Alkoxylates of aliphatic alcohols (C ≥6): Human health tier II assessment

16 June 2020

Chemicals in this assessment

Chemical Name in the Inventory	CAS Number
Oxirane, methyl-, polymer with oxirane, monooctadecyl ether	9038-43-1
Oxirane, methyl-, polymer with oxirane, hexadecyl ether	9087-53-0
Oxirane, methyl-, polymer with oxirane, monodecyl ether	37251-67-5
Oxirane, methyl-, polymer with oxirane, monododecyl ether	37311-00-5
Oxirane, methyl-, polymer with oxirane, monooctyl ether	37311-02-7
Oxirane, methyl-, polymer with oxirane, monotetradecyl ether	37311-04-9
Oxirane, methyl-, polymer with oxirane, monoisotridecyl ether	50861-66-0
Oxirane, methyl-, polymer with oxirane, monohexyl ether	52232-09-4

Chemical Name in the Inventory	CAS Number
Alcohols, C12-14, ethoxylated propoxylated	68439-51-0
Alcohols, C12-18, ethoxylated propoxylated	69227-21-0
Alcohols, C10-16, ethoxylated propoxylated	69227-22-1
Alcohols, C16-18, ethoxylated propoxylated	68002-96-0
Alcohols, C10-12, ethoxylated propoxylated	68154-97-2
Alcohols, C12-16, ethoxylated, propoxylated	68213-24-1
Alcohols, C12-20, ethoxylated propoxylated	68526-95-4
Alcohols, C12-15, ethoxylated propoxylated	68551-13-3
Alcohols, C11-15-secondary, ethoxylated propoxylated	68551-14-4
Alcohols, C8-10, ethoxylated propoxylated	68603-25-8
Alcohols, C6-12, ethoxylated propoxylated	68937-66-6
Alcohols, C8-18, ethoxylated propoxylated	69013-18-9
Alcohols, C14-18 and C16-18-unsaturated, ethoxylated propoxylated	72854-13-8
Alcohols, C16-20, ethoxylated propoxylated	73049-34-0
Alcohols, tallow, ethoxylated propoxylated	103819-03-0
Alcohols, C9-11, branched and linear, ethoxylated propoxylated	102782-43-4
Alcohols, C12-14-secondary, ethoxylated, propoxylated	103331-86-8
Oxirane, methyl-, polymer with oxirane, monononyl ether	103657-84-7
Oxirane, methyl-, polymer with oxirane, monoundecyl ether	103657-85-8

Chemical Name in the Inventory	CAS Number
Alcohols, C9-11, ethoxylated propoxylated	103818-93-5
Alcohols, C13-15-branched and linear, ethoxylated propoxylated	111905-54-5
Alcohols, C16 and C18-unsaturated, alkyl, ethoxylated propoxylated	116810-31-2
Alcohols, C8-12-alkyl, ethoxylated propoxylated	116810-33-4
Alcohols, C12-15-branched and linear, ethoxylated propoxylated	120313-48-6
Alcohols, C6-10, ethoxylated propoxylated	68987-81-5

Preface

This assessment was carried out by staff of the National Industrial Chemicals Notification and Assessment Scheme (NICNAS) using the Inventory Multi-tiered Assessment and Prioritisation (IMAP) framework.

The IMAP framework addresses the human health and environmental impacts of previously unassessed industrial chemicals listed on the Australian Inventory of Chemical Substances (the Inventory).

The framework was developed with significant input from stakeholders and provides a more rapid, flexible and transparent approach for the assessment of chemicals listed on the Inventory.

Stage One of the implementation of this framework, which lasted four years from 1 July 2012, examined 3000 chemicals meeting characteristics identified by stakeholders as needing priority assessment. This included chemicals for which NICNAS already held exposure information, chemicals identified as a concern or for which regulatory action had been taken overseas, and chemicals detected in international studies analysing chemicals present in babies' umbilical cord blood.

Stage Two of IMAP began in July 2016. We are continuing to assess chemicals on the Inventory, including chemicals identified as a concern for which action has been taken overseas and chemicals that can be rapidly identified and assessed by using Stage One information. We are also continuing to publish information for chemicals on the Inventory that pose a low risk to human health or the environment or both. This work provides efficiencies and enables us to identify higher risk chemicals requiring assessment.

The IMAP framework is a science and risk-based model designed to align the assessment effort with the human health and environmental impacts of chemicals. It has three tiers of assessment, with the assessment effort increasing with each tier. The Tier I assessment is a high throughput approach using tabulated electronic data. The Tier II assessment is an evaluation of risk on a substance-by-substance or chemical category-by-category basis. Tier III assessments are conducted to address specific concerns that could not be resolved during the Tier II assessment.

These assessments are carried out by staff employed by the Australian Government Department of Health and the Australian Government Department of the Environment and Energy. The human health and environment risk assessments are conducted and published separately, using information available at the time, and may be undertaken at different tiers.

This chemical or group of chemicals are being assessed at Tier II because the Tier I assessment indicated that it needed further investigation.

For more detail on this program please visit:**www.nicnas.gov.au**

Disclaimer

ACRONYMS & ABBREVIATIONS

Grouping Rationale

This assessment for alkoxylates of aliphatic alcohols (C ≥6) or alcohol alkoxylates (AAs) is conducted in conjunction with the other IMAP Human Health Tier II assessments for ethoxylates of and propoxylates of aliphatic alcohols (C ≥6) (NICNASa; NICNASb). Three assessments in this series are based on the analogue chain-length category approach (OECD, 2014), including structure-activity relationship (SAR) analyses of these chemicals and their physiochemical, toxicokinetic and toxicological profiles. The SAR information is mainly derived from available data for alcohol ethoxylates (AEs) where applicable (NICNASa).

In this assessment, the chemicals will be referred to as AAs and the individual alkoxylate units (either ethoxylate or propoxylate) as AO.

Although most AAs in this group are polymers according to the definition in the National Industrial Chemicals (Notification and Assessment) Act (1989), the individual members do not necessarily meet the criteria for polymers of low concern (please refer to NICNAS PLC criteria available at nicnas.gov.au), based on molecular weight (MW).

These AA polymers share similar uses as nonionic surfactants in cosmetic products, including in baby, personal care, and fragrance products. They are also used in domestic and commercial products, including in laundry detergents, household and industrial cleaners (see **Import, Manufacture & Use** section).

The AAs in this assessment are structurally related, where the hydrophilic alkoxylate (AO) chain is attached via an ether linkage to the hydrophobic aliphatic alcohol chain (C ≥6). The alkoxylate chain comprises mixed polyethylene glycol (PEG) and polypropylene glycol (PPG) repeats, which may be block, alternating, or randomly ordered chains (Lindner, 2010; CIR, 2016). The alkyl chain can be linear, branched, saturated or unsaturated in the AA group. Alkoxylated shorter chain alcohols (C <6) do not show the same degree of surface activity compared with longer chains, and hence they are not included in this assessment.

