variation on the naming convention, PEG/PPG-40/2 propylheptyl ether is an ingredient wherein the hydrophobic end is a seven carbon alkyl chain ("heptyl"), with a three carbon branch at the 2-position ("propyl"; this naming convention indicates a Guerbet alcohol, and thus substitution at the 2-position), and the poly-alkoxide end is comprised of *an average* of forty ethylene glycol repeats and two propylene glycol repeats ("PEG/PPG-40/2").

The dimethyl ethers are distinct in this group by being capped at both ends with methyl groups, instead of having one alkyl chain at one end. For example, PEG/PPG-3/6 dimethyl ether is an ingredient wherein one carbon is at each end of a poly-oxide chain, comprised of an average of three ethylene glycol repeats and six propylene glycol repeats.

Physical and Chemical Properties

Physical and chemical properties data on the alkyl PEG/PPG ethers are provided in Table 3.⁶⁻²⁷ Very few published data on specific properties were available, other than most of the alkyl PEG/PPG ethers are clear to slightly yellow liquids.

The alkyl PEG/PPG ethers, as alkoxyate polymers, are generally not defined as a single compound, but as a mixture of a homologous series with a medium-range molecular weight and a specific percentage by weight of the hydrophobic tail.²⁸ The degree of hydrophobicity and hydrophilicity are fine-tuned by the components that make up each ether. The hydrophobicity of the product can be controlled by the fatty alcohol used and the distribution of the propylene glycol block; alternatively, the hydrophilicity is controlled by varying the length and position of the ethylene glycol repeats.

Method of Manufacture

The manufacture of alkyl PEG/PPG ethers consists of a number of variable steps.²⁹ The first step typically involves activating the alkyl alcohol (e.g., lauryl alcohol) with a metal hydroxide (e.g., potassium hydroxide), thereby generating an alkoxide (e.g., lauroxide; i.e. the initiator). This alkoxide is then reacted with ethylene oxide, propylene oxide, or a mixture of both (a mixture for random poly-alkoxides and consecutively for block poly-alkoxides; i.e., propagation). The propagation of the poly-alkoxide is then terminated with a Brønsted-Lowry type acid (e.g., hydrochloric acid), or in the case of the dimethyl ethers, a methyl halide (e.g., methyl iodide). This synthetic pathway (specifically, the addition of ethoxide) can potentially lead to the generation of some 1,4-dioxane; however, this byproduct can be monitored easily by gas chromatography and minimized via suitable process and purification accommodations.

Inclusion of propylene oxide into nonionic surfactants can be accomplished by 1) placement of a single block of propylene oxide between the alcohol and a block of ethylene oxide; 2) by placing a single block of propylene oxide after a single block of ethylene oxide; 3) by direct placement into the polyoxyethylene portion as a propylene oxide block or as an ethylene oxide-propylene oxide mix; or 4) by placing a single propylene oxide block in the middle of the ethylene oxide chain.³⁰ The propylene oxide placement affects the physical and surface active properties.

Impurities

No published impurities data were found, other than one source stating that PPG-25-laureth-25 contains ≤ 10 mg/L 1,4-dioxane.³¹

It is not expected that there would be any significant amount of the residual starting materials used in the manufacture of the alkyl PEG/PPG ethers (i.e., ethylene oxide and propylene oxide) or any significant amount of the residual by-product 1,4-dioxane found in these ingredients. Since these are volatile compounds, any levels present are expected to be low.

It is important that the formulators keep the levels of these starting materials and residual by-product low. The National Toxicology Program (NTP) *Report on Carcinogens, Twelfth Edition* states that ethylene oxide is known to be a human carcinogen based on sufficient evidence of carcinogenicity from studies in humans, including epidemiological studies and studies on mechanisms of carcinogenesis,³² and that propylene oxide and 1,4-dioxane are reasonably anticipated to be human carcinogens based on sufficient evidence of carcinogenicity from studies in experimental animals.^{33,34} The International Agency for Research on Cancer (IARC) concluded there is limited evidence in humans and sufficient evidence in experimental animals for the carcinogenicity of ethylene oxide, with an overall evaluation that ethylene oxide is carcinogenic to humans.³⁵ For propylene oxide and 1,4-dioxane, the IARC concluded there is inadequate evidence in humans and there is

sufficient evidence in experimental animals for carcinogenicity, with an overall evaluation that propylene oxide is possibly carcinogenic to humans.^{35,36}

USE

Cosmetic

The alkyl PEG/PPG ethers included in this review are reported to function in cosmetics mostly as surfactants, skin conditioning agents, and/or emulsifying agents.¹ The function(s) of each ingredient are provided in Table 2.

The FDA collects information from manufacturers on the use of individual ingredients in cosmetic formulations as a function of cosmetic product category in its Voluntary Cosmetic Registration Program (VCRP). VCRP data obtained from the FDA in 2013³⁷ and data received in response to a survey of the maximum reported use concentration by category conducted by the Personal Care Products Council (Council)^{38,39} indicate that 26 of the 131 alkyl PEG/PPG ethers named in this safety assessment are currently used in cosmetic formulations; additionally, according to VCRP data, PPG-30-decyltetradeceth-10, an ingredient not named in the *International Cosmetic Ingredient Dictionary and Handbook*, has one reported use. PPG-5-ceteth-20 has the most reported uses, 445, followed by and PEG/PPG-36/41 dimethyl ether, 243 reported uses, and PPG-1-trideceth-6, 224 reported uses. All other in-use ingredients have less than 40 reported uses. (Table 4.)

According to the results of the concentration of use survey, PPG-5-ceteth-20 and PEG/PPG-14/7 dimethyl ether have the highest reported concentrations of use in leave-on formulations; PPG-5-ceteth-20 is used at up to 10% in “other” fragrance preparations and in tonics, dressings, and other hair grooming aids, and PEG/PPG-14/7 dimethyl ether is used at up to 7% in face and neck products and body and hand products. PPG-2-isodeceth-12 has the highest use concentration in rinse-off products; it is used at up to 10% in paste masks and mud packs. All other in-use alkyl PEG/PPG ethers are reported to be used in leave-on products at concentrations of 5% or below (Table 4). The 105 alkyl PEG/PPG ethers not reported to be in use are listed in Table 5.

In some cases, reports of uses were received in the VCRP, but no concentration of use data are available. For example, PPG-2-cetareth-9 is reported to be used in 9 cosmetic formulations, but no use concentration data were reported. Additionally, for some ingredients, no reported uses were received in the VCRP, but a use concentration was provided in the industry survey. For example, PEG/PPG-55/28 dimethyl ether was not reported to be in use in the VCRP, but the industry survey indicated that it is used at up to 5% in shampoos and other non-coloring hair preparations and at 3% in face and neck formulations. It should be presumed in these cases that there is at least one use in every category for which a concentration is reported.

Some alkyl PEG/PPG ethers are reported to be used in products that are applied to baby skin (e.g., PPG-25-laureth-25 has one reported use in “other” baby products), to the eye area or mucous membranes (e.g., PEG/PPG-14/7 dimethyl ether is used in eye lotions at 5%), or that could possibly be ingested (e.g., PEG/PPG-36/41 dimethyl ether is used at 5% in lipsticks). Additionally, some of the alkyl esters are used in cosmetic sprays and could possibly be inhaled; the maximum reported use in spray formulation is 7% PEG/PPG-14/7 dimethyl ether in spray body and hand products. 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.^{40,41} 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.^{42,43}

Some of the alkyl PEG/PPG ethers are used in spray deodorant products at low concentrations of use; the highest reported use concentration of this type was 0.19% PPG-8-ceteth-20.³⁸ 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.⁴³ 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.

All of the alkyl PEG/PPG ethers included in this report appear in the European Commission database with information on cosmetic ingredients and substances (CosIng) inventory.⁴⁴ Listing in the inventory does not indicate the ingredients are actually used in cosmetic products or approved for such use.

Non-Cosmetic

In Europe, PPG-4-trideceth-6 can be used at 0.05 mg/kg in food contact materials; it is to be used only in polytetrafluoroethylene (PTFE) items sintered at high temperatures.⁴⁵ (PTFE is the non-stick coating used on cookware).⁴⁶

The inclusion of PPG-5-ceteth-20 in the development of dermal⁴⁷ and nasal⁴⁸ drug delivery systems is being evaluated.⁴⁷ In both studies, systems composed of PPG-5-ceteth-20, oleic acid, and water were used to form thermodynamically-stable microemulsions that could phase into a liquid crystalline matrix.

Other examples of non-cosmetic industrial uses are provided in Table 6.^{6,13,26}

TOXICOKINETICS

Published absorption, distribution, metabolism, and excretion data were not found. However, data on analogous compounds are available from the safety assessments of the alkyl PEG ethers and PPGs, and summaries of these data follow.

From the CIR safety assessment of Alkyl PEG Ethers: ²

According to the original laureths report, in general, alkyl PEG ethers are readily absorbed through the skin of guinea pigs and rats and through the intestinal mucosa of rats, and they are quickly eliminated from the body through the urine, feces, and expired air. In rats, compounds analogous to laureth-9 are rapidly absorbed and excreted in the urine after oral, intraperitoneal, and subcutaneous dosing. Two distinct polar metabolites were identified in the urine for each compound tested. The length of the alkyl chain appeared to have an effect on metabolism, with excretion of longer alkyl chains occurring at a higher proportion in expired air and less in urine. Similar results were found following oral administration in humans. Again, the major route of excretion was the urine. The metabolic product of each compound was a defined function of carbon chain length. However, the longer carbon chain ethoxylates produced more metabolic CO₂ and less urinary elimination products. The degradation of ether linkage and oxidation of the alkyl chain to form lower molecular weight PEG-like compounds and carbon dioxide and water appeared to be the major degradation pathway of alcohol ethoxylates.

In dermal metabolism studies with hairless mice, the 4-hour percutaneous absorption decreased from 22.9% for laureth-1 to 2.1% for laureth-10 solutions, 0.25% in ethanol. The absorbed laureths were rapidly metabolized to carbon dioxide. Compounds analogous to laureth-9 readily penetrated the skin of rats, and approximately 50% of the absorbed dose was excreted. Using human subjects, the majority of the dose could be wiped away from the test site after 8 h; less than 2% was found in the urine. With atopic patients, the calculated dermal absorption rate for laureth-9 was 0.0017% for a diluted bath oil and 0.0035% with after-shower application. For PEG-3 methyl ether, however, in vitro absorption data indicated that it would not readily penetrate the skin.

From the CIR safety assessment of PPGs: ^{3,5}

Animal studies using PPGs with avg mol wts of 425-2025 indicated that PPGs are readily absorbed from the gastrointestinal tract and excreted in the urine and feces.

Dermal penetration of propylene glycol from a ternary cosolvent solution through hairless mouse skin was 57% over a 24 h period. However, in a study in which propylene glycol was applied to the finger tip of a human subject, the results of thermal emission decay-Fourier transform infrared spectroscopy indicated that propylene glycol did not reach the dermis.

Penetration Enhancement

PPG-4-ceteth-20 did not enhance the penetration of tenoxicam, a non-steroidal anti-inflammatory drug, through guinea pig skin.⁴⁹ An in vitro study was performed in which the permeation through guinea pig skin of a 1.0% tenoxicam suspension containing 10% propylene glycol and 5.0% PPG-4-ceteth-20 was compared to that of tenoxicam without the surfactant. One gram of the test material was applied to the skin sample, and the receptor fluid was sampled every 3 h, for 48 h. The steady-state flux was $8.11 \pm 0.56 \times 10^{-5} \mu\text{g/s} \cdot \text{cm}^2$ for tenoxicam without surfactant and $7.28 \pm 0.94 \times 10^{-5} \mu\text{g/s} \cdot \text{cm}^2$ for tenoxicam with PPG-4-ceteth-20; penetration rates were not statistically significantly different.

From the CIR safety assessment of Alkyl PEG Ethers: ²

Some alkyl PEG ethers, such as cetareths and oleths, have been reported to enhance the penetration of certain compounds through the skin.

From the CIR safety assessment of PPGs: ³

Propylene glycol can act as a penetration enhancer for some chemicals and under some conditions. Often, it works synergistically with other enhancers. The mechanism by which propylene glycol enhances penetration has not been definitively identified.

TOXICOLOGICAL STUDIES

No published single-dose or repeated-dose toxicity or ocular irritation studies were found. However, data on analogous compounds are available from the safety assessments of the alkyl PEG ethers and PPGs, and summaries of these data follow.

Single-Dose (Acute) Toxicity

From the CIR safety assessment of Alkyl PEG Ethers: ²

Acute oral toxicity data were available for some of the laureths, PEG methyl ethers, and the C- pareth ingredients. C9-11 Pareth-8, C14-15 pareth-11, and C14-15 pareth-13 had the lowest LD₅₀ values, which were 1 mg/kg in rats. Many of the LD₅₀ values were in the range of 2300-3300 mg/kg, with some, such as C12-13 pareth-2, having a value >10,000 mg/kg.

Dermally, the data available indicated the LD₅₀ values for rats and rabbits were mostly >2000 mg/kg for these families of ingredients. Specifically for laureth-4, the dermal LD₅₀ ranged from 0.93-1.78 ml/kg for rabbits, and the researchers indicated that, in rats, the potential for neurotoxicity was observed. In acute inhalation studies with PEG-3 methyl ether, an LC₅₀ value was not established, as all animals survived exposure to 200 mg/L for 1 h and to concentrated vapors for 8 h.

From the CIR safety assessment of PPGs:^{3,5}

The oral LD₅₀ of propylene glycol was >21 g/kg for rats. The LD₅₀ of PPG, mol wts 300-3900, ranged from 0.5-40 g/kg for rats, while the oral LD₅₀ of PPGs, mol wts not given, ranged from 1.5-17 g/kg for guinea pigs. The dermal LD₅₀ of propylene glycol was >11.2 g/kg for mice and was 13 g/kg for rats. The dermal LD₅₀ of PPG, mol wts 425-2025, was >20 ml/kg for rabbits.

Repeated-Dose Toxicity

From the CIR safety assessment of Alkyl PEG Ethers:²

In 21-day, 90-day and 2-yr feeding studies, compounds analogous to laureth-9 had no-observable adverse effect levels (NOAELs) of 459-519, 50-785, and 50-162 mg/kg bw in rats. In a 13-day oral study with an unspecified deceth, doses of ≥25 g/kg resulted in death in rabbits. In a 14-day drinking water study, PEG-3 methyl ether was mildly to moderately toxic at 4 g/kg and severely toxic at ≥8 g/kg, while in a 91-day drinking water study, PEG-3 methyl ether had a NOAEL of 400 mg/kg/day for liver effects; testicular effects were observed, but were attributed to contamination with 2-methoxyethanol. In a 13-wk dietary study, a dose of ≤10,000 ppm C14-15 parath-7 produced some differences compared to controls in organ weights and clinical chemistry and hematology values, but since no microscopic lesions were observed, these were not considered toxicologically significant. For an unspecified oleth administered orally to rats, doses of ≥750 mg/kg resulted in either death or significant signs of toxicity, and 1 of 6 animals given 3000 mg/kg/day for 17 days was killed in moribund condition; however, at necropsy, the organs and tissues appeared normal.

In a 2-wk dermal study, dosing with 495-1980 mg/kg/day undiluted laureth-4 under occlusion did not result in erythema or edema, and no toxicologically significant results were reported, while in a 13-wk study, moderate localized erythema was observed at all doses of 2.5% aq. C₁₄₋₁₅ alkyl ethoxylate number (AE)₇ in rabbits. For PEG-3 methyl ether, some erythema and edema were observed with occlusive applications of 1000 mg/kg/day in a 12-day study using rats; however, one study using rats reported a NOAEL of 4000 mg/kg/day. Similar results were observed with PEG-7 methyl ether in 14- and 21-day studies, in which ≤5000 mg/kg, unoccluded, produced slight to moderate erythema and desquamation in rats and a 50% solution applied unocclusively produced slight to moderate erythema and slight desquamation in rabbits. No results observed with any of the PEG methyl ethers were considered toxicologically significant. The dermal responses observed in a 13 wk studies involving application of ≤25% aq. C₉₋₁₁ parath-6 to rats (epidermal thickening with hyperkeratosis) or a 0.5% solution of an unspecified talloweth to rabbits (slight irritation, moderate epidermal hyperplasia, hyperkeratosis, and inflammatory infiltrates), were not considered toxicologically significant.

From the CIR safety assessment of PPGs:^{3,5}

All mice survived in a study in which mice were given 10% propylene glycol in drinking water for 14 days, and all rats and mongrel dogs survived oral dosing with up to 3.0 ml 100% propylene glycol, 3 times per day, for 3 days. In a subchronic study, a dose of ≤50,000 ppm propylene glycol given in the feed for 15 wks did not produce any lesions. PPG 750 (avg. molecular weight) did not cause any adverse effects when given at 0.1% for 10 days, but a concentration of 1% produced slight increases in liver and kidney weight. The highest no effect level of PPG 1200 fed to rats and dogs for 90 days was 0.3%. No adverse effects were seen in a 90-day study in which rats or dogs fed 501 or 810 mg/kg/day, respectively, PPG 2000. In a subchronic dermal study, 1 ml/kg PPG 2000 did not cause adverse effects in rabbits, but 5 and 10 ml/kg caused a slight depression in growth. Subchronic inhalation data reported some effects in rats due to propylene glycol exposure of 2.2 mg/l air for 6 h/day, 5 days/wk, for 13 wks, but these effects were inconsistent and without dose-response trends. No toxic effects were reported in chronic studies when rats or dogs were given feed containing 50 g/kg or 5 g/kg, respectively, propylene glycol.