A notation of '$C_{x–y}AO_n$' will be used to represent the corresponding AAs in this assessment.

n = average number of alkoxylation (AO) units

x–y = range of carbon units (C ≥6)

Generally, increasing the carbon chain length increases lipophilicity, whereas increasing alkoxylation increases hydrophilicity of the chemical. For surfactants of similar chain length, increasing ethoxylate content increases hydrophilicity, while increasing propoxylate content increases lipophilicity. These trends are consistent across the linear, branched, saturated or unsaturated AAs of varying alkyl chain lengths and alkoxylation degrees (Lindner, 2010). It was demonstrated that branching of the AAs had a relatively minor impact on calculated partition coefficients (K_{ow}), and hence their biological properties (Lindner, 2010). Further, for unsaturated AAs, as the point of unsaturation is generally remote from the carbon where the alkoxylate chain is attached, they are expected to have similar physiochemical properties to saturated AAs.

On the basis of the analogue and chain-length approach (i.e. by considering similarities and trends in molecular structure, physiochemical properties (K_{ow}), uses, and hazard profiles), the AAs in this assessment are qualified to be assessed as a group. According to CIR (2016), the only difference between AAs and AEs (analogues) is the inclusion of PPG units for fine-

tuning the surfactant properties of the AA chemicals. Available data for any AAs or read-across information from analogues will be applicable to group members where data are incomplete or unavailable.

Overall, AAs are not expected to be systemically toxic, although some short chain ethylene glycol ethers, e.g. methyl and ethyl homologues are of concern for a range of adverse health effects. They include skin and eye irritation, liver and kidney damage, bone marrow and central nervous system (CNS) depression, testicular atrophy, developmental toxicity, and immunotoxicity. For higher propyl and butyl homologues, the toxicity involves haemolysis (anaemia) with secondary effects relating to haemosiderin accumulation in the spleen, liver and kidney, and compensatory haematopoiesis in the bone marrow. Systemic toxicity was shown to decrease with increasing alkyl chain lengths and/or alkoxylation degrees (ECETOC, 2005; US EPA, 2010). The chemicals ethylene glycol hexyl ether (with a longer alkyl chain length, CAS No. 112-25-4) and diethylene glycol butyl ether (with a higher ethoxylation degree, CAS No. 112-34-5) have no evidence of systemic effects including haemolysis (ECETOC, 2005; NICNASc).

Commercially available AAs are mixtures of homologues of varying carbon chain lengths and it is possible that some of the chemicals with an average alkyl chain length C ≥6 may also contain shorter alkyl chains C <6. It is not practical to quantify the proportion of shorter C <6 chain lengths present in such chemicals, or these shorter chain lengths may not be present at all. The available data suggest a lack of systemic toxicity for the AE chemicals with potential short alkyl chain presence (NICNASa); therefore, the toxicity of the chemicals in this assessment is unlikely to be significantly affected by the presence of shorter chain alkyl groups.

Import, Manufacture and Use

Australian

The Australian industrial uses below were reported in publicly available safety data sheets (SDS).

The following chemicals have reported cosmetic uses as emulsifiers and fragrance agents:

- Alcohols, C6-10, ethoxylated propoxylated (CAS No. 68987-81-5)
- Alcohols, C9-11, ethoxylated propoxylated (CAS No. 103818-93-5)
- Alcohols, C10-12, ethoxylated propoxylated (CAS No. 68154-97-2)
- Alcohols, C12-14, ethoxylated propoxylated (CAS No. 68439-51-0)
- Alcohols, C12-15, ethoxylated propoxylated (CAS No. 68551-13-3)
- Alcohols, C12-18, ethoxylated propoxylated (CAS No. 69227-21-0)
- Oxirane, methyl-, polymer with oxirane, monododecyl ether (CAS No. 37311-00-5)
- Oxirane, methyl-, polymer with oxirane, monotetradecyl ether (CAS No. 37311-04-9)
- Oxirane, methyl-, polymer with oxirane, hexadecyl ether (CAS No. 9087-53-0)
- Oxirane, methyl-, polymer with oxirane, monooctadecyl ether (CAS No. 9038-43-1)

The following chemicals have reported domestic and commercial uses:

In detergents and cleaning products

- Alcohols, C6-10, ethoxylated propoxylated (CAS No. 68987-81-5)
- Alcohols, C6-12, ethoxylated propoxylated (CAS No. 68937-66-6)
- Alcohols, C8-10, ethoxylated propoxylated (CAS No. 68603-25-8)

- Alcohols, C8-18, ethoxylated propoxylated (CAS No. 69013-18-9)
- Alcohols, C9-11, ethoxylated propoxylated (CAS No. 103818-93-5)
- Alcohols, C10-12, ethoxylated propoxylated (CAS No. 68154-97-2)
- Alcohols, C10-16, ethoxylated propoxylated (CAS No. 69227-22-1)
- Alcohols, C12-14, ethoxylated propoxylated (CAS No. 68439-51-0)
- Alcohols, C12-15, ethoxylated propoxylated (CAS No. 68551-13-3)
- Alcohols, C12-18, ethoxylated propoxylated (CAS No. 69227-21-0)
- Alcohols, C11-15-secondary, ethoxylated propoxylated (CAS No. 68551-14-4)
- Alcohols, C12-15-branched and linear, ethoxylated propoxylated (CAS No. 120313-48-6)
- Alcohols, C13-15-branched and linear, ethoxylated propoxylated (CAS No. 111905-54-5)
- Oxirane, methyl-, polymer with oxirane, monononyl ether (CAS No. 103657-84-7)
- Oxirane, methyl-, polymer with oxirane, monododecyl ether (CAS No. 37311-00-5)
- Oxirane, methyl-, polymer with oxirane, monoisotridecyl ether (CAS No. 50861-66-0)

In paints and automotive coatings (anti-corrosion and rust removal products)

- Oxirane, methyl-, polymer with oxirane, monododecyl ether (CAS No. 37311-00-5)
- Alcohols, C12-15, ethoxylated propoxylated (CAS No. 68551-13-3)

In colouring agents

- Alcohols, C10-12, ethoxylated propoxylated (CAS No. 68154-97-2)

In coolant formulations

- Alcohols, C12-14, ethoxylated propoxylated (CAS No. 68439-51-0)

In metalworking cutting fluid

- Alcohols, C10-12, ethoxylated propoxylated (CAS No. 68154-97-2)

The following chemicals have reported site-limited uses:

In mining

- Alcohols, C10-16, ethoxylated propoxylated (CAS No. 69227-22-1)
- Alcohols, C12-14-secondary, ethoxylated, propoxylated (CAS No. 103331-86-8)

The following chemicals have reported non-industrial uses in agricultural formulations:

- Alcohols, C9-11, ethoxylated propoxylated (CAS No. 103818-93-5)
- Alcohols, C10-12, ethoxylated propoxylated (CAS No. 68154-97-2)
- Alcohols, C16-18, ethoxylated propoxylated (CAS No. 68002-96-0)
- Alcohols, C12-15, ethoxylated propoxylated (CAS No. 68551-13-3)

- Alcohols, C12-18, ethoxylated propoxylated (CAS No. 69227-21-0)

International

The following international uses have been identified through the European Commission Cosmetic Ingredients and Substances (CosIng) database; Substances in Preparations in Nordic Countries (SPIN) database; the United States (US) National Library of Medicine Household Products Database; US Personal Care Products Council International Nomenclature Cosmetic Ingredients (INCI) directory; US Environmental Protection Agency (US EPA) National Center for Computational Toxicology (NCCT) resources; and an assessment by the Cosmetic Ingredient Review Expert Panel (CIR, 2016).

The following chemicals have reported cosmetic uses:

- Alcohols, C10-12, ethoxylated propoxylated (CAS No. 68154-97-2)
- Alcohols, C12-14, ethoxylated propoxylated (CAS No. 68439-51-0)
- Alcohols, C12-15, ethoxylated propoxylated (CAS No. 68551-13-3)
- Alcohols, C12-18, ethoxylated propoxylated (CAS No. 69227-21-0)
- Oxirane, methyl-, polymer with oxirane, monododecyl ether (CAS No. 37311-00-5)
- Oxirane, methyl-, polymer with oxirane, monotetradecyl ether (CAS No. 37311-04-9)
- Oxirane, methyl-, polymer with oxirane, hexadecyl ether (CAS No. 9087-53-0)
- Oxirane, methyl-, polymer with oxirane, monooctadecyl ether (CAS No. 9038-43-1)

Some AAs can be used at up to 10 % in leave-on and rinse-off cosmetics, mostly as surfactants, skin conditioning agents and emulsifying agents. The chemicals are also used at 5–7 % in products applied to baby skin (e.g. PPG-25-laureth-25 with CAS No. 37311-00-5), the eye area, mucous membranes, or where there is the possibility of incidental inhalation (e.g. cosmetic sprays) or ingestion (e.g. lipsticks) (CIR, 2016).

Some chemicals have reported domestic and commercial uses in:

- cleaning and washing products;
- paints and coatings;
- automotive use;
- construction; and
- waste treatment.

Some chemicals have reported site-limited uses in:

- manufacturing; and
- mining.

Some chemicals have reported non-industrial uses in:

- pesticides, agricultural or pharmaceutical formulations; and
- food and beverage manufacture.

Restrictions

Australian

The chemicals in this group are synthesised through processes which may result in 1,4-dioxane as an impurity. This impurity (listed under dioxane) is controlled through the Poisons Standard (the Standard for the Uniform Scheduling of Medicines and Poisons (SUSMP)) in Schedule 6, with schedule labelling requirements applying above 100 ppm in Appendix G (SUSMP, 2019).

International

No known restrictions have been identified.

Existing Worker Health and Safety Controls

Hazard Classification

The following chemicals:

- Alcohols, C8-10, ethoxylated propoxylated (CAS No. 68603-25-8)
- Alcohols, C9-11, ethoxylated propoxylated (CAS No. 103818-93-5)

are classified as hazardous on the Hazardous Chemicals Information System (HCIS), with the hazard categories and hazard statements for human health (Safe Work Australia):

- Acute Toxicity – Category 4; H302 (Harmful if swallowed)
- Skin Irritation – Category 2; H315 (Causes skin irritation)
- Eye Damage – Category 1; H318 (Causes serious eye damage)

Exposure Standards

Australian

No specific exposure standards are available.

International

No specific exposure standards are available.

Health Hazard Information

The AAs in this group contain two defining substructures, the hydrophobic alcohol derived alkyl chain moiety and the hydrophilic alkoxylate chain moiety. Chemicals with the same generic CAS number may include a range of ethoxylation and propoxylation degrees and properties, which may affect the toxicological properties.

Overall, AAs are not expected to be systemically toxic on the basis of the analogue and chain-length category approach (refer to **Grouping Rationale** section). Therefore, the primary focus of this group assessment is on acute toxicity, skin and eye irritation hazard endpoints. For toxicological endpoints (e.g. sensitisation, repeated dose toxicity, etc.), where data for a specific chemical

are available, an evaluation together with consideration of weight of evidence will be carried out to examine the potential toxicity and hazard classification as appropriate.

Toxicokinetics

No toxicokinetic data are available for AAs.

Based on read-across information from AE analogues, the AAs in this assessment (whether linear, branched, saturated or unsaturated) are expected to be absorbed, metabolised and excreted in the urine, faeces and in expired air with minimal tissue distribution, following oral exposure. Excretion following dermal absorption is primarily via the urine.

Read-across information suggests that oral absorption of AAs is expected to be rapid and extensive, while dermal absorption is slow and incomplete with a lower penetration rate for human skin than for rat skin. The AAs with shorter alkyl and/or AO chains (or smaller molecular weight) are expected to more readily absorbed (orally and dermally) than longer ones (or larger molecular weight). Some AAs may enhance penetration of other ingredients through the skin due to their surfactant properties, although PPG-4-ceteth-20 (CAS No. 9087-53-0) at 5 % did not change the penetration rate of the drug tenoxicam through guinea pig skin (CIR, 2016). The overall distribution and excretion are expected to be similar across AAs, regardless of their chain lengths. Metabolism is predicted to comprise hydrolysis of the ether linkage followed by oxidation of the alkyl chain to form lower molecular weight compounds, and ultimately carbon dioxide (CO2) and water, although no metabolic studies were available. Metabolism was found to correlate to the chemical chain lengths, resulting in a higher proportion excreted in expired air (with longer alkyl chains) and/or in the faeces (with longer alkoxylate chains) and less in the urine (HERA, 2009; CIR, 2016; NICNASa).

Acute Toxicity

Oral

Some of the AAs in this group are currently classified with hazard category ‘Acute Toxicity – Category 4’ and hazard statement ‘H302 Harmful if swallowed’ in the HCIS (refer to the **Existing Worker Health and Safety Controls** section). Based on the available data and read-across information from AE analogues, the AAs in this group are expected to have low to moderate acute oral toxicity. Unless data for the specific chemical are available to indicate otherwise, moderate acute oral toxicity cannot be ruled out and hazard classification is recommended for the remaining chemicals in this group (refer to the **Recommendation** section).