Ocular Irritation

From the CIR safety assessment of Alkyl PEG Ethers:²

A 5% aq. solution of laureth-9 was not irritating to rabbit eyes. Compounds analogous to laureth-9 were moderately to severely irritating when instilled into rabbit eyes, and a 10% solution was moderately irritating. Dilution of these compounds reduced irritancy, and 0.1-1.0% solutions were non-irritating to rabbit eyes. At varying concentrations, PEG-3 methyl ether was slightly irritating to rabbit eyes. Undiluted C₉₋₁₁, C₁₂₋₁₃, C₁₂₋₁₅, and C₁₄₋₁₅ paraths were moderately to extremely irritating in Draize tests using unrinsed rabbit eyes, except for C₁₄₋₁₅ parath-18, which was minimally to mildly irritating. Rinsing reduced irritation in some cases but not all. At concentrations of 0.1-1%, these ingredients were non- to mildly irritating, while at 10%, they were moderately to severely irritating in some cases and practically non- to mildly irritating in others. A 5% solution of oleth-20 produced mild, transient conjunctival redness and chemosis in rabbit eyes.

From the CIR safety assessment of PPGs:^{3,5}

Undiluted propylene glycol and PPG, mol wt 425-2025, were at most slight ocular irritants.

Mucosal Irritation

From the CIR safety assessment of Alkyl PEG Ethers:²

A single instillation of 1% Laureth-9 (vehicle not specified) into the nostrils of rats caused swelling after 4 h and severe damage to the nasal mucosa, with shedding of necrotic epithelium, after 2 days. Regeneration of the epithelium started by day 3. A single dose of undiluted laureth-9 and a repeated dose (5 days) of a 15% aq. solution was not an irritant to the vaginal mucosa of dogs.

REPRODUCTIVE AND DEVELOPMENTAL TOXICITY

No published reproductive and developmental toxicity studies were found. However, data on analogous compounds are available from the safety assessments of the alkyl PEG ethers and PPGs, and summaries of these data follow.

From the CIR safety assessment of Alkyl PEG Ethers:²

In a two-generation reproductive study, dermal administration of $\leq 25\%$ C9-11 pareth-6 did not have a toxicologically significant effect on dams or offspring. In two-generation oral reproductive studies with dietary administration of compounds analogous to laureth-9, the NOAEL for reproductive toxicity was >250 mg/kg bw/day, and the NOAELs for maternal and developmental toxicity were 50 mg/kg bw/day. Dosing with ≤ 1000 mg/kg PEG-3 methyl ether did not result in any treatment-related reproductive effects in rats. A dose of 3000 mg/kg PEG-3 methyl ether did result in increased length of gestation and increased maternal kidney weights. In a study in which gravid rats were dosed with ≤ 5000 mg/kg PEG-3 methyl ether on days 6-15 of gestation, the maternal and developmental NOELs for rats were 625 mg/kg/day, and the NOAEL for maternal toxicity was 1250 mg/kg/day. For rabbits given ≤ 1500 mg/kg PEG-3 methyl ether on days 6-18 of gestation, clinical signs of toxicity and mortality were statistically significantly increased for the high dose group. The maternal and developmental NOELs for rabbits were 250 and 1000 mg/kg/day PEG-3 methyl ether, respectively. The NOAEL for maternal toxicity was 500 mg/kg/day, and the presumed NOAEL for developmental toxicity was 1500 mg/kg/day. In a test for developmental neurotoxicity, no neurotoxic effects attributable to PEG-3 methyl ether were identified.

From the CIR safety assessment of PPGs:^{3,5}

Oral administration of propylene glycol did not have any adverse reproductive or developmental effects when evaluated in mice at concentrations of $\leq 5\%$, in rats (not specified whether it was in feed or water), at doses of ≤ 1600 mg/kg, in rabbits at doses of ≤ 1230 mg/kg, or in hamsters at doses of ≤ 1550 mg/kg. Embryonic development was reduced or inhibited completely in cultures of mouse zygotes exposed to 3.0 or 6.0 M propylene glycol, respectively. A study examining induction of cytogenetic aberrations in mice reported an increase in the frequency of premature centrosphere separation with 1300-5200 mg/kg propylene glycol. In zygotes from propylene glycol-dosed mice, hyperploidy was increased.

GENOTOXICITY

No published genotoxicity studies were found. However, data on analogous compounds are available from the safety assessments of the alkyl PEG ethers and PPGs, and summaries of these data follow.

From the CIR safety assessment of Alkyl PEG Ethers:²

An unspecified laureth was not mutagenic or genotoxic in an Ames test, transformation assay, or mouse lymphoma assay, and it did not induce sister chromatid exchanges or chromosomal aberrations in Chinese hamster ovary cells. Compounds analogous to laureth-9 were not mutagenic in an Ames test or clastogenic in in vitro or in vivo chromosomal aberration studies. PEG-3 methyl ether was not mutagenic or genotoxic in an Ames test, forward mutation assay, or in vivo mouse micronucleus test. PEG-7 methyl ether and C9-11 pareth-6 were not mutagenic in Ames tests.

From the CIR safety assessment of PPGs:^{3,5}

Propylene glycol, $\leq 10,000$ $\mu\text{g}/\text{plate}$, was not mutagenic in Ames tests with or without metabolic activation. Propylene glycol, tested at concentrations of 3.8-22.8 mg/ml, was a weak but potential inducer of sister chromatid exchanges (SCEs), causing a dose-dependent increase in SCEs in a Chinese hamster cell line. However in another SCE assay using human cultured fibroblasts and Chinese hamster cells with and without metabolic activation, propylene glycol was not mutagenic. Propylene glycol, 32 mg/ml, induced chromosomal aberrations in a Chinese hamster fibroblast line, but not in human embryonic cells. Propylene glycol was not mutagenic in mitotic recombination or base pair substitution assays, or in a micronucleus test or a hamster embryo cell transformation assay. (Concentration used not specified) Tripropylene glycol, $\leq 10,000$ $\mu\text{g}/\text{plate}$, was not mutagenic in an Ames assay.

CARCINOGENICITY

No published carcinogenicity studies were found. However, data on analogous compounds are available from the safety assessments of the alkyl PEG ethers and PPGs, and summaries of these data follow.

From the CIR safety assessment of Alkyl PEG Ethers:²

Compounds that are analogous to laureth-9 were not carcinogenic in feeding studies in which rats were given up to 1% in the diet for 2 yrs.

From the CIR safety assessment of PPGs:⁵

Undiluted propylene glycol was not carcinogenic in lifetime dermal study in mice, and it was not carcinogenic in a 2-yr chronic feed study in which rats were given $\leq 50,000$ ppm propylene glycol in the diet.

IRRITATION AND SENSITIZATION

Non-Human

PPG-5-ceteth-20 was classified as a moderate to mild dermal irritant in an *in vitro* assay.⁵⁰ In an MTT (3-(4,5-dimethyl-thiazol-2-4)-2,5-diphenyltetrazolium bromide) cytotoxicity assay performed to predict dermal irritancy, PPG-5-ceteth-20 had an ET₅₀ of 9.78 h; substances with an ET₅₀ (i.e., time required to reduce tissue viability by 50%) in the range of 4-12 h have an expected irritancy of moderate to mild.

A single 24-h occlusive application of PPG-5-ceteth-20 was not a primary dermal irritant in rabbits.⁵¹ Occlusive patches containing 0.5 ml undiluted PPG-5-ceteth-20 were applied for 24 h to both intact and abraded skin of three rabbits; the test sites were clipped free of hair. The patches were described as 2 x 2; units were not provided. The test sites were evaluated for reactions upon patch removal, and 48 h later. No erythema, eschar formation, or edema was observed at any of the test sites 24 or 72 h after application.

Non-human irritation and sensitization data on analogous compounds are also available from the safety assessments of the alkyl PEG ethers and PPGs, and summaries of these data follow.

From the CIR safety assessment of Alkyl PEG Ethers:²

Using rabbits, undiluted laureth-9 produced moderate irritation at abraded sites, while 10 and 20% dilutions caused slight irritation at intact and abraded sites at 24 h. The dermal irritation potentials of several compounds that were analogous to laureth-9 were determined. Under semi-occlusive conditions with a 4 h application, C₁₄₋₁₅AE₇, 0.5 ml at 10, 25, or 100%, was not irritating to rabbit skin. Following a 4 h occlusive application to rabbit skin, undiluted C₁₂₋₁₄AE₁₀ and undiluted C₁₃AE₆ were moderately irritating, and undiluted C₁₃AE_{6,5} and undiluted C₁₂₋₁₄AE₆ were severely irritating. A 24 h occlusive application of C₁₄₋₁₅AE₇ was severely irritating to rabbit skin. A contraceptive aerosol formulation containing 20% laureth-9 was mildly irritating in a Draize test. In a mixture containing an unspecified laureth, the laureth was considered to be a strong irritant to rabbit skin. Non-occlusive applications of PEG-3 methyl ether caused minimal irritation to rabbit skin. Undiluted C9-11, C12-13, C12-15, and C14-15 pareths were moderately to severely irritating to rabbit skin in Draize studies, with the exception of C14-15 pareth-18, which was mildly irritating. Dilutions of these ingredients were also tested, and, generally, 0.1 and 1% dilutions were non- to mildly irritating, while 10% dilutions ranged from slightly to, mostly, moderately irritating.

The sensitization potential of a number of alkyl PEG ethers was evaluated using guinea pigs. Laureths-5 and -9, compounds analogous to laureth-9, C9-11 pareth-3, -5, -6, -8, C12-13 pareth-2, -3, and -7, C12-15 pareth-3, -7, and -9, and C14-15 pareth-7, -11, -13, and -18 were not sensitizers in guinea pigs.

From the CIR safety assessment of PPGs:^{3,5}

In one study using nude mice, 50% propylene glycol may have caused skin irritation, while in another study, 100% propylene glycol was minimally irritating to hairless mice. Undiluted propylene glycol was at most a mild dermal irritant in a Draize test using rabbits with intact and abraded skin. No reactions to undiluted propylene glycol were observed with guinea pigs, rabbits, or Gottingen swine. Using nude mice, hypertrophy, dermal inflammation, and proliferation were observed with 50% propylene glycol. These effects were not seen in hairless mice with undiluted propylene glycol. Propylene glycol (concentrations not given) was negative in a number of sensitization/allergenicity assays using guinea pigs. In a study using guinea pigs, 0.5 ml propylene glycol was a weak sensitizer. PPG (concentration not stated), mol wt 425-2025, was not an irritant to rabbits.

Human

PPG-5-ceteth-20 was not a primary irritant, fatiguing agent, or sensitizer in a human repeated insult patch test (HRIPT).⁵² Induction consisted of 10 occlusive patches containing 0.5 ml undiluted PPG-5-ceteth-20 applied to the inner aspect of the arm or forearm of 50 subjects. The first induction patch was applied for 48 h, and the remaining nine patches for 24 h; there was a 24-h rest period between patches. The test site was evaluated for reactions upon removal of each patch. A 48-h challenge patch was applied 10-14 days after the last induction patch. No reactions were observed in any of the subjects during induction or challenge.

Human irritation and sensitization data on analogous compounds are also available from the safety assessments of the alkyl PEG ethers and PPGs, and summaries of these data follow.

From the CIR safety assessment of Alkyl PEG Ethers:²

In a retrospective clinical study, 0.97% of patients had a weakly positive and 0.25% of 3186 patients had a strongly positive reaction to 0.5% laureth-9, and 1.77% had weakly and 0.34% of 6202 had strongly positive allergic contact reactions to 3% laureth-9. Undiluted and 25% aq. C₁₄₋₁₅AE₇ produced negligible to slight irritation in an occlusive 3-patch application test, and a 10% aq. solution of C₁₄₋₁₅AE_{6,5} was slightly irritating in 10 subjects when applied under an occlusive patch for 24 h. In a human repeat insult patch test (HRIPT) in 51 subjects of formulations containing laureth-9, 12% of subjects challenged with 10 and 15% formulations and 18% of patients challenged with formulations containing 20% laureth-9 had mild reactions. Test compounds analogous to laureth-9, evaluated in HRIPTs at concentrations of 1-25%, were not sensitizers. In HRIPTs to determine the sensitization potential of 1-15% C₁₄₋₁₅AE₇ and 5-25% C12-15 pareth-7, slight or mild irritation was observed, but the ingredients were not sensitizers to human subjects. The clinical effect of steareth-2, -10, and -21 was evaluated on normal and damaged skin in 20 subjects. These steareths did not have an effect on dermal blood flow with either normal or damaged skin, but transepidermal water loss of damaged skin was decreased with steareth-2 and steareth-21. PEG-3 methyl ether was slightly irritating in a clinical study.

A number of case studies, primarily with laureths, particularly laureth-9, have been reported. Reactions included, but were not limited to, eczema, contact dermatitis, and a pruritic rash.

From the CIR safety assessment of PPGs:^{3,5}

In some studies, propylene glycol induced skin irritation reactions in normal subjects and in patients, while in other studies, no irritation was reported in predictive tests. Reactions were observed at concentrations as low as 10% in a predictive test in 24 subjects and 2% in provocative tests, while in other studies, up to 100% propylene glycol was not reported to cause irritation. Use studies in 24-40 subjects of deodorants containing 35-73% propylene glycol did not report any potential for eliciting irritation or sensitization. Propylene glycol generally did not induce sensitization reactions when tested at 12-86%, although results were questionable in a 101 subject RIPT of a deodorant containing 73% propylene glycol. Additionally, in a modified Draize sensitization study with 203 subjects, propylene glycol (0.2 ml) induced 19 cutaneous reactions at challenge. Propylene glycol did not produce a photoallergic response in a provocative photopatch test in 82 patients. Retrospective analysis of pools of patient patch test data indicated that ≤6.0% of patients tested had positive reactions to 30% aq. propylene glycol.

SUMMARY

Because the data from the alkyl PEG ethers report and PPG report are summary data from those reports, this summary only includes new data provided in this safety assessment.

This report is a safety assessment of 131 alkyl PEG/PPG ethers that can be used in cosmetics. Alkyl PEG/PPG ethers are the reaction products of an alkyl alcohol and one or more equivalents each of ethylene oxide and propylene oxide (forming repeats of PEG and PPG, respectively). Each of the alkyl PEG/PPG ethers has surfactant properties, with a chain structure that has a hydrophobic end and a hydrophilic end; the dimethyl ethers are distinct in this group by being capped at both ends with methyl groups, instead of having one alkyl chain at one end. The alkyl PEG/PPG ethers are typically manufactured by: 1) activating the alcohol by generating an alkoxide; 2) reacting the alkoxide with ethylene oxide, propylene oxide, or a mixture of both; and 3) terminating the propagation. The actual order of alkoxide repeats in each ingredient, and from each source of an ingredient, may be block, alternating, or random, and the propylene oxide placement affects the physical and surface-active properties. Based on this chemistry, the potentially carcinogenic compounds ethylene oxide and propylene oxide are potentially present at residual levels, along with the residual by-product 1,4-dioxane. In practice, these impurities are not present because of steps in the manufacturing process that remove them.

The alkyl PEG/PPG ethers are reported to function in cosmetics mostly as surfactants, skin conditioning agents, and/or emulsifying agents. VCRP data obtained from the FDA in 2013 and data received in response to a Council survey of maximum reported use concentration indicate that 26 of the alkyl PEG/PPG ethers named in this safety assessment are currently used in

cosmetic formulations. PPG-5-ceteth-20 has the most reported uses, 445, and the highest reported concentration in leave-on products, 10%. Most of the in-use alkyl PEG/PPG ethers are used in less than 40 formulations and at concentrations of $\leq 5\%$.

In Europe, PPG-4-trideceth-6 can be used at 0.05 mg/kg in food contact materials; it is to be used only in PTFE items sintered at high temperatures. PPG-5-ceth-20 is being evaluated for inclusion in dermal and nasal drug delivery systems.

Often, surfactants can be penetration enhancers. However, PPG-4-ceteth-20 did not enhance the penetration of tenoxicam through guinea pig skin.

Undiluted PPG-5-ceteth-20 was predicted to be a mild to moderate dermal irritant based on the results of an MTT cytotoxicity assay, but it was not a primary irritant in rabbit skin, nor was it a primary irritant, fatiguing agent, or sensitizer in a 50 subject HRIPT.