Similarly for the AE analogues (HERA, 2009; NICNASa), the discrepancy in study results below was attributable to variations in alkyl and/or AO chain lengths and study designs.

The following chemicals have reported oral median lethal dose (LD50) values of 810 to >4000 mg/kg bw in rats (conversion from mL/kg to mg/kg bw is based on an assumed density of 1 kg/L). At necropsy, haemorrhage of the internal organs were observed, e.g. mottled red lung, dark maroon spleen and liver, distended and/or vascularised intestine and stomach, and blood in the urine.

- $C_{8–10}AO_n$ (CAS No. 68603-25-8): LD50 = 810–1660 mg/kg bw (female-male) (NTRLa)
- $C_{12–15}AO_n$ (CAS No. 68551-13-3): LD50 = 1600–3200 mg/kg bw (male) (NTRLb)
- $C_{12–14}AO_n$ (CAS No. 68439-51-0): LD50 = 2140–5410 mg/kg bw (female-male) (NTRLc)
- $C_{12–18}AO_n$ (CAS No. 69227-21-0): LD50 = 2478 mg/kg bw (sex not specified) (NTRLd)
- $C_{12–14}AO_n$ secondary (CAS No. 103331-86-8): LD50 = 3250 mg/kg bw (sex not specified) (RTECS)
- $C_{11–15}AO_n$ (CAS No. 68551-14-4): LD50 = 3730–>4000 mg/kg bw (female-male) (NTRLe)

Dermal

Based on the available data, the chemicals in this group are expected to have low to moderate acute dermal toxicity. Unless data for the specific chemical are available to indicate otherwise moderate acute dermal toxicity cannot be ruled out and hazard classification is recommended for this group (refer to the **Recommendation** section).

The following chemicals have reported dermal LD50 values of 790 to <16000 mg/kg bw in rabbits (conversion from mL/kg to mg/kg bw is based on an assumed density of 1 kg/L). At necropsy, congestion of the lung and haemorrhage of the internal organs were observed, e.g. mottled red lung and granular liver, pale spleen, discoloured kidney, foci in the lung, kidney and stomach, and blood in the urine.

- $C_{12–15}AO_n$ (CAS No. 68551-13-3): LD50 = 790–3200 mg/kg bw (male) (NTRLb)
- $C_{12–18}AO_n$ (CAS No. 69227-21-0): LD50 = 1476 mg/kg bw (sex not specified) (NTRLd)
- $C_{8–10}AO_n$ (CAS No. 68603-25-8): LD50 = 1680–3250 mg/kg bw (female-male) (NTRLa)
- $C_{12–14}AO_n$ (CAS No. 68439-51-0): LD50 = 5700–11300 mg/kg bw (female-male) (NTRLc)
- $C_{11–15}AO_n$ (CAS No. 68551-14-4): LD50 = 10200–<16000 mg/kg bw (female-male) (NTRLe)

For the chemical CAS No. 68603-25-8 (undiluted), serious lung effects at necropsy (e.g. granulomatous pneumonitis, bronchopneumonia, alveolar histocytosis and interstitial pneumonia) were reported after a 24-hour occlusive dermal application in rabbits (NTRLf).

Inhalation

Based on the available data and read-across information from AE analogues, the chemicals in this group are expected to have low acute inhalation toxicity.

However, read-across information suggests that the acute toxic thresholds will be reached when rats are exposed to undiluted AAs in the form of respirable mists or aerosols, or at concentrations exceeding the saturated vapour pressure in air (OECD, 2006; HERA, 2009; NICNASa).

The following chemicals have reported oral median lethal concentration (LC50) values of 0.26 mg/L/4h (aerosol) to substantially saturated vapour in rats. At necropsy, congestion and haemorrhage of the lung were observed.

- $C_{16–18}AO_n$ (CAS No. 68002-96-0): LC50 (aerosol) = 0.26–0.59 mg/L/4h (NTRLg)
- $C_{12–18}AO_n$ (CAS No. 69227-21-0): LC50 (aerosol) = 0.36–0.52 mg/L/4h (NTRLh)
- $C_{12–14}AO_n$ (CAS No. 68439-51-0): LC50 >saturated vapour (NTRLc)
- $C_{8–10}AO_n$ (CAS No. 68603-25-8): LD50 >saturated vapour or 8 mg/L/1h (NTRLi)

Corrosion / Irritation

Respiratory Irritation

Inhalation of droplets and/or particles (aerodynamic diameters <10 µm) released from the aerosolised products of these surfactant chemicals may cause respiratory irritation and consequent damage to the lung through prolonged or repeated exposure (refer to the **Repeat Dose Toxicity** section).

Skin Irritation

Some of the AAs in this group are currently classified with hazard category 'Skin Irritation – Category 2' and hazard statement 'H315 Causes skin irritation' in the HCIS (refer to the **Existing Worker Health and Safety Controls** section). Based on the available data and read-across information from AE analogues, this hazard classification is recommended for the remaining chemicals in the group (unless data for the specific chemical are available to indicate otherwise) (refer to the **Recommendation** section).

For the AE analogues, the degree of skin irritation was reported to be dependent on the type of patch (open vs semi-occlusive vs occlusive), exposure time (4 hours to 4 weeks), single vs repeated applications, and the concentration used. The chemicals were moderately to severely irritating at 100 %, slightly to moderately irritating at 10 %, mildly irritating at 1 %, and non-irritating at 0.1–0.5 %. The severity of irritation appears to inversely correlate with the degree of ethoxylation (i.e. more severe irritation for lower ethoxylation EO1–EO3) and is unlikely to be greatly affected by the alkyl chain length (HERA, 2009: NICNASa). These findings are considered applicable to this AA group.

The following chemicals have reported test results on rabbit skin, ranging from non-irritating or slightly irritating to moderately and severely irritating:

- $C_{12–14}AO_n$ (CAS No. 68439-51-0): non-irritant, 4-hour occlusive (NTRLc)
- $C_{12–14}AO_n$ secondary (CAS No. 103331-86-8): slight skin irritant (RTECS)
- $C_{8–10}AO_n$ (CAS No. 68603-25-8): skin irritant, 4-hour occlusive (erythema and mild oedema in 6/6 rabbits, desquamation at 7 days, which subsided after 14 days) (NTRLa)
- $C_{11–15}AO_n$ (CAS No. 68551-14-4): skin irritant, 4-hour occlusive (erythema in 6/6 rabbits, mild oedema in 2/6, fissuring in 1/6, desquamation in 2/6, all dermal reactions subsided within 14 days) (NTRLe)
- $C_{12–15}AO_n$ (CAS No. 68551-13-3): skin irritant, 24-hour occlusive (severe erythema with eschar, moderate oedema, desiccation, skin cracked and bleeding (NTRLb)
- $C_{12–18}AO_n$ (CAS No. 69227-21-0): severe skin irritant (score of 6.5/8) (NTRLd)
- PPG-5-ceteth-20 (CAS No. CAS No. 9087-53-0): slight to moderate skin irritant in an in vitro test, but not a primary skin irritant in rabbits and humans (CIR, 2016)

Eye Irritation

Some of the AAs in this group are currently classified with hazard category 'Eye Damage – Category 1' and hazard statement 'H318 Causes serious eye damage' in the HCIS (refer to the **Existing Work Health and Safety Controls** section). Based on the available data and read-across information from AE analogues, this hazard classification is recommended for the remaining chemicals in the group (unless data are available for the specific chemical to indicate otherwise) (refer to the **Recommendation** section).

Similarly to the AE analogues (NICNASa), the degree of eye irritation for AAs is expected to be concentration-dependent. Rinsing the eye immediately after application of some AAs with tap water for 20–30 seconds may reduce the severity of the effects.

The following chemicals have reported test results on rabbit eye:

- $C_{12–14}AO_n$ (CAS No. 68439-51-0): minimal eye irritant (NTRLc)
- $C_{12–14}AO_n$ secondary (CAS No. 103331-86-8): moderate eye irritant (RTECS)
- $C_{11–15}AO_n$ (CAS No. 68551-14-4): eye irritant (no corneal injury, iritis in 2/4 eyes, mild to moderate conjunctivitis in 4/4, all subsided within 72 hours to 7 days) (NTRLe)
- $C_{8–10}AO_n$ (CAS No. 68603-25-8): severe eye irritant
  - 0.005 mL caused mild to moderate corneal injury, iritis, and moderate to severe conjunctivitis in all 6/6 rabbits, all healed at 14 days (NTRLa); and

- 0.1 mL produced a mean 7-day score of 33.5/110 for corneal opacity, iritis, and conjunctivitis with limited evidence of reversibility. Fibrovascular connective tissue was observed in 3/6 rabbits at day 7 (NTRLj)

- $C_{12-18}AO_n$ (CAS No. 69227-21-0): severe eye irritant (score of 32.4/110) (NTRLd)

- $C_{12-15}AO_n$ (CAS No. 68551-13-3): severe irreversible eye irritant (a mean 7-day score of 35.5/110 for corneal opacity, iritis, and conjunctivitis, and blood vessels on cornea were observed) (NTRLb)

Sensitisation

Skin Sensitisation

Based on read-across information from AE analogues, the AAs in this group are not considered to cause skin sensitisation.

There is no evidence of skin sensitisation for AE analogues, based on 25 guinea pig maximisation tests (covering the range of C9 to C21 and EO2 to EO21) and 13 non-adjuvant Buehler tests (covering the range of C9 to C15 and EO3 to EO13) (NICNASa).

The chemical $C_{12-18}AO_n$ (CAS No. 69227-21-0) produced positive skin sensitisation responses at primary (6/9 animals) and secondary (9/9) challenges (10 %), 2 weeks after 9 induction doses (10 %) over 3 weeks, 5 hours/day (NTRLd). However, this result is not consistent with all other tested analogues and may be confounded by impurities in the test substance.

Repeated Dose Toxicity

Oral

Based on read-across information from AE analogues (NICNASa), the chemicals in this group are not expected to cause serious damage to health from repeated oral exposure.

Dermal

Based on read-across information from AE analogues (NICNASa), the chemicals in this group are not expected to cause serious damage to health (apart from local effects) from repeated dermal exposure.

Inhalation

Based on the available data, repeated inhalation exposure to droplets and/or particles (aerodynamic diameters <10 µm) released from the sprays of the chemicals is likely to cause severe lung injury and consequent serious adverse health effects, warranting hazard classification for this group (refer to the **Recommendation** section).

In an OECD Test Guideline (TG) 412 (Subacute Inhalation Toxicity: 28-Day) study, Wistar rats (5/sex) were exposed head-nose to liquid aerosols of $C_{16-18}AO_n$ (CAS No. 68002-96-0) at 0, 0.0005, 0.001, 0.0025 and 0.025 mg/L for 6 hours/day, 5 days/weeks, for 28 days. Mass median aerodynamic diameters (MMADs) of the particle size were 1.2–1.7 µm. At 0.025 mg/L, inflammatory and epithelial changes in the nasal cavity, larynx, trachea and lung were observed. These severe lung effects resulted in more general adverse health effects, such as premature death of animals, respiratory dysfunction, altered haematological parameters, and other unspecified pathological or histopathological findings. The no observed adverse effect concentration (NOAEC) for lower respiratory tract (lung) was 0.0025 mg/L and for the upper respiratory tract (larynx) was 0.001mg/L (NTRLk).

Genotoxicity

No data are available.

Carcinogenicity

No data are available.

Reproductive and Developmental Toxicity

No data are available.

Risk Characterisation

Critical Health Effects

The critical human health effects of the AAs for risk characterisation are acute oral and dermal toxicity, and skin, eye and respiratory irritation. The irritant effects are similar to those caused by other surfactants. The severity of irritation appears to increase directly with the chemical concentration.

Public Risk Characterisation

Some of the AA chemicals have reported cosmetic, domestic and commercial uses in Australia and overseas. According the Cosmetic Ingredient Review Expert Panel (CIR, 2016), cosmetic use concentrations currently are: ≤10 % in leave on and rinse-off products; and 5–7 % in products applied to baby skin, mucous membrane, the eye area, and spray and powder products. The same use concentrations, use patterns, and hence widespread public exposure are expected in Australia, mainly involving exposure via the skin and eyes. Incidental inhalation (from aerosolised or powder products) and ingestion can also occur.

Considering the wide range of domestic products containing these chemicals, there is a possibility of public exposure to the chemicals through secondary exposure via the environment. However, this indirect human exposure is considered to be at very diluted concentrations; and hence, it not considered comparable to direct exposure.

The CIR Expert Panel (CIR, 2016) indicated that up to 95–99 % of the droplets and/or particles (aerodynamic diameters >10 µm) released from cosmetic sprays containing these surfactant chemicals are not expected to be respirable into the gas exchange region of the lung, but likely to deposit in the nasopharyngeal and bronchial regions and subsequently undergo elimination. Aerosol uses leading to inhalation of smaller droplets are not expected for the chemicals in this group.