DISCUSSION

Alkyl PEG/PPG ethers are the reaction products of an alkyl alcohol and one or more equivalents each of ethylene oxide and propylene oxide (forming repeats of PEG and PPG, respectively). The alkyl PEG/PPG ethers share very similar physiochemical properties with another family of ingredients that previously has been reviewed by the CIR Expert Panel and found safe when formulated to be non-irritating, i.e., the alkyl PEG ethers. The only difference between the alkyl PEG ethers and the alkyl PEG/PPG ethers is the inclusion of PPG repeat units, which are used to simply fine-tune the surfactant properties of these ingredients. The PPGs also have been found safe when formulated to be non-irritating by the Panel.

Although there are little data available on the individual alkyl PEG/PPG ethers, the Panel stated that existing data on analogous ingredients (i.e., from the alkyl PEG ethers and PPG safety assessments) support the safety of this ingredient family. These data provided the Panel with a good indication of a lack of toxicity of the alkyl PEG/PPG ethers. Additionally, the alkyl PEG/PPG ethers are larger molecules than alkyl PEG ethers and the PPGs, so they are less likely to penetrate the skin and enter the circulation. And, the maximum use concentration reported for the alkyl PEG/PPG ethers is lower than that reported in the safety assessments of the alkyl PEG ethers or the PPGs.

The Panel was concerned about the possibility of the presence of residual starting materials used in the manufacture of the alkyl PEG/PPG ethers (i.e., ethylene oxide and propylene oxide) and of the residual by-product, 1,4-dioxane. These compounds are potentially carcinogenic. The Panel noted these are volatile compounds, and therefore, levels of these compounds in cosmetics are expected to be below the level of toxicological concern. Although levels may be low, the Panel stressed that the cosmetics industry should continue to use the necessary procedures to remove these impurities from the ingredients before blending them into cosmetic formulations.

The Panel recognized that some of the alkyl PEG/PPG ethers can enhance the penetration of other ingredients through the skin. The Panel cautioned that care should be taken in formulating cosmetic products that may contain these ingredients in combination with any ingredients whose safety was based on their lack of dermal absorption data, or when dermal absorption was a concern.

Additionally, the Panel was also concerned that the potential exists for dermal irritation with the use of products formulated with alkyl PEG/PPG ethers. The Panel specified that products must be formulated to be non-irritating.

Finally, the Panel discussed the issue of incidental inhalation exposure of alkyl PEG/PPG ethers in products that could be inhaled. Because the alkyl PEG/PPG ethers are not expected to have chemical activity in biological systems, particles deposited in the nasopharyngeal or bronchial regions of the respiratory tract present no toxicological concerns. Coupled with the small actual exposure in the breathing zone, the expected particle size, and the concentrations at which the ingredients are used, the available information indicates that incidental inhalation would not be a significant route of exposure that might lead to local respiratory or systemic effects. A detailed discussion and summary of the Panel's approach to evaluating incidental inhalation exposures to ingredients in cosmetic products that may be aerosolized is available at <http://www.cir-safety.org/cir-findings>.

CONCLUSION

The CIR Expert Panel concluded that the following 131 alkyl PEG/PPG ethers are safe in the present practices of use and concentration in cosmetics described in this safety assessment when formulated to be non-irritating.

PEG-4-PPG-7 C13/C15 Alcohol*	PPG-2 C9-11 Pareth-11*	PPG-2-Isodeceth-4*
PEG/PPG-3/6 Dimethyl Ether*	PPG-2 C12-13 Pareth-8	PPG-2-Isodeceth-6*
PEG/PPG-7/12 Dimethyl Ether*	PPG-2 C12-15 Pareth-6*	PPG-2-Isodeceth-8*
PEG/PPG-9/2 Dimethyl Ether	PPG-4 C13-15 Pareth-15*	PPG-2-Isodeceth-9*
PEG/PPG-14/7 Dimethyl Ether	PPG-5 C9-15 Pareth-6*	PPG-2-Isodeceth-10*
PEG/PPG-17/4 Dimethyl Ether	PPG-6 C9-11 Pareth-5*	PPG-2-Isodeceth-12
PEG/PPG-22/40 Dimethyl Ether*	PPG-6 C12-15 Pareth-12*	PPG-2-Isodeceth-18*
PEG/PPG-27/14 Dimethyl Ether*	PPG-6 C12-18 Pareth-11*	PPG-2-Isodeceth-25*
PEG/PPG-35/40 Dimethyl Ether	PPG-3 C12-14 Sec-Pareth-7*	PPG-3-Isodeceth-1*
PEG/PPG-36/41 Dimethyl Ether	PPG-4 C12-14 Sec-Pareth-5*	PPG-4-Isodeceth-10*
PEG/PPG-50/40 Dimethyl Ether	PPG-5 C12-14 Sec-Pareth-7*	PPG-3-Isosteareth-9
PEG/PPG-52/32 Dimethyl Ether*	PPG-5 C12-14 Sec-Pareth-9*	PPG-2-Laureth-5*
PEG/PPG-55/28 Dimethyl Ether	PPG-1-Deceth-4*	PPG-2-Laureth-8*
PEG/PPG-4/2 Propylheptyl Ether*	PPG-1-Deceth-5*	PPG-2-Laureth-12*
PEG/PPG-6/2 Propylheptyl Ether*	PPG-1-Deceth-6*	PPG-3-Laureth-8*
PEG-7/PPG-2 Propylheptyl Ether*	PPG-1-Deceth-7*	PPG-3-Laureth-9*
PEG/PPG-8/2 Propylheptyl Ether*	PPG-2-Deceth-3	PPG-3-Laureth-10*
PEG/PPG-10/2 Propylheptyl Ether*	PPG-2-Deceth-5*	PPG-3-Laureth-12*
PEG/PPG-14/2 Propylheptyl Ether*	PPG-2-Deceth-7*	PPG-4 Laureth-2*
PEG/PPG-40/2 Propylheptyl Ether*	PPG-2-Deceth-8*	PPG-4 Laureth-5*
PPG-2-Ceteareth-9	PPG-2-Deceth-10*	PPG-4 Laureth-7*
PPG-4-Ceteareth-12*	PPG-2-Deceth-12	PPG-4-Laureth-15*
PPG-10-Ceteareth-20*	PPG-2-Deceth-15*	PPG-5-Laureth-5
PPG-1-Ceteth-1*	PPG-2-Deceth-20*	PPG-6-Laureth-3*
PPG-1-Ceteth-5*	PPG-2-Deceth-30*	PPG-25-Laureth-25
PPG-1-Ceteth-10*	PPG-2-Deceth-40*	PPG-3-Myreth-3*
PPG-1-Ceteth-20*	PPG-2-Deceth-50*	PPG-3-Myreth-11*
PPG-2-Ceteth-1*	PPG-2-Deceth-60*	PPG-2-PEG-11 Hydrogenated Lauryl
PPG-2-Ceteth-5*	PPG-4-Deceth-4*	Alcohol Ether*
PPG-2-Ceteth-10	PPG-4-Deceth-6*	PPG-3-PEG-6 Oleyl Ether*
PPG-2-Ceteth-20*	PPG-6-Deceth-4*	PPG-9-Steareth-3*
PPG-4-Ceteth-1*	PPG-6-Deceth-9*	PPG-23-Steareth-34*
PPG-4-Ceteth-5*	PPG-8-Deceth-6*	PPG-30 Steareth-4*
PPG-4-Ceteth-10*	PPG-14-Deceth-6*	PPG-34-Steareth-3
PPG-4-Ceteth-20	PPG-6-Decyltetradeceth-12*	PPG-38 Steareth-6*
PPG-5-Ceteth-20	PPG-6-Decyltetradeceth-20	PPG-1 Trideceth- 6
PPG-8-Ceteth-1	PPG-6-Decyltetradeceth-30	PPG-1 Trideceth-13*
PPG-8-Ceteth-2*	PPG-13-Decyltetradeceth-24	PPG-4 Trideceth-6*
PPG-8-Ceteth-5*	PPG-20-Decyltetradeceth-10	PPG-6 Trideceth-8*
PPG-8-Ceteth-10	PPG-9-Ethylhexeth-5*	Propylene Glycol Capreth-4*
PPG-8-Ceteth-20	PPG-1-Isodeceth-4*	Propylene Glycol Isodeceth-4*
PPG-2 C9-11 Pareth-5*	PPG-1-Isodeceth-6*	Propylene Glycol Isodeceth-12*
PPG-2 C9-11 Pareth-7*	PPG-1-Isodeceth-7*	Propylene Glycol Laureth-6*
PPG-2 C9-11 Pareth-8*	PPG-1-Isodeceth-9*	Propylene Glycol Oleth-5*

*Not reported to be in current use. Were ingredients in this group not in current use to be used in the future, the expectation is that they would be used in product categories and at concentrations comparable to others in this group.

TABLES

Table 1. Alkyl PEG/PPG Ethers included in this assessment

PEG-4-PPG-7 C13/C15 Alcohol	PPG-2 C9-11 Pareth-11	PPG-2-Isodeceth-4
PEG/PPG-3/6 Dimethyl Ether	PPG-2 C12-13 Pareth-8	PPG-2-Isodeceth-6
PEG/PPG-7/12 Dimethyl Ether	PPG-2 C12-15 Pareth-6	PPG-2-Isodeceth-8
PEG/PPG-9/2 Dimethyl Ether	PPG-4 C13-15 Pareth-15	PPG-2-Isodeceth-9
PEG/PPG-14/7 Dimethyl Ether	PPG-5 C9-15 Pareth-6	PPG-2-Isodeceth-10
PEG/PPG-17/4 Dimethyl Ether	PPG-6 C9-11 Pareth-5	PPG-2-Isodeceth-12
PEG/PPG-22/40 Dimethyl Ether	PPG-6 C12-15 Pareth-12	PPG-2-Isodeceth-18
PEG/PPG-27/14 Dimethyl Ether	PPG-6 C12-18 Pareth-11	PPG-2-Isodeceth-25
PEG/PPG-35/40 Dimethyl Ether	PPG-3 C12-14 Sec-Pareth-7	PPG-3-Isodeceth-1
PEG/PPG-36/41 Dimethyl Ether	PPG-4 C12-14 Sec-Pareth-5	PPG-4-Isodeceth-10
PEG/PPG-50/40 Dimethyl Ether	PPG-5 C12-14 Sec-Pareth-7	PPG-3-Isosteareth-9
PEG/PPG-52/32 Dimethyl Ether	PPG-5 C12-14 Sec-Pareth-9	PPG-2-Laureth-5
PEG/PPG-55/28 Dimethyl Ether	PPG-1-Deceth-4	PPG-2-Laureth-8
PEG/PPG-4/2 Propylheptyl Ether	PPG-1-Deceth-5	PPG-2-Laureth-12
PEG/PPG-6/2 Propylheptyl Ether	PPG-1-Deceth-6	PPG-3-Laureth-8
PEG-7/PPG-2 Propylheptyl Ether	PPG-1-Deceth-7	PPG-3-Laureth-9
PEG/PPG-8/2 Propylheptyl Ether	PPG-2-Deceth-3	PPG-3-Laureth-10
PEG/PPG-10/2 Propylheptyl Ether	PPG-2-Deceth-5	PPG-3-Laureth-12
PEG/PPG-14/2 Propylheptyl Ether	PPG-2-Deceth-7	PPG-4 Laureth-2
PEG/PPG-40/2 Propylheptyl Ether	PPG-2-Deceth-8	PPG-4 Laureth-5
PPG-2-Cetareth-9	PPG-2-Deceth-10	PPG-4 Laureth-7
PPG-4-Cetareth-12	PPG-2-Deceth-12	PPG-4-Laureth-15
PPG-10-Cetareth-20	PPG-2-Deceth-15	PPG-5-Laureth-5
PPG-1-Ceteth-1	PPG-2-Deceth-20	PPG-6-Laureth-3
PPG-1-Ceteth-5	PPG-2-Deceth-30	PPG-25-Laureth-25
PPG-1-Ceteth-10	PPG-2-Deceth-40	PPG-3-Myreth-3
PPG-1-Ceteth-20	PPG-2-Deceth-50	PPG-3-Myreth-11
PPG-2-Ceteth-1	PPG-2-Deceth-60	PPG-2-PEG-11 Hydrogenated Lauryl Alcohol Ether
PPG-2-Ceteth-5	PPG-4-Deceth-4	PPG-3-PEG-6 Oleyl Ether
PPG-2-Ceteth-10	PPG-4-Deceth-6	PPG-9-Steareth-3
PPG-2-Ceteth-20	PPG-6-Deceth-4	PPG-23-Steareth-34
PPG-4-Ceteth-1	PPG-6-Deceth-9	PPG-30 Steareth-4
PPG-4-Ceteth-5	PPG-8-Deceth-6	PPG-34-Steareth-3
PPG-4-Ceteth-10	PPG-14-Deceth-6	PPG-38 Steareth-6
PPG-4-Ceteth-20	PPG-6-Decyltetradeceth-12	PPG-1 Trideceth- 6
PPG-5-Ceteth-20	PPG-6-Decyltetradeceth-20	PPG-1 Trideceth-13
PPG-8-Ceteth-1	PPG-6-Decyltetradeceth-30	PPG-4 Trideceth-6
PPG-8-Ceteth-2	PPG-13-Decyltetradeceth-24	PPG-6 Trideceth-8
PPG-8-Ceteth-5	PPG-20-Decyltetradeceth-10	Propylene Glycol Capreth-4
PPG-8-Ceteth-10	PPG-9-Ethylhexeth-5	Propylene Glycol Isodeceth-4
PPG-8-Ceteth-20	PPG-1-Isodeceth-4	Propylene Glycol Isodeceth-12
PPG-2 C9-11 Pareth-5	PPG-1-Isodeceth-6	Propylene Glycol Laureth-6
PPG-2 C9-11 Pareth-7	PPG-1-Isodeceth-7	Propylene Glycol Oleth-5
PPG-2 C9-11 Pareth-8	PPG-1-Isodeceth-9	

Table 2. Definitions, Structures, and, Functions

Ingredient (CAS No. if available)	Definition¹ & Structure <small>CRS star®</small>	Function
PEG-4-PPG-7 C13/C15 Alcohol	the polyoxypropylene, polyoxyethylene ether of a mixture of synthetic C13/C15 alcohols with an average propoxylation value of 7 and an average ethoxylation value of 4	surfactant – emulsifying agent
PEG/PPG-3/6 Dimethyl Ether (61419-46-3)	the copolymer produced by the interaction of 3 moles of ethylene oxide with 6 moles of propylene oxide end-blocked with methyl ether	skin conditioning agent - misc
PEG/PPG-7/12 Dimethyl Ether	copolymer produced by the interaction of 7 moles of ethylene oxide with 12 moles of propylene oxide end-blocked with dimethyl ether	skin conditioning agent - misc
PEG/PPG-9/2 Dimethyl Ether (61419-46-3)	the copolymer produced by the interaction of 9 moles of ethylene oxide with 2 moles of propylene oxide end-blocked with dimethyl ether	skin conditioning agent - misc
PEG/PPG-14/7 Dimethyl Ether (61419-46-3)	the copolymer produced by the interaction of 14 moles of ethylene oxide with 7 moles of propylene oxide end-blocked with dimethyl ether	skin conditioning agent - misc
PEG/PPG-17/4 Dimethyl Ether	the copolymer produced by the interaction of 17 moles of ethylene oxide with 4 moles of propylene oxide end-blocked with dimethyl ether	skin conditioning agent - misc
PEG/PPG-22/40 Dimethyl Ether	a copolymer produced by the interaction of 22 moles of ethylene oxide with 40 moles of propylene oxide end-blocked with methyl ether	skin conditioning agent - misc

Table 2. Definitions, Structures, and, Functions

Ingredient (CAS No. if available)	Definition & Structure ^{CIR staff®}	Function
PEG/PPG-27/14 Dimethyl Ether	a copolymer produced by the interaction of 27 moles of ethylene oxide with 14 moles of propylene oxide end-blocked with methyl ether	skin conditioning agent - misc
PEG/PPG-35/40 Dimethyl Ether	the copolymer produced by interacting 35 moles of ethylene oxide with 40 moles of propylene oxide end-blocked with dimethyl ether	skin conditioning agent - misc
PEG/PPG-36/41 Dimethyl Ether	the copolymer produced by the interaction of 36 moles of ethylene oxide and 41 moles of propylene oxide end-blocked with methyl ether	skin conditioning agent - misc
PEG/PPG-50/40 Dimethyl Ether	the copolymer produced by the interaction of 50 moles of ethylene oxide with 40 moles of propylene oxide end-blocked with dimethyl ether	skin conditioning agent - misc
PEG/PPG-52/32 Dimethyl Ether	a copolymer produced by the interaction of 52 moles of ethylene oxide with 32 moles of propylene oxide end-blocked with methyl ether	skin conditioning agent - misc
PEG/PPG-55/28 Dimethyl Ether	a copolymer produced by the interaction of 55 moles of ethylene oxide with 28 moles of propylene oxide end-blocked with methyl ether	skin conditioning agent - misc
PEG/PPG-4/2 Propylheptyl Ether (166736-08-9)	the product formed by the reaction of 2-propylheptanol with an average of 4 moles of ethylene oxide and 2 moles of propylene oxide	surfactant – cleansing, dispersing, emulsifying, or solubilizing agent