The Panel determined that cosmetic use concentrations of the alcohol alkoxylates are safe when formulated to be non-irritating. However, skin, eye and respiratory irritant effects on exposure could occur with some of the chemicals within the group at high concentrations and/or eye irritation from accidental eye contact cannot be ruled out for some known use concentrations.

The chemicals are synthesised through processes that might result in 1,4-dioxane as a residual by-product. The concentration of 1,4-dioxane (listed under dioxane) is controlled through the Poisons Standard (Schedule 6), with schedule labelling requirements applying at above 100 ppm (Appendix G; SUSMP, 2019).

The available data for some of the chemicals can be extrapolated to support the safety of all the chemicals in this group. Taking into consideration the current uses and existing restrictions described above, the chemicals are not considered to pose an unreasonable risk to public health when used at low concentrations or when formulated to be non-irritating.

The total surfactant concentration in the products should be considered when determining label instructions, especially where direct dermal and ocular exposures are likely to occur, or when packaging presents the possibility of incidental inhalation or

ingestion. Any irritant effects could be mitigated by labelling (such as warning statement- If in eyes wash out immediately with water etc.) and concentration controls. Any controls for these chemicals should be considered as part of a broader review of the management of surfactants in the SUSMP.

Occupational Risk Characterisation

During product formulation, oral, dermal, ocular and inhalation exposure of workers to the chemicals may occur, particularly where manual or open processes are used. These may include transfer and blending activities, quality control analysis, and cleaning and maintenance of equipment. Worker exposure to the chemicals at higher concentrations is expected. The level and route of exposure will vary depending on the method of application and work practices employed.

Given the critical systemic acute and local health effects, the chemicals could pose an unreasonable risk to workers unless adequate control measures to minimise relevant exposure are implemented. Good hygiene practices to minimise oral exposure are expected to be in place.

The chemicals should be appropriately classified and labelled to ensure that a person conducting a business or undertaking (PCBU) at a workplace (such as an employer) has adequate information to determine appropriate controls.

The data available support an amendment to the hazard classification in the HCIS (Safe Work Australia) (refer to the **Recommendation** section).

NICNAS Recommendation

Further risk management is required. Sufficient information is available to recommend that risks to public health and safety from the potential use of the chemicals in cosmetic, domestic and commercial products be managed through changes to the Poisons Standard in the broader context of total surfactants, and risks to workplace health and safety be managed through changes to classification and labelling under HCIS. It is recommended that the chemicals be considered as part of a broader review of the management of surfactants in the SUSMP.

The assessment of these chemicals is considered to be sufficient provided that risk management recommendations are implemented and all requirements are met under workplace health and safety and poisons legislation as adopted by the relevant state or territory.

Regulatory Control

Public Health

The public can be exposed to the chemicals through their presence in domestic (such as laundry and cleaning) or cosmetic products. However, the chemicals are not expected to be contact sensitisers or to be irritating at low concentrations. There is potential for dermal, ocular and respiratory irritation to occur from use of these chemicals at higher concentrations depending on the use pattern.

A different class of surfactant chemicals (such as sodium lauryl sulfate and its salts) are listed in Schedule 6 of the Poisons Standard.

No specific regulatory controls are recommended for the chemicals in this group as part of this assessment. NICNAS recommends that formulators of products containing these chemicals should take into account the total surfactant concentration in the products when determining label instructions, especially where direct dermal and ocular exposures are likely to occur, or when packaging presents the possibility of incidental inhalation or ingestion. Any irritant effects can be mitigated by labelling (such as warning statement—If in eyes wash out immediately with water etc.) and concentration controls. Any controls for these chemicals should be considered as part of a broader review of the management of surfactants in the SUSMP.

Work Health and Safety

Unless data for a specific chemical are available, the critical health effects cannot be ruled out for any chemical as they can be formulated with variable degree of alkoxylation and alkyl chain lengths. Chemicals with the same generic CAS number may include a range of ethoxylation and propoxylation degrees, which may affect the toxicological properties.

The chemicals are recommended for classification and labelling aligned with the Globally Harmonized System of Classification and Labelling of Chemicals (GHS) as below, unless data for a specific chemical are available to indicate lower (or higher) toxicity.

Note: The classification for specific target organ toxicity repeated exposure – Category 1 (STOT RE 1) below does not apply under circumstances where formation of respirable aerosols will not occur.

In addition, the recommended classification and labelling entry for the majority of chemicals should have the following note appended 'Note 10 (The chemical is a substance of unknown or variable composition, complex reaction product, or biological material (UVCB). The hazards of the chemical may depend on the composition. For more information refer to the assessment report published on the website of the National Industrial Chemical Notification and Assessment Scheme.)

This assessment does not consider classification of physical hazards and environmental hazards.

From 1 January 2017, under the model Work Health and Safety Regulations, chemicals are no longer to be classified under the Approved Criteria for Classifying Hazardous Substances system.

Hazard	Approved Criteria (HSIS)[a]	GHS Classification (HCIS)[b]
Acute Toxicity	Not Applicable	Harmful if swallowed - Cat. 4 (H302) Harmful in contact with skin - Cat. 4 (H312)
Irritation / Corrosivity	Not Applicable	Causes serious eye damage - Cat. 1 (H318) Causes skin irritation - Cat. 2 (H315)
Repeat Dose Toxicity	Not Applicable	Causes damage to organs through prolonged or repeated exposure through inhalation - Cat. 1 (H372)

[a] Approved Criteria for Classifying Hazardous Substances [NOHSC:1008(2004)].

[b] Globally Harmonized System of Classification and Labelling of Chemicals (GHS) United Nations, 2009. Third Edition.

[*] Existing Hazard Classification. No change recommended to this classification

Advice for consumers

Products containing the chemical should be used according to label instructions.

Advice for industry

Control measures

Control measures to minimise the risk from oral, dermal, ocular, and inhalation exposure to the chemicals should be implemented in accordance with the hierarchy of controls. Approaches to minimise risk include substitution, isolation and engineering controls. Measures required to eliminate, or minimise risk arising from storing, handling and using a hazardous chemical depend on the physical form and the manner in which the chemicals are used. Examples of control measures that could minimise the risk include, but are not limited to:

- using closed systems or isolating operations;
- minimising manual processes and work tasks through automating processes;
- work procedures that minimise splashes and spills;
- regularly cleaning equipment and work areas; and
- using protective equipment that is designed, constructed, and operated to ensure that the worker does not come into contact with the chemicals.

Guidance on managing risks from hazardous chemicals are provided in the *Managing risks of hazardous chemicals in the workplace—Code of practice* available on the Safe Work Australia website.

Personal protective equipment should not solely be relied upon to control risk and should only be used when all other reasonably practicable control measures do not eliminate or sufficiently minimise risk. Guidance in selecting personal protective equipment can be obtained from Australian, Australian/New Zealand or other approved standards.

Obligations under workplace health and safety legislation

Information in this report should be taken into account to help meet obligations under workplace health and safety legislation as adopted by the relevant state or territory. This includes, but is not limited to:

- ensuring that hazardous chemicals are correctly classified and labelled;
- ensuring that (material) safety data sheets ((M)SDS) containing accurate information about the hazards (relating to both health hazards and physicochemical (physical) hazards) of the chemicals are prepared; and
- managing risks arising from storing, handling and using a hazardous chemical.

Your work health and safety regulator should be contacted for information on the work health and safety laws in your jurisdiction.

Information on how to prepare an (M)SDS and how to label containers of hazardous chemicals are provided in relevant codes of practice such as the *Preparation of safety data sheets for hazardous chemicals—Code of practice* and *Labelling of workplace hazardous chemicals—Code of practice*, respectively. These codes of practice are available from the Safe Work Australia website.

A review of the physical hazards of these chemicals has not been undertaken as part of this assessment.

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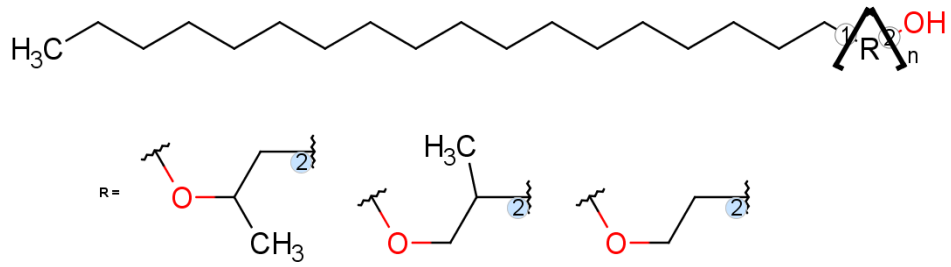
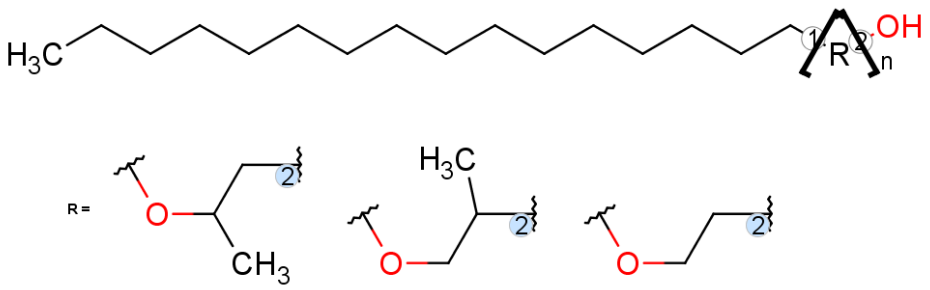
Last Update 16 June 2020

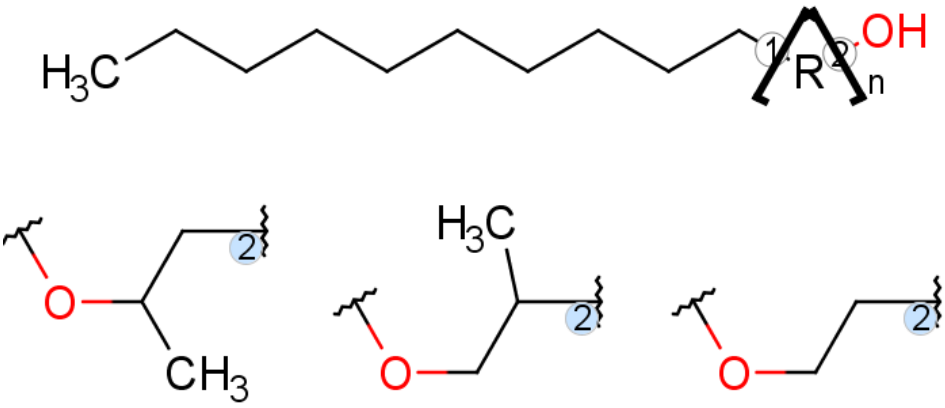
Chemical Identities

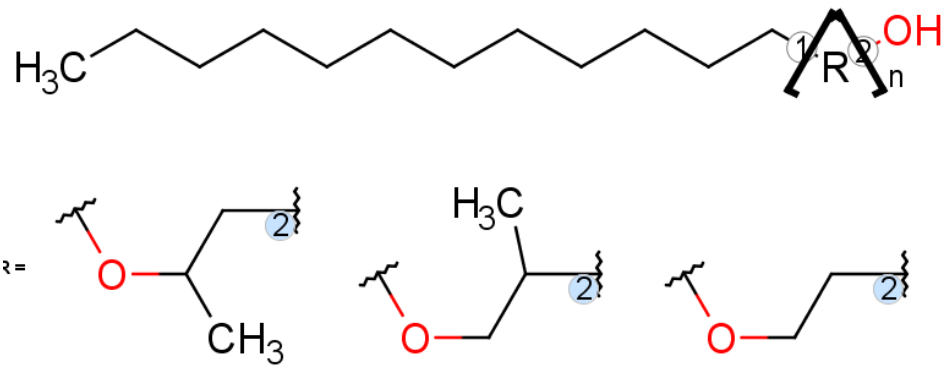
Chemical Name in the	**Oxirane, methyl-, polymer with oxirane, monooctadecyl ether**

Inventory and Synonyms	oxyethylated, oxypropylated octadecanol stearyl alcohol, ethoxylated and propoxylated polyoxyethylenepolyoxypropylene, alkyl ether PPG-23-steareth-34 PPG-9-steareth-3
CAS Number	9038-43-1
Structural Formula	
Molecular Formula	C18H38O.(C3H6O.C2H4O)x
Molecular Weight	