Table 2. Definitions, Structures, and, Functions

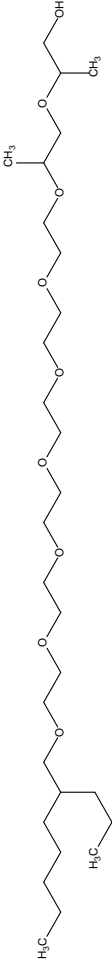
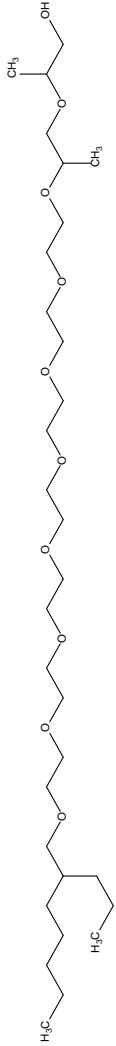
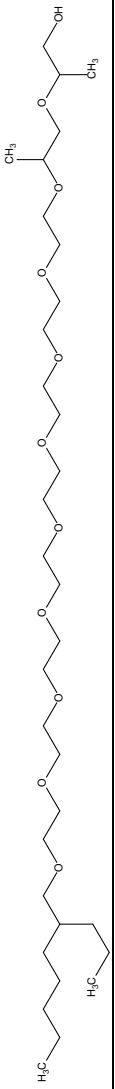
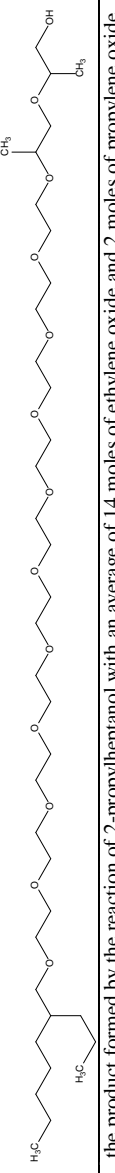
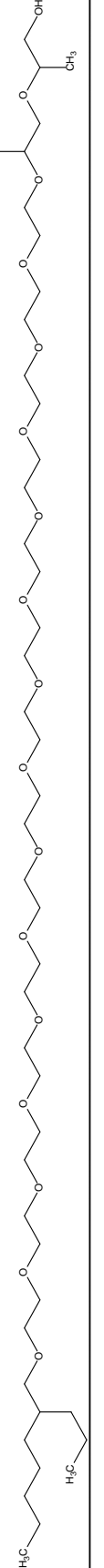
Ingredient (CAS No. if available)	Definition ¹ & Structure ¹ <small>CIR staff[®]</small>	Function
PEG/PPG-6/2 Propylheptyl Ether (166736-08-9)	<p>the product formed by the reaction of 2-propylheptanol with an average of 6 moles of ethylene oxide and 2 moles of propylene oxide</p> 	surfactant – cleansing, dispersing, emulsifying, or solubilizing agent
PEG-7/PPG-2 Propylheptyl Ether	<p>the product formed by the reaction of 2-propylheptanol with an average of 7 moles of ethylene oxide and 2 moles of propylene oxide</p> 	surfactant – cleansing, dispersing, emulsifying, or solubilizing agent
PEG/PPG-8/2 Propylheptyl Ether (166736-08-9)	<p>the product formed by the reaction of 2-propylheptanol with an average of 8 moles of ethylene oxide and 2 moles of propylene oxide</p> 	surfactant – cleansing, dispersing, emulsifying, or solubilizing agent
PEG/PPG-10/2 Propylheptyl Ether (166736-08-9)	<p>the product formed by the reaction of 2-propylheptanol with an average of 10 moles of ethylene oxide and 2 moles of propylene oxide</p> 	surfactant – cleansing, dispersing, emulsifying, or solubilizing agent
PEG/PPG-14/2 Propylheptyl Ether (166736-08-9)	<p>the product formed by the reaction of 2-propylheptanol with an average of 14 moles of ethylene oxide and 2 moles of propylene oxide</p> 	surfactant – cleansing, dispersing, emulsifying, or solubilizing agent

Table 2. Definitions, Structures, and, Functions

Ingredient (CAS No. if available)	Definition ¹ & Structure ^{CR staff[®]}	Function
PPG-40/2 Propylheptyl Ether (166736-08-9)	the product formed by the reaction of 2-propylheptanol with an average of 40 moles of ethylene oxide and 2 moles of propylene oxide	surfactant – cleansing, dispersing, emulsifying, or solubilizing agent
PPG-2-Ceteareth-9	the polyoxypropylene, polyoxyethylene ether of Cetearyl Alcohol that conforms generally to the formula where R represents a blend of cetyl and stearyl radicals, x has an average value of 2 and y has an average value of 9	surfactant – emulsifying agent
PPG-4-Ceteareth-12	the polyoxypropylene, polyoxyethylene ether of Cetearyl Alcohol that conforms generally to the formula where R represents a blend of cetyl and stearyl radicals, x has an average value of 4 and y has an average value of 12	surfactant – emulsifying agent
PPG-10-Ceteareth-20	the polyoxypropylene, polyoxyethylene ether of Cetearyl Alcohol that conforms generally to the formula where R represents a blend of cetyl and stearyl radicals, x has an average value of 10 and y has an average value of 20	surfactant – emulsifying agent
PPG-1-Ceteth-1 (37311-01-6; 9087-53-0)	the polyoxypropylene, polyoxyethylene ether of cetyl alcohol that conforms generally to the formula where x has an average value of 1 and y has an average value of 1	skin conditioning agent – emollient; surfactant – emulsifying agent
PPG-1-Ceteth-5 (37311-01-6; 9087-53-0)	the polyoxypropylene, polyoxyethylene ether of cetyl alcohol that conforms generally to the formula where x has an average value of 1 and y has an average value of 5	skin conditioning agent – emollient; surfactant – emulsifying agent

Table 2. Definitions, Structures, and, Functions


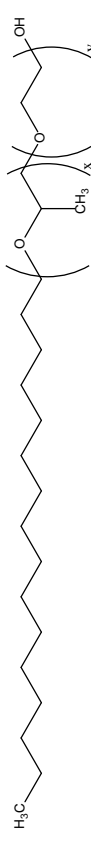
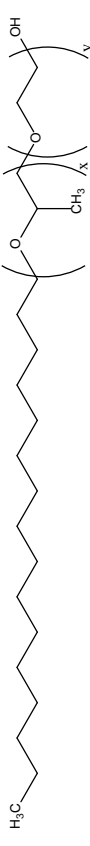
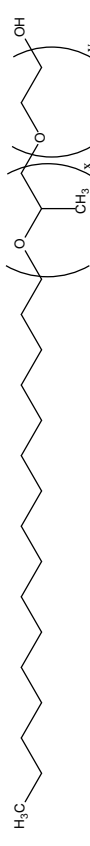
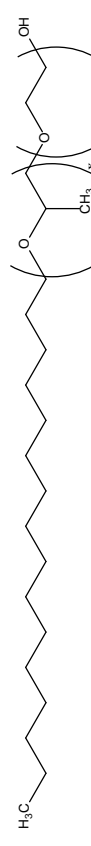

Ingredient (CAS No. if available)	Definition ¹ & Structure ^{CR staff}	Function
PPG-1-Ceteth-10 (37311-01-6; 9087-53-0)	 <p>the polyoxypropylene, polyoxyethylene ether of cetyl alcohol that conforms generally to the formula where x has an average value of 1 and y has an average value of 10</p>	skin conditioning agent – emollient; surfactant – emulsifying agent
PPG-1-Ceteth-20 (37311-01-6; 9087-53-0)	 <p>the polyoxypropylene, polyoxyethylene ether of cetyl alcohol that conforms generally to the formula where x has an average value of 1 and y has an average value of 20</p>	skin conditioning agent – emollient; surfactant – emulsifying and solubilizing agent
PPG-2-Ceteth-1 (37311-01-6; 9087-53-0)	 <p>the polyoxypropylene, polyoxyethylene ether of cetyl alcohol that conforms generally to the formula where x has an average value of 2 and y has an average value 1</p>	skin conditioning agent – emollient; surfactant – emulsifying agent
PPG-2-Ceteth-5 (37311-01-6; 9087-53-0)	 <p>the polyoxypropylene, polyoxyethylene ether of cetyl alcohol that conforms generally to the formula where x has an average value of 2 and y has an average value of 5</p>	skin conditioning agent – emollient; surfactant – emulsifying agent
PPG-2-Ceteth-10 (37311-01-6; 9087-53-0)	 <p>the polyoxypropylene, polyoxyethylene ether of cetyl alcohol that conforms generally to the formula where x has an average value of 2 and y has an average value of 10</p>	skin conditioning agent – emollient; surfactant – emulsifying agent
PPG-2-Ceteth-20 (37311-01-6; 9087-53-0)	 <p>is the polyoxypropylene, polyoxyethylene ether of cetyl alcohol that conforms generally to the formula where x has an average value of 2 and y has an average value of 20</p>	skin conditioning agent – emollient; surfactant – emulsifying and solubilizing agent

Table 2. Definitions, Structures, and, Functions


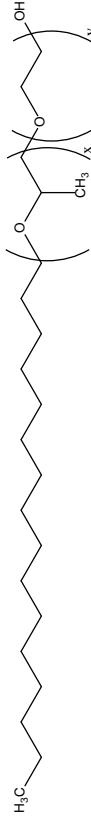
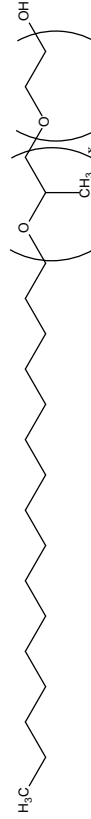
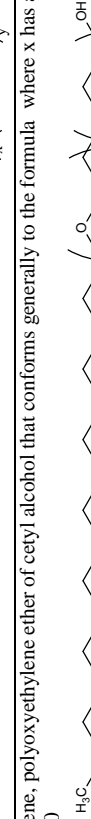



Ingredient (CAS No. if available)	Definition ¹ & Structure ¹ <small>CIR staff[®]</small>	Function
PPG-4-Ceteth-1 (37311-01-6; 9087-53-0)	 <p>the polyoxypropylene polyoxyethylene ether of cetyl alcohol that conforms generally to the formula where x has an average value of 4 and y has an average value of 1</p>	skin conditioning agent – emollient; surfactant – emulsifying agent
PPG-4-Ceteth-5 (37311-01-6; 9087-53-0)	 <p>the polyoxypropylene, polyoxyethylene ether of cetyl alcohol that conforms generally to the formula where x has an average value of 4 and y has an average value of 5</p>	skin conditioning agent – emollient; surfactant – emulsifying agent
PPG-4-Ceteth-10 (37311-01-6; 9087-53-0)	 <p>the polyoxypropylene, polyoxyethylene ether of cetyl alcohol that conforms generally to the formula where x has an average value of 4 and y has an average value of 10</p>	surfactant – emulsifying agent
PPG-4-Ceteth-20 (37311-01-6; 9087-53-0)	 <p>the polyoxypropylene, polyoxyethylene ether of cetyl alcohol that conforms generally to the formula where x has an average value of 4 and y has an average value of 20</p>	surfactant – emulsifying agent
PPG-5-Ceteth-20 (37311-01-6; 9087-53-0)	 <p>the polyoxypropylene, polyoxyethylene ether of cetyl alcohol that conforms generally to the formula where x has an average value of 5 and y has an average value of 20</p>	surfactant – emulsifying agent
PPG-8-Ceteth-1 (37311-01-6; 9087-53-0)	 <p>the polyoxypropylene, polyoxyethylene ether of cetyl alcohol that conforms generally to the formula where x has an average value of 8 and y has an average value of 1</p>	skin conditioning agent – emollient; surfactant – emulsifying agent
PPG-8-Ceteth-2 (37311-01-6; 9087-53-0)	 <p>the polyoxypropylene, polyoxyethylene ether of cetyl alcohol that conforms generally to the formula where x has an average value of 8 and y has an average value of 2</p>	skin conditioning agent – emollient; surfactant – emulsifying agent

Table 2. Definitions, Structures, and, Functions


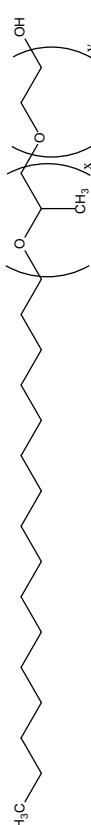
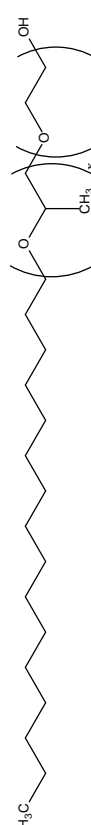
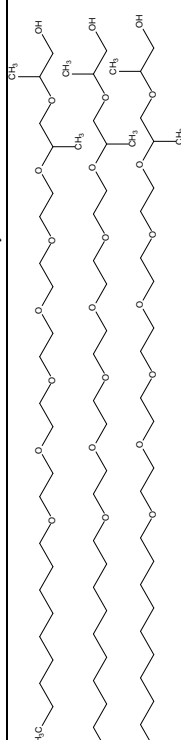
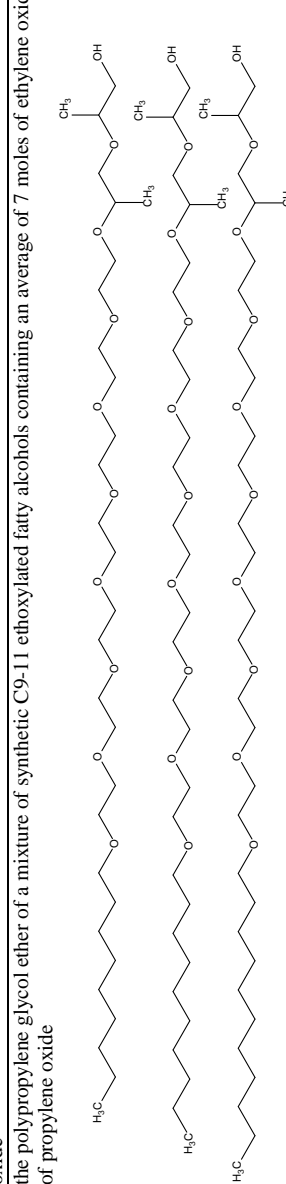
Ingredient (CAS No. if available)	Definition ¹ & Structure ¹ <small>CIR staff⁶</small>	Function
PPG-8-Ceteth-5 (37311-01-6; 9087-53-0)	<p data-bbox="203 1323 235 1617"></p> <p data-bbox="300 357 349 1617">the polyoxypropylene, polyoxyethylene ether of cetyl alcohol that conforms generally to the formula where x has an average value of 8 and y has an average value of 5</p>	skin conditioning agent – emollient; surfactant – emulsifying agent
PPG-8-Ceteth-10 (37311-01-6; 9087-53-0)	<p data-bbox="397 1323 487 1449"></p> <p data-bbox="495 357 544 1617">the polyoxypropylene, polyoxyethylene ether of cetyl alcohol that conforms generally to the formula where x has an average value of 8 and y has an average value of 10</p>	skin conditioning agent – emollient; surfactant – emulsifying agent
PPG-8-Ceteth-20 (37311-01-6; 9087-53-0)	<p data-bbox="592 1323 682 1449"></p> <p data-bbox="690 357 738 1617">the polyoxypropylene, polyoxyethylene ether of cetyl alcohol that conforms generally to the formula where x has an average value of 8 and y has an average value of 20</p>	surfactant – emulsifying agent
PPG-2 C9-11 Pareth-5	<p data-bbox="844 1323 1023 1617">the polypropylene glycol ether of a mixture of synthetic C9-11 ethoxylated fatty alcohols containing an average of 5 moles of ethylene oxide and 2 moles of propylene oxide</p> <p data-bbox="844 441 1023 1176"></p>	surfactant – emulsifying agent
PPG-2 C9-11 Pareth-7	<p data-bbox="1039 1323 1088 1617">the polypropylene glycol ether of a mixture of synthetic C9-11 ethoxylated fatty alcohols containing an average of 7 moles of ethylene oxide and 2 moles of propylene oxide</p> <p data-bbox="1039 441 1323 1617"></p>	surfactant – emulsifying agent

Table 2. Definitions, Structures, and, Functions

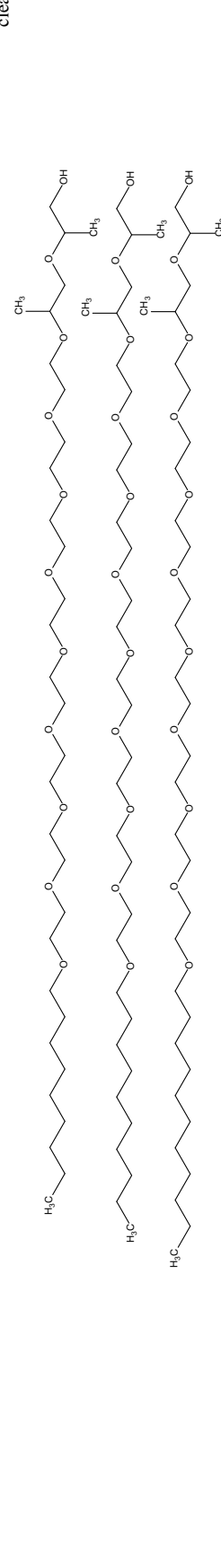
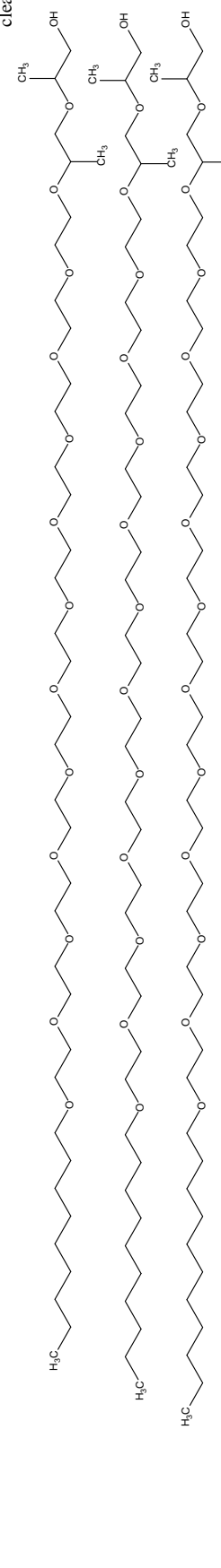
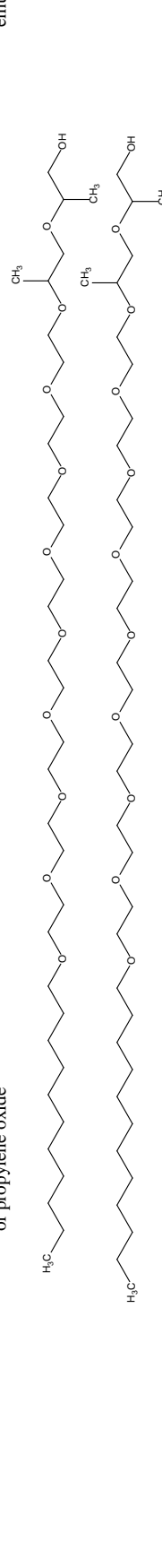
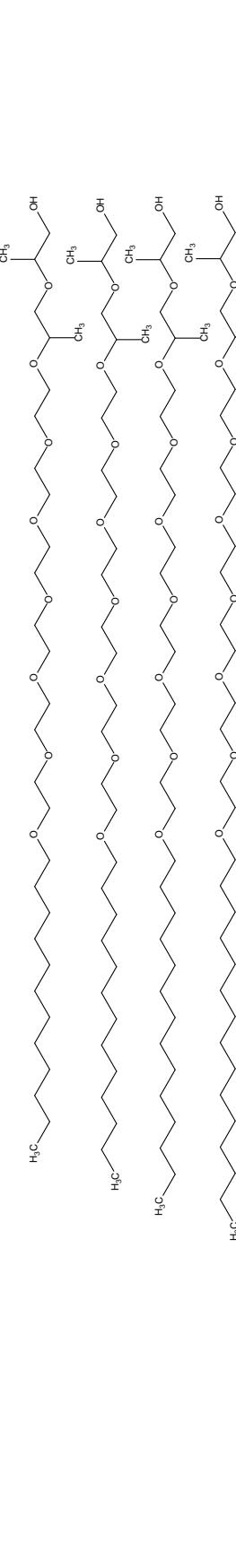
Ingredient (CAS No. if available)	Definition¹ & Structure^{CIR staff[®]}	Function
PPG-2 C9-11 Pareth-8	<p data-bbox="196 254 243 1992">the polypropylene glycol ether of a mixture of synthetic C9-11 ethoxylated fatty alcohols containing an average of 8 moles of ethylene oxide and 2 moles of propylene oxide</p> 	surfactant – emulsifying and cleansing agent
PPG-2 C9-11 Pareth-11	<p data-bbox="503 254 552 1992">the polypropylene glycol ether of a mixture of synthetic C9-11 ethoxylated fatty alcohols containing an average of 11 moles of ethylene oxide and 2 moles of propylene oxide</p> 	surfactant – emulsifying and cleansing agent
PPG-2 C12-13 Pareth-8	<p data-bbox="812 254 860 1992">the polypropylene glycol ether of a mixture of synthetic C12-13 ethoxylated fatty alcohols containing an average of 8 moles of ethylene oxide and 2 moles of propylene oxide</p> 	surfactant – emulsifying agent
PPG-2 C12-15 Pareth-6	<p data-bbox="1055 254 1104 1992">a polyoxyethylene, polyoxypropylene ether of a mixture of synthetic C12-15 ethoxylated fatty alcohols containing an average of 6 moles of ethylene oxide and 2 moles of propylene oxide</p> 	surfactant – emulsifying agent
PPG-4 C13-15 Pareth-15	<p data-bbox="1380 254 1472 1992">the polyoxyethylene, polyoxypropylene ether of a mixture of synthetic C13-15 ethoxylated fatty alcohols containing an average of 15 moles of ethylene oxide and 4 moles of propylene oxide</p>	surfactant – emulsifying agent

Table 2. Definitions, Structures, and, Functions

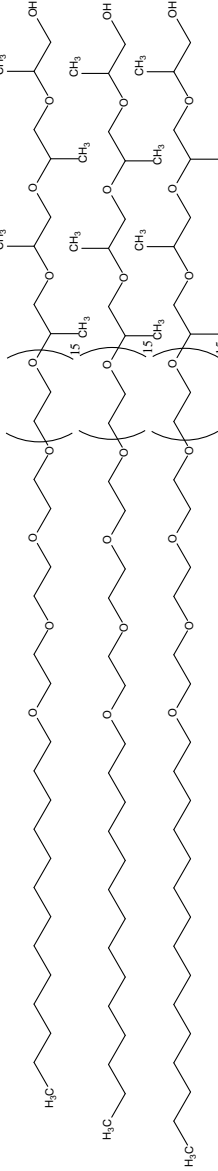
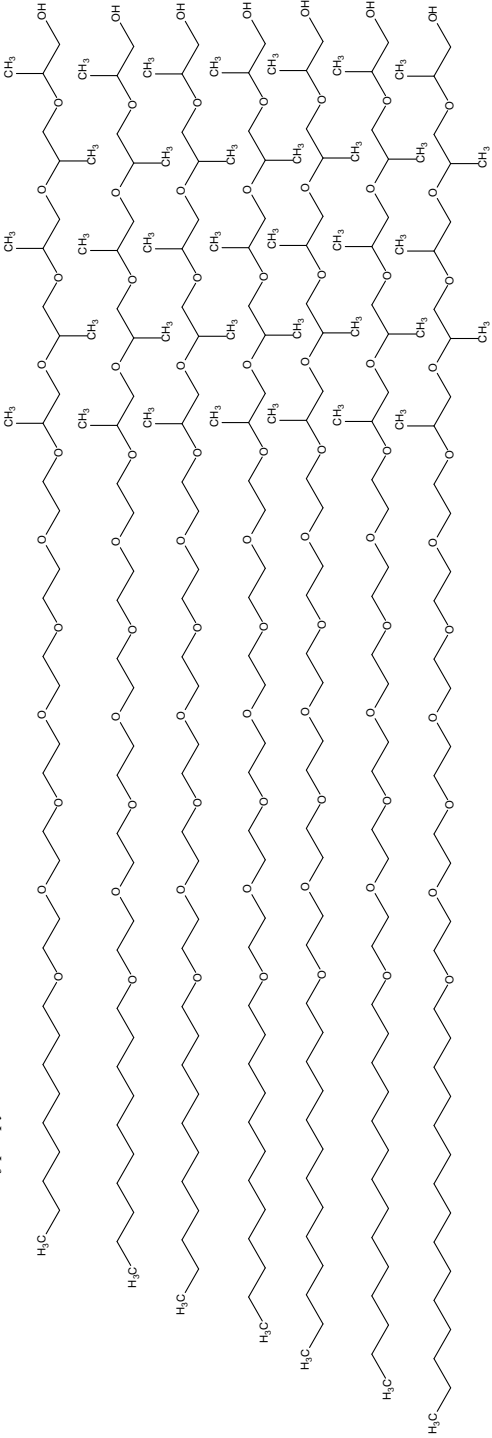
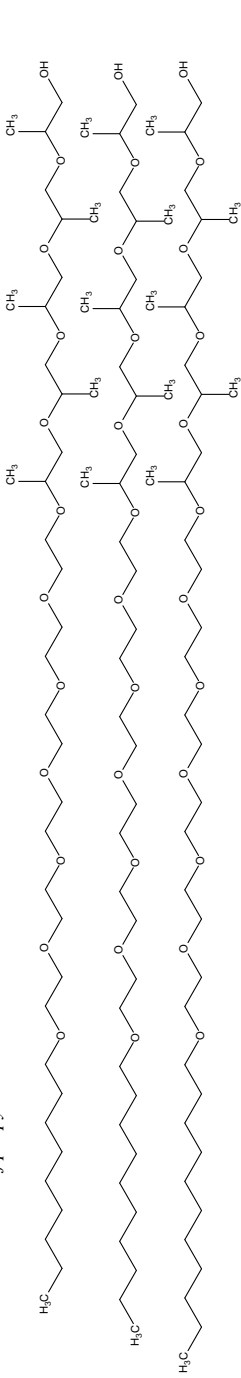
Ingredient (CAS No. if available)	Definition ¹ & Structure ^{CIR star[®]}	Function
PPG-5 C9-15 Pareth-6		surfactant – emulsifying agent
PPG-6 C9-11 Pareth-5 (154518-36-2)	<p>the polyoxyethylene, polyoxypropylene ether of a mixture of synthetic C9-11 ethoxylated fatty alcohols containing an average of 5 moles of ethylene oxide and 6 moles of propylene oxide</p> 	surfactant – emulsifying agent
PPG-6 C12-15 Pareth-12 (68551-13-3) ⁵³	<p>the polyoxyethylene, polyoxypropylene ether of a mixture of synthetic C12-15 ethoxylated fatty alcohols containing an average of 12 moles of ethylene oxide and 6 moles of propylene oxide</p> 	surfactant – emulsifying agent

Table 2. Definitions, Structures, and, Functions

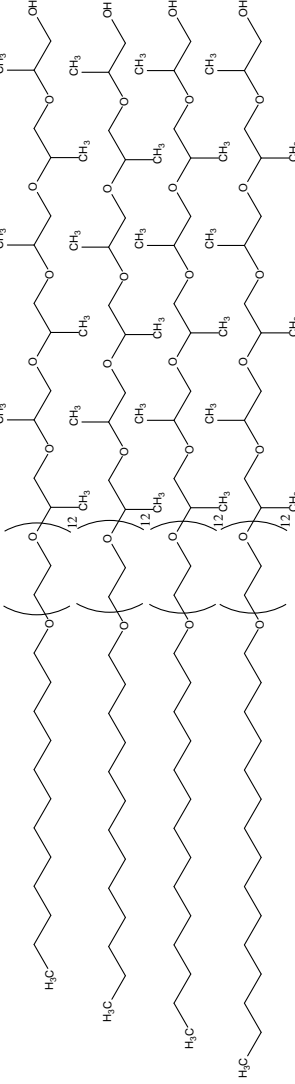
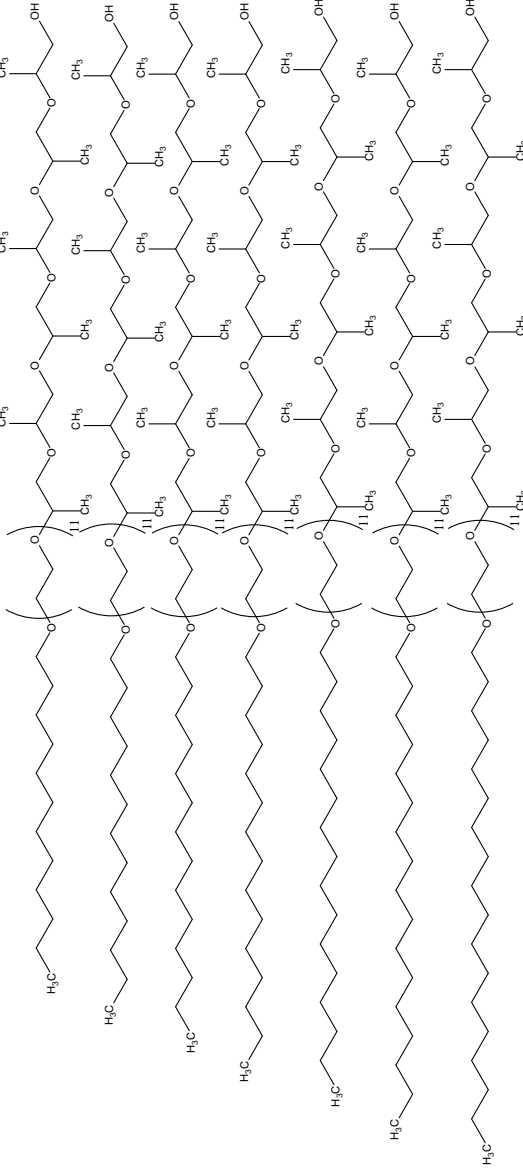
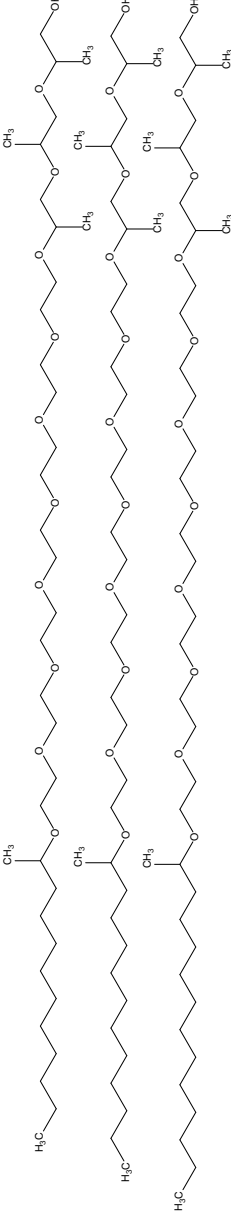
Ingredient (CAS No. if available)	Definition ¹ & Structure ¹ <small>CIR staff[®]</small>	Function
PPG-6 C12-18 Pareth-11		surfactant – emulsifying agent
the polyoxyethylene, polyoxypropylene ether of a mixture of synthetic C12-18 ethoxylated fatty alcohols containing an average of 11 moles of ethylene oxide and 6 moles of propylene oxide		emulsion stabilizer; surfactant – emulsifying agent
PPG-3 C12-14 Sec-Pareth-7 (68131-40-8) ¹³		emulsion stabilizer; surfactant – emulsifying agent

Table 2. Definitions, Structures, and, Functions

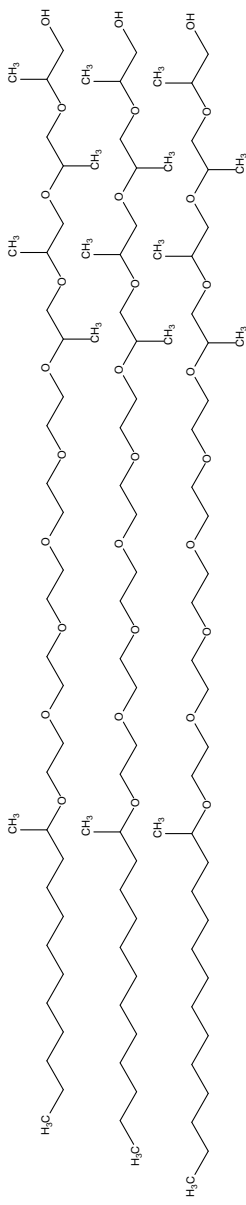
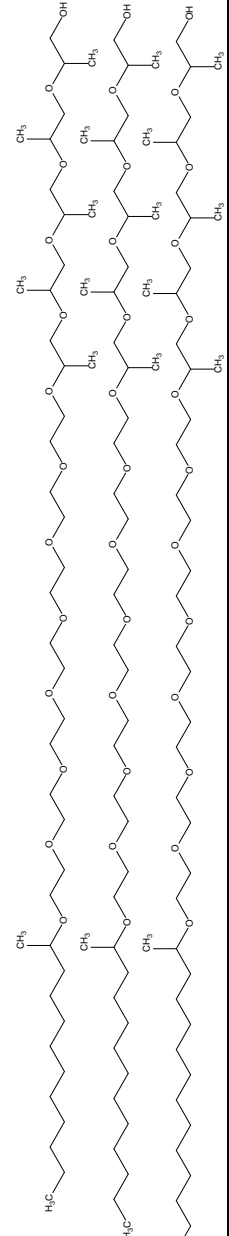
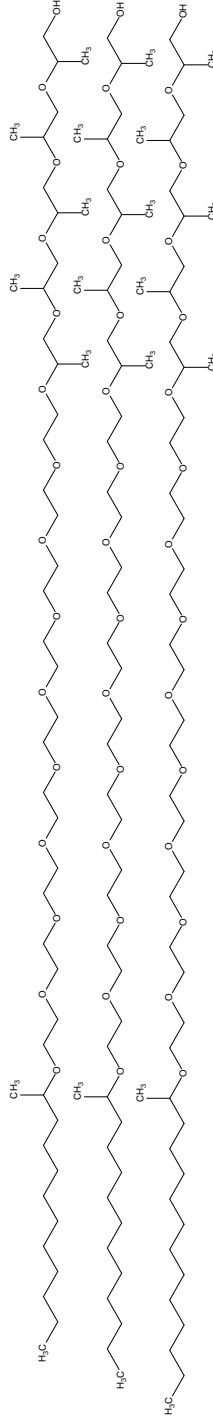
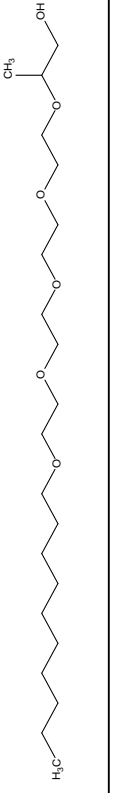
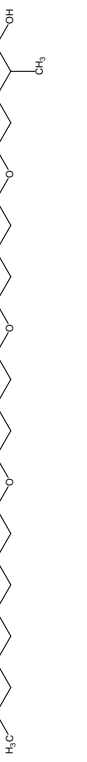
Ingredient (CAS No. if available)	Definition¹ & Structure^{CIR staff[®]}	Function
PPG-4 C12-14 Sec-Parath-5 (68131-40-8) ¹³	<p data-bbox="203 661 251 1396">the polyoxyethylene, polyoxypropylene ether of a mixture of synthetic secondary C12-14 alcohols with an average ethoxylation value of 5 and an average propoxylation value of 4</p> 	emulsion stabilizer; surfactant – emulsifying agent
PPG-5 C12-14 Sec-Parath-7 (68131-40-8) ¹³	<p data-bbox="511 661 560 1396">the polyoxyethylene, polyoxypropylene ether of a mixture of synthetic secondary C12-14 alcohols with an average ethoxylation value of 7 and an average propoxylation value of 5</p> 	emulsion stabilizer; surfactant – emulsifying agent
PPG-5 C12-14 Sec-Parath-9 (68131-40-8) ¹³	<p data-bbox="803 661 852 1396">the polyoxyethylene, polyoxypropylene ether of a mixture of synthetic secondary C12-14 alcohols with an average ethoxylation value of 9 and an average propoxylation value of 5</p> 	emulsion stabilizer; surfactant – emulsifying agent
PPG-1-Deceeth-4	<p data-bbox="1079 661 1128 1396">the polyoxyethylene, polyoxypropylene ether of decyl alcohol that conforms generally to the formula where x has an average value of 1 and y has an average value of 4</p> 	surfactant- cleansing and emulsifying agent
PPG-1-Deceeth-5	<p data-bbox="1242 661 1291 1396">the polyoxyethylene, polyoxypropylene ether of decyl alcohol that conforms generally to the formula where x has an average value of 1 and y has an average value of 5</p> 	surfactant- cleansing and emulsifying agent

Table 2. Definitions, Structures, and, Functions

Ingredient (CAS No. if available)	Definition ¹ & Structure ^{CIR staff[®]}	Function
PPG-1-Deceth-6	the polyoxyethylene, polyoxypropylene ether of decyl alcohol that conforms generally to the formula where x has an average value of 1 and y has an average value of 6	surfactant – emulsifying agent
PPG-1-Deceth-7	the polyoxyethylene, polyoxypropylene ether of decyl alcohol that conforms generally to the formula where x has an average value of 1 and y has an average value of 7	surfactant- cleansing and emulsifying agent
PPG-2-Deceth-3 (37251-67-5)	the polyoxypropylene, polyoxyethylene ether of decyl alcohol containing an average of 3 moles of ethylene oxide and 2 moles of propylene oxide	surfactant – emulsifying agent
PPG-2-Deceth-5	the polyoxyethylene, polyoxypropylene ether of decyl alcohol containing an average of 5 moles of ethylene oxide and 2 moles of propylene oxide	surfactant – emulsifying agent
PPG-2-Deceth-7 (37251-67-5)	the polyoxypropylene, polyoxyethylene ether of decyl alcohol containing an average of 7 moles of ethylene oxide and 2 moles of propylene oxide	surfactant – emulsifying agent
PPG-2-Deceth-8	the polyoxypropylene, polyoxyethylene ether of decyl alcohol containing an average of 8 moles of ethylene oxide and 2 moles of propylene oxide	surfactant – emulsifying agent
PPG-2-Deceth-10 (37251-67-5)	the polyoxypropylene, polyoxyethylene ether of decyl alcohol containing an average of 10 moles of ethylene oxide and 2 moles of propylene oxide	surfactant – emulsifying agent
PPG-2-Deceth-12 (37251-67-5)	the polyoxypropylene, polyoxyethylene ether of decyl alcohol containing an average of 12 moles of ethylene oxide and 2 moles of propylene oxide	surfactant – emulsifying agent
PPG-2-Deceth-15 (37251-67-5)	the polyoxypropylene, polyoxyethylene ether of decyl alcohol containing an average of 15 moles of ethylene oxide and 2 moles of propylene oxide	surfactant – emulsifying agent

Table 2. Definitions, Structures, and, Functions

Ingredient (CAS No. if available)	Definition¹ & Structure^{CIR staff}	Function
PPG-2-Deceth-20 (37251-67-5)	the polyoxypropylene, polyoxyethylene ether of decyl alcohol containing an average of 20 moles of ethylene oxide and 2 moles of propylene oxide	surfactant – emulsifying agent
PPG-2-Deceth-30 (37251-67-5)	the polyoxyethylene, polyoxypropylene ether of decyl alcohol containing an average of 30 moles of ethylene oxide and 2 moles of propylene oxide	surfactant – emulsifying agent
PPG-2-Deceth-40	the polyoxyethylene, polyoxypropylene ether of decyl alcohol containing an average of 40 moles of ethylene oxide and 2 moles of propylene oxide	surfactant – emulsifying agent
PPG-2-Deceth-50	the polyoxyethylene, polyoxypropylene ether of decyl alcohol containing an average of 50 moles of ethylene oxide and 2 moles of propylene oxide	surfactant – emulsifying agent
PPG-2-Deceth-60	the polyoxyethylene, polyoxypropylene ether of decyl alcohol containing an average of 60 moles of ethylene oxide and 2 moles of propylene oxide	surfactant – emulsifying agent
PPG-4-Deceth-4	the polyoxyethylene, polyoxypropylene ether of decyl alcohol containing an average of 4 moles of ethylene oxide and 4 moles of propylene oxide	surfactant – emulsifying agent
PPG-4-Deceth-6 (37251-67-5)	the polyoxyethylene, polyoxypropylene ether of decyl alcohol containing an average of 4 moles of ethylene oxide and 6 moles of propylene oxide	surfactant – emulsifying agent
PPG-6-Deceth-4 (68154-97-2) ⁵³	the polyoxyethylene, polyoxypropylene ether of decyl alcohol containing an average of 4 moles of ethylene oxide and 6 moles of propylene oxide	surfactant – emulsifying agent
PPG-6-Deceth-9 (68154-97-2) ⁵³	the polyoxyethylene, polyoxypropylene ether of decyl alcohol containing an average of 9 moles of ethylene oxide and 6 moles of propylene oxide	surfactant – emulsifying agent

Table 2. Definitions, Structures, and, Functions



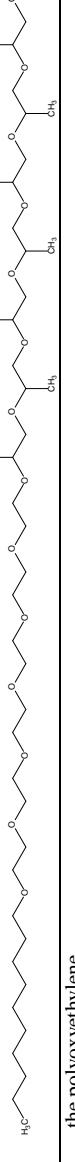

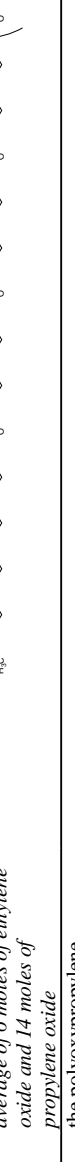

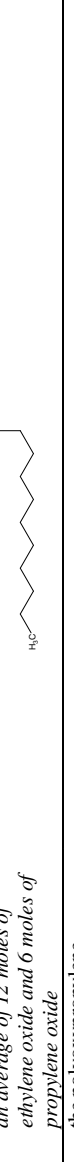

Ingredient (CAS No. if available)	Definition ¹ & Structure ² <small>CR staff³</small>	Function
PPG-8-Deceth-6 (68154-97-2) ^{5,3}	 <p>the polyoxyethylene, polyoxypropylene ether of decyl alcohol containing an average of 6 moles of ethylene oxide and 8 moles of propylene oxide</p>	surfactant – emulsifying agent
PPG-14-Deceth-6	 <p>the polyoxyethylene, polyoxypropylene ether of decyl alcohol containing an average of 6 moles of ethylene oxide and 14 moles of propylene oxide</p>	surfactant – emulsifying agent
PPG-6-Decyltetradeceth-12 (72484-69-6) ¹⁶	 <p>the polyoxypropylene, polyoxyethylene ether of Decyltetradecanol containing an average of 12 moles of ethylene oxide and 6 moles of propylene oxide</p>	surfactant – emulsifying agent
PPG-6-Decyltetradeceth-20 (72484-69-6) ¹⁷	 <p>the polyoxypropylene, polyoxyethylene ether of Decyltetradecanol containing an average of 20 moles of ethylene oxide and 6 moles of propylene oxide</p>	surfactant – emulsifying agent
PPG-6-Decyltetradeceth-30 (72484-69-6) ¹⁸	 <p>the polyoxypropylene, polyoxyethylene ether of Decyltetradecanol containing an average of 30 moles of ethylene oxide and 6 moles of propylene oxide</p>	surfactant – emulsifying agent
PPG-13-Decyltetradeceth-24	 <p>the polyoxypropylene, polyoxyethylene ether of Decyltetradecanol containing an average of 24 moles of ethylene oxide and 13 moles of propylene oxide</p>	surfactant – emulsifying agent
PPG-20-Decyltetradeceth-10	 <p>the polyoxypropylene, polyoxyethylene ether of Decyltetradecanol containing an average of 10 moles of ethylene oxide and 20 moles of propylene oxide</p>	surfactant – emulsifying agent
PPG-9-Ethylhexeth-5 (64366-70-7)	 <p>the polyoxypropylene, polyoxyethylene ether of octyl alcohol containing an average of 5 moles of ethylene oxide and 6 moles of propylene oxide</p>	surfactant – emulsifying agent

Table 2. Definitions, Structures, and, Functions

Ingredient (CAS No. if available)	Definition ¹ & Structure ^{CIR staff[®]}	Function
PPG-1-Isodeceth-4	<p>the polyoxyethylene, polyoxypropylene ether of isodecyl alcohol containing an average of 5 moles of ethylene oxide and 4 moles of propylene oxide 4 (a.k.a. Propylene Glycol Isodeceth-4)³⁴</p>	surfactant-cleansing and emulsifying agent
PPG-1-Isodeceth-6	<p>is the polyoxyethylene, polyoxypropylene ether of isodecyl alcohol containing an average of 6 moles of ethylene oxide and 6 moles of propylene oxide 1</p>	surfactant-cleansing and emulsifying agent
PPG-1-Isodeceth-7	<p>the polyoxyethylene, polyoxypropylene ether of isodecyl alcohol containing an average of 7 moles of ethylene oxide and 6 moles of propylene oxide 1</p>	surfactant-cleansing and emulsifying agent
PPG-1-Isodeceth-9	<p>the polyoxyethylene, polyoxypropylene ether of isodecyl alcohol containing an average of 9 moles of ethylene oxide and 6 moles of propylene oxide 1</p>	surfactant-cleansing and emulsifying agent
PPG-2-Isodeceth-4 (155683-77-5) ³³	<p>One example of an "iso" the polyoxypropylene, polyoxyethylene glycol ether of isodecyl alcohol containing an average of 4 moles of ethylene oxide and 2 moles of propylene oxide 9</p>	surfactant – emulsifying agent
PPG-2-Isodeceth-6 (155683-77-5) ³³	<p>the polyoxyethylene, polyoxypropylene ether of isodecyl alcohol containing an average of 6 moles of ethylene oxide and 6 moles of propylene oxide 2</p>	surfactant – emulsifying agent
PPG-2-Isodeceth-8 (155683-77-5) ³³	<p>the polyoxyethylene, polyoxypropylene ether of isodecyl alcohol containing an average of 8 moles of ethylene oxide and 6 moles of propylene oxide 2</p>	surfactant-cleansing and emulsifying agent
PPG-2-Isodeceth-9 (155683-77-5) ³³	<p>One example of an "iso" the polyoxypropylene, polyoxyethylene ether of isodecyl alcohol containing an average of 9 moles of ethylene oxide and 6 moles of propylene oxide 2</p>	surfactant – emulsifying agent
	<p>One example of an "iso"</p>	surfactant – emulsifying agent

Table 2. Definitions, Structures, and, Functions

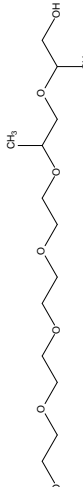

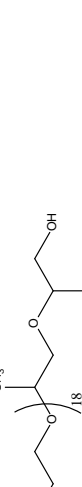
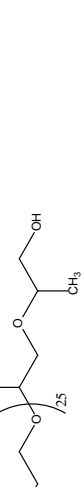
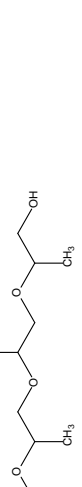
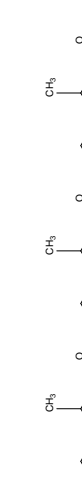

Ingredient (CAS No. if available)	Definition¹ & Structure^{CIR staff}	Function
PPG-2-Isodeceth-10 (155683-77-5) ⁵³	the polyoxypropylene, polyoxyethylene ether of isodecyl alcohol containing an average of 10 moles of ethylene oxide and 6 moles of propylene oxide	surfactant-cleansing and emulsifying agent
One example of an "iso"		surfactant – emulsifying agent
PPG-2-Isodeceth-12 (155683-77-5) ⁵³	the polyoxypropylene, polyoxyethylene ether of isodecyl alcohol containing an average of 12 moles of ethylene oxide and 6 moles of propylene oxide	surfactant – emulsifying agent
One example of an "iso"		surfactant – emulsifying agent
PPG-2-Isodeceth-18 (155683-77-5) ⁵³	the polyoxypropylene, polyoxyethylene ether of isodecyl alcohol containing an average of 18 moles of ethylene oxide and 6 moles of propylene oxide	surfactant-cleansing and emulsifying agent
One example of an "iso"		surfactant-cleansing and emulsifying agent
PPG-2-Isodeceth-25 (155683-77-5) ⁵³	the polyoxypropylene, polyoxyethylene ether of isodecyl alcohol containing an average of 25 moles of ethylene oxide and 6 moles of propylene oxide	surfactant-cleansing and emulsifying agent
One example of an "iso"		surfactant-cleansing and emulsifying agent
PPG-3-Isodeceth-1 (155683-77-5) ⁵³	the polyoxypropylene, polyoxyethylene ether of isodecyl alcohol containing an average of 1 mole of ethylene oxide and 3 moles of propylene oxide	skin conditioning agent - emollient
One example of an "iso"		skin conditioning agent - emollient
PPG-4-Isodeceth-10	the polyoxypropylene, polyoxyethylene ether of isodecyl alcohol containing an average of 10 moles of ethylene oxide and 4 moles of propylene oxide	surfactant-cleansing and emulsifying agent
One example of an "iso"		surfactant-cleansing and emulsifying agent
PPG-3-Isosteareth-9	the polyoxypropylene, polyoxyethylene ether of Isostearyl Alcohol containing an average of 9 moles of ethylene oxide and 3 moles of propylene oxide	surfactant-emulsifying agent
One example of an "iso"		surfactant-emulsifying agent

Table 2. Definitions, Structures, and, Functions

Ingredient (CAS No. if available)	Definition ¹ & Structure ^{CIR staff[®]}	Function
PPG-2-Laureth-5	the polyoxypropylene, polyoxyethylene ether of Lauryl Alcohol containing an average of 5 moles of ethylene oxide and 2 moles of propylene oxide	skin conditioning agent – emollient; surfactant-emulsifying agent
PPG-2-Laureth-8	the polyoxypropylene, polyoxyethylene ether of Lauryl Alcohol containing an average of 8 moles of ethylene oxide and 2 moles of propylene oxide	skin conditioning agent – emollient; surfactant-emulsifying agent
PPG-2-Laureth-12	the polyoxypropylene, polyoxyethylene ether of Lauryl Alcohol containing an average of 9 moles of ethylene oxide and 3 moles of propylene oxide	surfactant-emulsifying agent
PPG-3-Laureth-8	the polyoxypropylene, polyoxyethylene ether of Lauryl Alcohol containing an average of 8 moles of ethylene oxide and 3 moles of propylene oxide	surfactant-emulsifying agent
PPG-3-Laureth-9	the polyoxypropylene, polyoxyethylene ether of Lauryl Alcohol containing an average of 9 moles of ethylene oxide and 3 moles of propylene oxide	surfactant-emulsifying agent
PPG-3-Laureth-10	the polyoxypropylene, polyoxyethylene derivative of Lauryl Alcohol containing an average of 10 moles of ethylene oxide and 3 moles of propylene oxide	surfactant-emulsifying agent
PPG-3-Laureth-12	the polyoxypropylene, polyoxyethylene derivative of Lauryl Alcohol containing an average of 12 moles of ethylene oxide and 3 moles of propylene oxide	surfactant-emulsifying agent
PPG-4 Laureth-2 (68439-51-0) ⁵³	the polyoxypropylene, polyoxyethylene ether of Lauryl Alcohol containing an average of 2 moles of ethylene oxide and 4 moles of propylene oxide	skin conditioning agent – emollient; surfactant-emulsifying agent

Table 2. Definitions, Structures, and, Functions

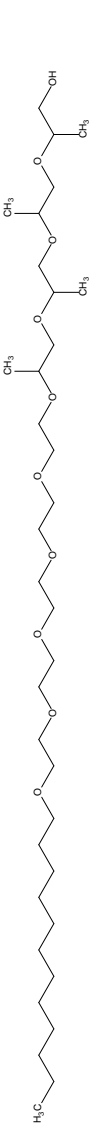
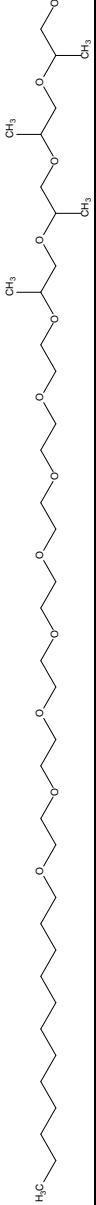

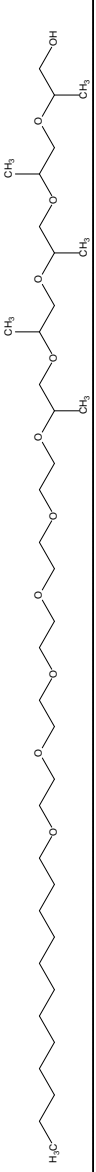
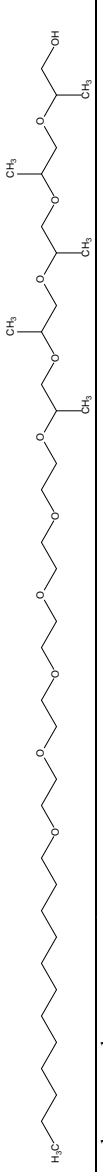

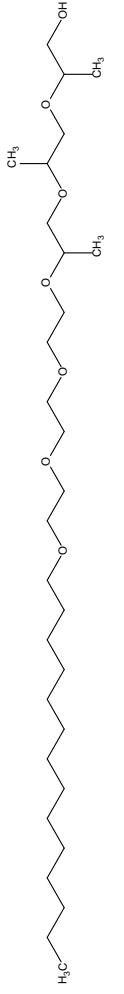
Ingredient (CAS No. if available)	Definition¹ & Structure^{CIR staff²}	Function
PPG-4 Laureth-5 (68439-51-0) ⁵³	the polyoxypropylene, polyoxyethylene ether of Lauryl Alcohol containing an average of 5 moles of ethylene oxide and 4 moles of propylene oxide 	skin conditioning agent – emollient; surfactant-emulsifying agent
PPG-4 Laureth-7	the polyoxypropylene, polyoxyethylene ether of Lauryl Alcohol containing an average of 7 moles of ethylene oxide and 4 moles of propylene oxide 	skin conditioning agent – emollient; surfactant-emulsifying agent
PPG-4-Laureth-15	the polyoxyethylene, polyoxypropylene ether of Lauryl containing an average of 15 moles of ethylene oxide and 4 moles of propylene oxide 	skin conditioning agent – emollient; surfactant-emulsifying agent
PPG-5-Laureth-5	the polyoxyethylene, polyoxypropylene ether of lauryl alcohol containing an average of 5 moles of ethylene oxide and 5 moles of propylene oxide 	skin conditioning agent – emollient; surfactant-emulsifying agent
PPG-6-Laureth-3	the polyoxypropylene, polyoxyethylene ether of lauryl alcohol containing an average of 3 moles of ethylene oxide and 6 moles of propylene oxide 	skin conditioning agent – emollient; surfactant-emulsifying agent
PPG-25-Laureth-25 (37311-00-5; 68238-81-3) ⁵³	the polyoxypropylene, polyoxyethylene ether of Lauryl Alcohol containing an average of 25 moles of ethylene oxide and 25 moles of propylene oxide 	surfactant-emulsifying agent
PPG-3-Myreth-3 (37311-04-9)	the polyoxypropylene, polyoxyethylene ether of myristyl alcohol containing an average of 3 moles of ethylene oxide and 3 moles of propylene oxide 	skin conditioning agent – emollient; surfactant-emulsifying agent

Table 2. Definitions, Structures, and, Functions

Ingredient (CAS No. if available)	Definition¹ & Structure^{CR staff}	Function
PPG-3-Myreth-11 (37311-04-9)	the polyoxypropylene, polyoxyethylene ether of myristyl alcohol containing an average of 11 moles of ethylene oxide and 3 moles of propylene oxide	surfactant-emulsifying agent
PPG-2-PEG-11 Hydrogenated Lauryl Alcohol Ether	a polyoxypropylene, polyoxyethylene ether of hydrogenated lauryl alcohol containing an average of 11 moles of ethylene oxide and 2 moles of propylene oxide, and R represents the alkyl groups derived from hydrogenated lauryl alcohol	surfactant-emulsifying agent
PPG-3-PEG-6 Oleyl Ether	the polyoxypropylene, polyoxyethylene derivative of oleyl alcohol containing an average of 6 moles of ethylene oxide and 3 moles of propylene oxide	surfactant-emulsifying agent
PPG-9-Steareth-3 (9038-43-1)	the polyoxypropylene, polyoxyethylene ether of stearyl alcohol containing an average of 3 moles of ethylene oxide and 9 moles of propylene oxide	skin conditioning agent – emollient
PPG-23-Steareth-34 (9038-43-1)	the polyoxypropylene, polyoxyethylene ether of stearyl alcohol containing an average of 34 moles of ethylene oxide and 23 moles of propylene oxide	skin conditioning agent – emollient; surfactant-emulsifying agent
PPG-30 Steareth-4	the polyoxypropylene, polyoxyethylene ether of stearyl alcohol containing an average of 4 moles of ethylene oxide and 30 moles of propylene oxide	skin conditioning agent – emollient; surfactant-emulsifying agent
PPG-34-Steareth-3	the polyoxypropylene, polyoxyethylene ether of stearyl alcohol containing an average of 3 moles of ethylene oxide and 34 moles of propylene oxide	skin conditioning agent – emollient; surfactant-emulsifying agent
PPG-38 Steareth-6	the polyoxypropylene, polyoxyethylene ether of stearyl alcohol containing an average of 6 moles of ethylene oxide and 38 moles of propylene oxide	skin conditioning agent – emollient; surfactant-emulsifying agent

Table 2. Definitions, Structures, and, Functions

Ingredient (CAS No. if available)	Definition¹ & Structure^{CIR staff}	Function
PPG-1 Trideceth- 6	the polyoxypropylene, polyoxyethylene ether of tridecyl alcohol containing an average of 6 moles of ethylene oxide and 1 mole of propylene oxide	skin conditioning agent – emollient; surfactant-emulsifying agent
PPG-1 Trideceth-13	the polyoxypropylene, polyoxyethylene ether of tridecyl alcohol containing an average of 13 moles of ethylene oxide and 1 mole of propylene oxide	skin conditioning agent – emollient; surfactant-emulsifying agent
PPG-4 Trideceth-6 (65150-81-4) ⁵³	the polyoxypropylene, polyoxyethylene ether of tridecyl alcohol containing an average of 6 moles of ethylene oxide and 4 mole of propylene oxide	skin conditioning agent – emollient; surfactant-emulsifying agent
PPG-6 Trideceth-8	the polyoxypropylene, polyoxyethylene ether of tridecyl alcohol containing an average of 8 moles of ethylene oxide and 6 mole of propylene oxide	skin conditioning agent – emollient; surfactant-emulsifying agent
Propylene Glycol Capreth-4	the propylene glycol ether of polyethylene glycol derivative of capryl alcohol containing an average of 4 moles of ethylene oxide	surfactant-emulsifying agent
Propylene Glycol Isodeceth-4	the propylene glycol ether of ethoxylated isodecyl alcohol containing an average of 4 moles of ethylene oxide (a.k.a. PPG-1-Isodeceth-4) ⁵⁴	surfactant-emulsifying agent
Propylene Glycol Isodeceth-12	the propylene glycol ether of ethoxylated isodecyl containing an average of 4 moles of ethylene oxide	surfactant-emulsifying agent
Propylene Glycol Laureth-6	the propylene glycol ether of Laureth-6 containing an average of 6 moles of ethylene oxide	surfactant-emulsifying agent
Propylene Glycol Oleth-5	the propylene glycol ether of Oleth-5 containing an average of 6 moles of ethylene oxide	surfactant-emulsifying agent

⁵³ CIR staff drew the structures

Table 3. Physical and Chemical Properties

Property	Description	Reference
<i>PPG-5 C9-15 Pareth-6</i>		
physical state and appearance	colorless to yellowish liquid	26
active content	100%	26
solubility	soluble in water	26
stability	stable in acid and alkali	26
<i>PPG-3 C12-14 Sec-Pareth-7</i>		
odor	odorless	13
specific gravity	0.969 (20/20°C)	13
stability	stable to both acid and alkali; do not react with water or air under normal conditions	13
<i>PPG-4 C12-14 Sec-Pareth-5</i>		
odor	odorless	13
specific gravity	0.956 (20/20°C)	13
stability	stable to both acid and alkali; do not react with water or air under normal conditions	13
<i>PPG-5 C12-14 Sec-Pareth-7</i>		
odor	odorless	13
specific gravity	0.975 (20/20°C)	13
stability	stable to both acid and alkali; do not react with water or air under normal conditions	13
<i>PPG-5 C12-14 Sec-Pareth-9</i>		
odor	odorless	13
specific gravity	0.979 (20/20°C)	13
stability	stable to both acid and alkali; do not react with water or air under normal conditions	13
<i>PPG-2 C12-15 Pareth-6</i>		
physical state	liquid	15
active content	100% by wt	15
<i>PPG-4-Ceteth-1</i>		
physical state and appearance	colorless to pale yellow liquid	8
<i>PPG-4-Ceteth-10</i>		
physical state and appearance	colorless liquid	20
	colorless to pale yellow petrolatum-like substance	9
<i>PPG-4-Ceteth-20</i>		
physical state and appearance	white solid	21
	colorless to pale yellow waxy substance	10
<i>PPG-5-Ceteth-20</i>		
physical state	liquid	12
	clear to slightly hazy liquid	22
boiling point	310.9°C (760 mm Hg)	7
solubility	soluble in water and isopropanol	12
	dispersible in mineral oil	
<i>PPG-8-Ceteth-1</i>		
physical state and appearance	colorless liquid	23
<i>PPG-8-Ceteth-20</i>		
physical state and appearance	yellow solid	24
<i>PPG-2-Deceth-3</i>		
physical state and appearance	slightly yellow oil	14
<i>PPG-2-Deceth-5</i>		
physical state and appearance	slightly yellow oil	14
<i>PPG-2-Deceth-7</i>		
physical state and appearance	slightly yellow turbid oil	14
<i>PPG-2-Deceth-8</i>		
physical state and appearance	clear liquid	6
active content	90% (water content; 10%)	6
density	1020 kg/m ³ (20°C)	6
solubility	soluble in water, ethanol, propylene glycol, and 2-propanol	6
	dispersible in low aromatic solvent, white spirit, and xylene	
<i>PPG-2-Deceth-10</i>		
physical state and appearance	slightly yellow soft paste	14
<i>PPG-2-Deceth-12</i>		
physical state and appearance	slightly yellow soft paste	14
<i>PPG-2-Deceth-15</i>		
physical state and appearance	slightly yellow soft wax	14
<i>PPG-2-Deceth-20</i>		
physical state and appearance	slightly yellow soft wax	14
<i>PPG-2-Deceth-30</i>		
physical state and appearance	slightly yellow soft wax	14
<i>PPG-6-Deceth-4</i>		
physical state	liquid	15
active content	100% by wt	15
<i>PPG-6-Deceth-9</i>		
physical state	liquid	15
active content	100% by wt	15

Table 3. Physical and Chemical Properties

Property	Description	Reference
<i>PPG-8-Deceth-6</i>		
physical state	liquid	15
active content	100% by wt	15
<i>PPG-6 Decyltetradeceth-12</i>		
physical state and appearance	yellow solid	16
<i>PPG-6-Decyltetradeceth-20</i>		
physical state and appearance	yellow solid	17
<i>PPG-6-Decyltetradeceth-30</i>		
physical state and appearance	yellow solid	18
<i>PPG-9-Ethylhexeth-5</i>		
physical state and appearance	colorless to yellow liquid with a mild odor	11
boiling point	decomposes prior to boiling	11
<i>PPG-3-Isodeceth-1</i>		
physical state	liquid	19
<i>PPG-4-Laureth-2</i>		
physical state	liquid	15
active content	100%	15
<i>PPG-4-Laureth-5</i>		
physical state	liquid	15
active content	100%	15
<i>PPG-25-Laureth-25</i>		
physical state and appearance	colorless or pale yellow liquid	25
	colorless or straw-colored clear liquid	31
solubility	soluble in water	25
density	1.046±2%	31
pH	6.8±0.4	31
<i>PPG-1 Trideceth-13</i>		
physical state and appearance	colorless liquid	27
active content	95%	27
solubility	soluble in water	27
<i>Propylene Glycol Oleth-5</i>		
physical state	liquid	15
active content	100%	15

Table 4. Frequency and concentration of use according to duration and type of exposure

	<i># of Uses</i> ³⁷	<i>Max Conc of Use (%)</i> ³⁸	<i># of Uses</i> ³⁷	<i>Max Conc of Use (%)</i> ³⁸	<i># of Uses</i> ³⁷	<i>Max Conc of Use (%)</i> ³⁸
	PEG/PPG-9/2 Dimethyl Ether		PEG/PPG-14/7 Dimethyl Ether		PEG/PPG-17/4 Dimethyl Ether	
Totals*	NR	0.01-2	35	0.00011-7	11	0.1-5
<i>Duration of Use</i>						
<i>Leave-On</i>	<i>NR</i>	<i>0.01-2</i>	<i>34</i>	<i>0.00011-7</i>	<i>11</i>	<i>0.1-5</i>
<i>Rinse-Off</i>	<i>NR</i>	<i>0.03-0.97</i>	<i>1</i>	<i>0.01-3</i>	<i>NR</i>	<i>NR</i>
<i>Diluted for (Bath) Use</i>	<i>NR</i>	<i>NR</i>	<i>NR</i>	<i>NR</i>	<i>NR</i>	<i>NR</i>
<i>Exposure Type</i>						
Eye Area	NR	0.01	NR	0.01-5	NR	3
Incidental Ingestion	NR	NR	NR	1	NR	NR
Incidental Inhalation-Spray	NR	0.05	1 ^a	0.12-7	NR	NR
Incidental Inhalation-Powder	NR	NR	NR	0.01	NR	NR
Dermal Contact	NR	0.01-1	35	0.01-7	11	0.1-5
Deodorant (underarm)	NR	NR	NR	NR	NR	NR
Hair - Non-Coloring	NR	0.03-2	NR	0.12-3	NR	NR
Hair-Coloring	NR	NR	NR	0.5	NR	NR
Nail	NR	NR	NR	0.00011-1	NR	NR
Mucous Membrane	NR	NR	NR	1	NR	NR
Baby Products	NR	NR	NR	NR	NR	NR

Table 4. Frequency and concentration of use according to duration and type of exposure

	<i># of Uses</i> ³⁷	<i>Max Conc of Use (%)</i> ³⁸	<i># of Uses</i> ³⁷	<i>Max Conc of Use (%)</i> ³⁸	<i># of Uses</i> ³⁷	<i>Max Conc of Use (%)</i> ³⁸
	PEG/PPG-35/40 Dimethyl Ether		PEG/PPG-36/41 Dimethyl Ether		PEG/PPG-50/40 Dimethyl Ether	
Totals*	NR	1-3	243	0.1-5	2	0.05-2
Duration of Use						
<i>Leave-On</i>	<i>NR</i>	<i>1-3</i>	<i>243</i>	<i>0.1-5</i>	<i>NR</i>	<i>0.05</i>
<i>Rinse Off</i>	<i>NR</i>	<i>3</i>	<i>NR</i>	<i>0.1-1</i>	<i>2</i>	<i>0.4-2</i>
<i>Diluted for (Bath) Use</i>	<i>NR</i>	<i>NR</i>	<i>NR</i>	<i>NR</i>	<i>NR</i>	<i>NR</i>
Exposure Type						
Eye Area	NR	NR	91	0.1-1	NR	0.4
Incidental Ingestion	NR	NR	27	5	NR	NR
Incidental Inhalation-Spray	NR	NR	NR	NR	NR	NR
Incidental Inhalation-Powder	NR	NR	6	0.1	NR	NR
Dermal Contact	NR	1-3	215	0.1-1	2	0.5-2
Deodorant (underarm)	NR	NR	NR	NR	NR	NR
Hair - Non-Coloring	NR	NR	NR	1	NR	NR
Hair-Coloring	NR	NR	NR	NR	NR	NR
Nail	NR	NR	NR	NR	NR	NR
Mucous Membrane	NR	NR	27	5	NR	NR
Baby Products	NR	NR	NR	NR	NR	NR
	PEG/PPG-55/28 Dimethyl Ether		PPG-2-Ceteareth-9		PPG-2-Ceteth-10	
Totals*	NR	0.05-5	9	NR	1	NR
Duration of Use						
<i>Leave-On</i>	<i>NR</i>	<i>0.5-5</i>	<i>5</i>	<i>NR</i>	<i>1</i>	<i>NR</i>
<i>Rinse-Off</i>	<i>NR</i>	<i>0.05-5</i>	<i>4</i>	<i>NR</i>	<i>NR</i>	<i>NR</i>
<i>Diluted for (Bath) Use</i>	<i>NR</i>	<i>NR</i>	<i>NR</i>	<i>NR</i>	<i>NR</i>	<i>NR</i>
Exposure Type						
Eye Area	NR	NR	NR	NR	NR	NR
Incidental Ingestion	NR	NR	NR	NR	NR	NR
Incidental Inhalation-Spray	NR	NR	NR	NR	NR	NR
Incidental Inhalation-Powder	NR	NR	NR	NR	NR	NR
Dermal Contact	NR	0.5-3	8	NR	1	NR
Deodorant (underarm)	NR	NR	NR	NR	NR	NR
Hair - Non-Coloring	NR	0.05-5	1	NR	NR	NR
Hair-Coloring	NR	NR	NR	NR	NR	NR
Nail	NR	NR	NR	NR	NR	NR
Mucous Membrane	NR	NR	NR	NR	NR	NR
Baby Products	NR	NR	NR	NR	NR	NR
	PPG-4-Ceteth-20		PPG-5-Ceteth-20		PPG-8-Ceteth-1	
Totals	2	NR	445	0.05-10	NR	0.01
Duration of Use						
<i>Leave-On</i>	<i>2</i>	<i>NR</i>	<i>217</i>	<i>0.05-10</i>	<i>NR</i>	<i>0.01</i>
<i>Rinse Off</i>	<i>NR</i>	<i>NR</i>	<i>202</i>	<i>0.5-9</i>	<i>NR</i>	<i>NR</i>
<i>Diluted for (Bath) Use</i>	<i>NR</i>	<i>NR</i>	<i>26</i>	<i>1.5</i>	<i>NR</i>	<i>NR</i>
Exposure Type						
Eye Area	NR	NR	5	0.05-0.81	NR	NR
Incidental Ingestion	NR	NR	NR	NR	NR	NR
Incidental Inhalation-Spray	NR	NR	28 ^{a,b}	0.14-5; 1.5-10 ^b	NR	NR
Incidental Inhalation-Powder	NR	NR	NR	NR	NR	NR
Dermal Contact	2	NR	195	0.05-9	NR	0.01
Deodorant (underarm)	NR	NR	4 ^b	3-5	NR	NR
Hair - Non-Coloring	NR	NR	240	0.14-10	NR	NR
Hair-Coloring	NR	NR	8	2-3.1	NR	NR
Nail	NR	NR	2	0.1-1.5	NR	NR
Mucous Membrane	NR	NR	73	1.5-9	NR	NR
Baby Products	NR	NR	NR	NR	NR	NR

Table 4. Frequency and concentration of use according to duration and type of exposure

	<i># of Uses</i> ³⁷	<i>Max Conc of Use (%)</i> ³⁸	<i># of Uses</i> ³⁷	<i>Max Conc of Use (%)</i> ³⁸	<i># of Uses</i> ³⁷	<i>Max Conc of Use (%)</i> ³⁸
	PPG-8-Ceteth-10		PPG-8-Ceteth-20		PPG-2-Deceth-3	
Totals*	NR	0.036	10	0.072-2	NR	0.4
Duration of Use						
<i>Leave-On</i>	<i>NR</i>	<i>NR</i>	<i>9</i>	<i>0.1-1.1</i>	<i>NR</i>	<i>0.4</i>
<i>Rinse-Off</i>	<i>NR</i>	<i>0.036</i>	<i>1</i>	<i>0.072-2</i>	<i>NR</i>	<i>NR</i>
<i>Diluted for (Bath) Use</i>	<i>NR</i>	<i>NR</i>	<i>NR</i>	<i>0.075</i>	<i>NR</i>	<i>NR</i>
Exposure Type						
Eye Area	NR	NR	NR	0.3	NR	0.4
Incidental Ingestion	NR	NR	NR	NR	NR	NR
Incidental Inhalation-Spray	NR	NR	NR	0.19; 0.7 ^a	NR	NR
Incidental Inhalation-Powder	NR	NR	NR	1.1	NR	NR
Dermal Contact	NR	NR	10	0.075-2	NR	NR
Deodorant (underarm)	NR	NR	NR	spray: 0.19 not spray: 1	NR	NR
Hair - Non-Coloring	NR	0.036	NR	0.075-1	NR	NR
Hair-Coloring	NR	NR	NR	0.05	NR	NR
Nail	NR	NR	NR	NR	NR	NR
Mucous Membrane	NR	NR	NR	0.075	NR	NR
Baby Products	NR	NR	NR	NR	NR	NR
	PPG-2-Deceth-12		PPG-6-Decyltetradeceth-20		PPG-6-Decyltetradeceth-30	
Totals*	1	0.24-3	2	NR	18	0.25-2
Duration of Use						
<i>Leave-On</i>	<i>NR</i>	<i>0.24-3</i>	<i>2</i>	<i>NR</i>	<i>15</i>	<i>0.25-2</i>
<i>Rinse-Off</i>	<i>1</i>	<i>NR</i>	<i>NR</i>	<i>NR</i>	<i>3</i>	<i>0.3-0.5</i>
<i>Diluted for (Bath) Use</i>	<i>NR</i>	<i>NR</i>	<i>NR</i>	<i>NR</i>	<i>NR</i>	<i>NR</i>
Exposure Type						
Eye Area	NR	0.24	NR	NR	NR	NR
Incidental Ingestion	NR	NR	NR	NR	NR	NR
Incidental Inhalation-Spray	NR	NR	NR	NR	1 ^a	NR
Incidental Inhalation-Powder	NR	NR	NR	NR	NR	NR
Dermal Contact	NR	NR	2	NR	18	0.25-2
Deodorant (underarm)	NR	NR	NR	NR	NR	NR
Hair - Non-Coloring	NR	3	NR	NR	NR	NR
Hair-Coloring	1	NR	NR	NR	NR	NR
Nail	NR	NR	NR	NR	NR	NR
Mucous Membrane	NR	NR	NR	NR	NR	NR
Baby Products	NR	NR	NR	NR	NR	NR
	PPG-13-Decyltetradeceth-24		PPG-20-Decyltetradeceth-10		PPG-30-Decyltetradeceth-10[#]	
Totals	37	0.03	2	0.1-2	1	NR
Duration of Use						
<i>Leave-On</i>	<i>34</i>	<i>0.03-2</i>	<i>2</i>	<i>0.1-2</i>	<i>NR</i>	<i>NR</i>
<i>Rinse Off</i>	<i>3</i>	<i>0.3-1</i>	<i>NR</i>	<i>1</i>	<i>1</i>	<i>NR</i>
<i>Diluted for (Bath) Use</i>	<i>NR</i>	<i>2</i>	<i>NR</i>	<i>NR</i>	<i>NR</i>	<i>NR</i>
Exposure Type						
Eye Area	NR	0.1-0.3	NR	NR	NR	NR
Incidental Ingestion	NR	NR	NR	2	NR	NR
Incidental Inhalation-Spray	1 ^a	0.075-0.9; 2 ^b	NR	0.1-0.3	NR	NR
Incidental Inhalation-Powder	NR	0.03	NR	NR	NR	NR
Dermal Contact	37	0.03-2	1	0.1-2	1	NR
Deodorant (underarm)	NR	spray: 0.17 not spray: 0.057	NR	spray: 0.18 not spray: 0.4	NR	NR
Hair - Non-Coloring	NR	0.3-0.9	1	0.3-1	NR	NR
Hair-Coloring	NR	NR	NR	NR	NR	NR
Nail	NR	NR	NR	NR	NR	NR
Mucous Membrane	NR	2	NR	2	NR	NR
Baby Products	NR	NR	NR	NR	NR	NR

Table 4. Frequency and concentration of use according to duration and type of exposure

	# of Uses ³⁷	Max Conc of Use (%) ³⁸	# of Uses ³⁷	Max Conc of Use (%) ³⁸	# of Uses ³⁷	Max Conc of Use (%) ³⁸
	PPG-2-Isodeceth-12		PPG-3-Isosteareth-9		PPG-5-Laureth-5	
Totals	4	0.5-10	3	NR	8	0.033
Duration of Use						
<i>Leave-On</i>	2	0.5-1.5	3	NR	5	0.033
<i>Rinse Off</i>	2	10	NR	NR	3	NR
<i>Diluted for (Bath) Use</i>	NR	NR	NR	NR	NR	NR
Exposure Type						
Eye Area	NR	NR	NR	NR	NR	NR
Incidental Ingestion	NR	NR	NR	NR	NR	NR
Incidental Inhalation-Spray	NR	NR	2 ^b	NR	NR	NR
Incidental Inhalation-Powder	NR	NR	NR	NR	NR	NR
Dermal Contact	2	0.5-10	3	NR	7	0.033
Deodorant (underarm)	NR	NR	NR	NR	2 ^b	NR
Hair - Non-Coloring	2	1.5	NR	NR	1	NR
Hair-Coloring	NR	NR	NR	NR	NR	NR
Nail	NR	NR	NR	NR	NR	NR
Mucous Membrane	NR	NR	NR	NR	NR	NR
Baby Products	NR	NR	NR	NR	NR	NR
	PPG-25-Laureth-25		PPG-34-Steareth-3		PPG-1-Trideceth-6	
Totals	31	0.4-2	NR	1.9	224	0.024-0.4
Duration of Use						
<i>Leave-On</i>	27	0.4-2	NR	NR	127	0.05-0.4
<i>Rinse Off</i>	4	NR	NR	1.9	97	0.024-0.3
<i>Diluted for (Bath) Use</i>	NR	NR	NR	NR	NR	NR
Exposure Type						
Eye Area	2	0.72-1.5	NR	NR	1	NR
Incidental Ingestion	NR	NR	NR	NR	NR	NR
Incidental Inhalation-Spray	NR	NR	NR	NR	1 ^a	0.05
Incidental Inhalation-Powder	NR	NR	NR	NR	NR	NR
Dermal Contact	29	0.4-2	NR	NR	38	0.2-0.27
Deodorant (underarm)	NR	NR	NR	NR	NR	NR
Hair - Non-Coloring	2	NR	NR	1.9	168	0.05-0.4
Hair-Coloring	NR	NR	NR	NR	11	0.024-0.25
Nail	NR	NR	NR	NR	5	NR
Mucous Membrane	1	NR	NR	NR	NR	NR
Baby Products	1	NR	NR	NR	NR	NR

*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.

included in the VCRP, but not listed in the *International Cosmetic Ingredient Dictionary and Handbook*

^a Includes suntan products, in that it is not known whether or not the reported product is a spray.

^b Includes products for which it is not known whether or not the product is a spray.

NR – none reported

Table 5. No reported use ³⁷⁻³⁹

PEG-4-PPG-7 C13/C15 Alcohol	PPG-6 C9-11 Pareth-5	PPG-2-Isodeceth-8
PEG/PPG-3/6 Dimethyl Ether	PPG-6 C12-15 Pareth-12	PPG-2-Isodeceth-9
PEG/PPG-7/12 Dimethyl Ether	PPG-6 C12-18 Pareth-11	PPG-2-Isodeceth-10
PEG/PPG-22/40 Dimethyl Ether	PPG-3 C12-14 Sec-Pareth-7	PPG-2-Isodeceth-18
PEG/PPG-27/14 Dimethyl Ether	PPG-4 C12-14 Sec-Pareth-5	PPG-2-Isodeceth-25
PEG/PPG-52/32 Dimethyl Ether	PPG-5 C12-14 Sec-Pareth-7	PPG-3-Isodeceth-1
PEG/PPG-4/2 Propylheptyl Ether	PPG-5 C12-14 Sec-Pareth-9	PPG-4-Isodeceth-10
PEG/PPG-6/2 Propylheptyl Ether	PPG-1-Deceth-4	PPG-2-Laureth-5
PEG-7/PPG-2 Propylheptyl Ether	PPG-1-Deceth-5	PPG-2-Laureth-8
PEG/PPG-8/2 Propylheptyl Ether	PPG-1-Deceth-6	PPG-2-Laureth-12
PEG/PPG-10/2 Propylheptyl Ether	PPG-1-Deceth-7	PPG-3-Laureth-8
PEG/PPG-14/2 Propylheptyl Ether	PPG-2-Deceth-5	PPG-3-Laureth-9
PEG/PPG-40/2 Propylheptyl Ether	PPG-2-Deceth-7	PPG-3-Laureth-10
PPG-4-Ceteareth-12	PPG-2-Deceth-8	PPG-3-Laureth-12
PPG-10-Ceteareth-20	PPG-2-Deceth-10	PPG-4 Laureth-2
PPG-1-Ceteth-1	PPG-2-Deceth-15	PPG-4 Laureth-5
PPG-1-Ceteth-5	PPG-2-Deceth-20	PPG-4 Laureth-7
PPG-1-Ceteth-10	PPG-2-Deceth-30	PPG-4 Laureth-15
PPG-1-Ceteth-20	PPG-2-Deceth-40	PPG-6-Laureth-3
PPG-2-Ceteth-1	PPG-2-Deceth-50	PPG-3-Myreth-3
PPG-2-Ceteth-5	PPG-2-Deceth-60	PPG-3-Myreth-11
PPG-2-Ceteth-20	PPG-4-Deceth-4	PPG-2-PEG-11 Hydrogenated Lauryl Alcohol Ether
PPG-4-Ceteth-1	PPG-4-Deceth-6	PPG-3-PEG-6 Oleyl Ether
PPG-4-Ceteth-5	PPG-6-Deceth-4	PPG-9-Steareth-3
PPG-4-Ceteth-10	PPG-6-Deceth-9	PPG-23-Steareth-34
PPG-8-Ceteth-2	PPG-8-Deceth-6	PPG-30 Steareth-4
PPG-8-Ceteth-5	PPG-14-Deceth-6	PPG-38 Steareth-6
PPG-2 C9-11 Pareth-5	PPG-6-Decyltetradeceth-12	PPG-1 Trideceth-13
PPG-2 C9-11 Pareth-7	PPG-9-Ethylhexeth-5	PPG-4 Trideceth-6
PPG-2 C9-11 Pareth-8	PPG-1-Isodeceth-4	PPG-6 Trideceth-8
PPG-2 C9-11 Pareth-11	PPG-1-Isodeceth-6	Propylene Glycol Capreth-4
PPG-2 C12-13 Pareth-8	PPG-1-Isodeceth-7	Propylene Glycol Isodeceth-4
PPG-2 C12-15 Pareth-6	PPG-1-Isodeceth-9	Propylene Glycol Isodeceth-12
PPG-4 C13-15 Pareth-15	PPG-2-Isodeceth-4	Propylene Glycol Laureth-6
PPG-5 C9-15 Pareth-6	PPG-2-Isodeceth-6	Propylene Glycol Oleth-5

Table 6. Examples of non-cosmetic uses

Ingredient	Use	Reference
PPG-5 C9-15 Pareth-6	industrial washer and cleansing agents	²⁶
PPG C12-14 sec-Pareths	nonionic surfactants in the paper and pulp, metal, textile, plastics and paint, pesticide, and leather and fur industries	¹³
PPG-2-Deceth-8	all-purpose cleaner and emulsifier in paints and coatings	⁶

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