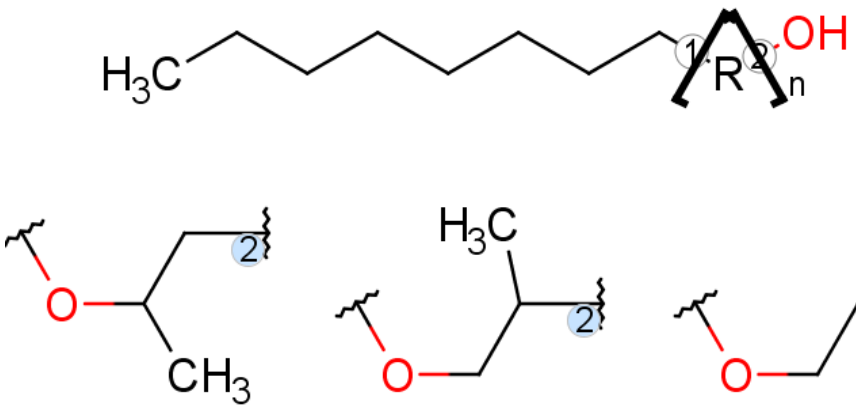
Chemical Name in the Inventory and Synonyms	**Oxirane, methyl-, polymer with oxirane, hexadecyl ether** oxyethylated, oxypropylated hexadecanol polyoxypropylenepolyoxyethylene, cetyl ether PPG-1-cetheth-1 PPG-4-ceteth-20 PPG-5-cetheth-20
CAS Number	9087-53-0
Structural Formula	
Molecular Formula	C16H34O.x(C3H6O.C2H4O)x
Molecular Weight	

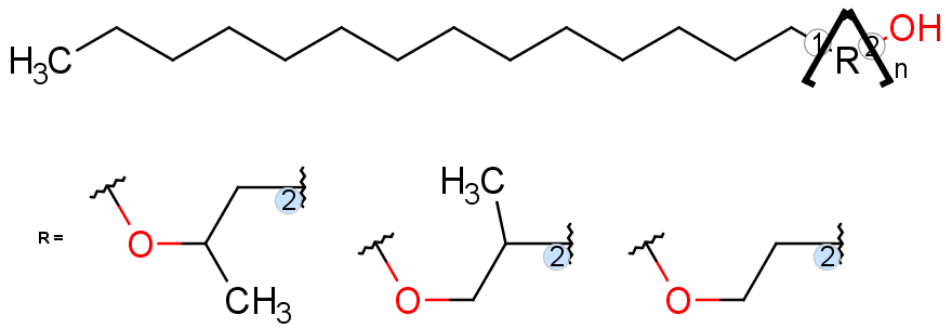
Chemical Name in the Inventory and Synonyms	**Oxirane, methyl-, polymer with oxirane, monodecyl ether** decyl alcohol, propoxylated, ethoxylated lauroxypolyoxyethyleneoxypropylene glycol PPG-1-deceth-4 PPG-2-deceth-3 PPG-4-deceth-6

CAS Number	37251-67-5
Structural Formula	
Molecular Formula	C10H22O.(C3H6O.C2H4O)x
Molecular Weight	

Chemical Name in the Inventory and Synonyms	**Oxirane, methyl-, polymer with oxirane, monododecyl ether** poly(propylene oxide, ethylene oxide), lauryl ether polyethylenepolypropylene glycol, monododecyl ether propylene glycol laureth-6 PPG-2-laureth-5 propylene glycol laureth-6
CAS Number	37311-00-5
Structural Formula	
Molecular Formula	C12H26O.(C3H6O.C2H4O)x
Molecular Weight	

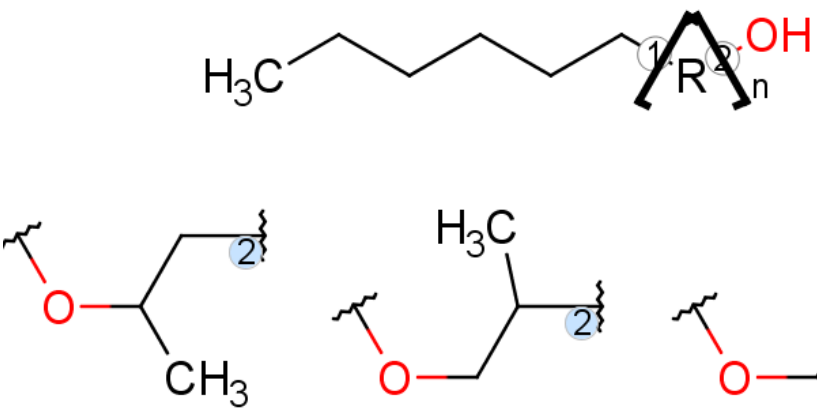
Chemical Name in the Inventory and Synonyms	**Oxirane, methyl-, polymer with oxirane, monooctyl ether** Octyl alcohol, propoxylated, ethoxylated propylene glycol capreth-4

CAS Number	37311-02-7
Structural Formula	
Molecular Formula	C8H18O.(C3H6O.C2H4O)x
Molecular Weight	

Chemical Name in the Inventory and Synonyms	**Oxirane, methyl-, polymer with oxirane, monotetradecyl ether** PPG-3-myreth-11 PPG-3-myreth-3
CAS Number	37311-04-9
Structural Formula	
Molecular Formula	C14H30O.(C3H6O.C2H4O)x
Molecular Weight	

Chemical Name in the Inventory and Synonyms	**Oxirane, methyl-, polymer with oxirane, monoisotridecyl ether** Polyethylenepolypropylene glycol, monoisotridecyl alcohol

CAS Number	50861-66-0
Structural Formula	**No Structural Diagram Available**
Molecular Formula	C13H28O.(C3H6O.C2H4O)x
Molecular Weight	

Chemical Name in the Inventory and Synonyms	**Oxirane, methyl-, polymer with oxirane, monohexyl ether**
CAS Number	52232-09-4
Structural Formula	
Molecular Formula	C6H14O.(C3H6O.C2H4O)x
Molecular Weight	

Chemical Name in the Inventory and Synonyms	**Alcohols, C12-14, ethoxylated propoxylated** Linear C12-14-alkyl alcohols, ethoxylated, propoxylated PPG-4-laureth-2 PPG-4-laureth-5
CAS Number	68439-51-0
Structural Formula	**No Structural Diagram Available**
Molecular Formula	Unspecified
Molecular Weight	

Chemical Name in the Inventory and Synonyms	**Alcohols, C12-18, ethoxylated propoxylated** (C12-18) Alkyl alcohol ethoxylate propoxylate PPG-6 C12-18-pareth-11
CAS Number	69227-21-0
Structural Formula	**No Structural Diagram Available**
Molecular Formula	Unspecified
Molecular Weight	

Chemical Name in the Inventory and Synonyms	**Alcohols, C10-16, ethoxylated propoxylated** (C10-16) Alkyl alcohol ethoxylate propoxylate
CAS Number	69227-22-1
Structural Formula	**No Structural Diagram Available**
Molecular Formula	Unspecified
Molecular Weight	

Chemical Name in the Inventory and Synonyms	**Alcohols, C16-18, ethoxylated propoxylated** (C16-18) Alkyl alcohol ethoxylate propoxylate PPG-2-ceteareth-9
CAS Number	68002-96-0
Structural Formula	**No Structural Diagram Available**

Molecular Formula	Unspecified
Molecular Weight	

Chemical Name in the Inventory and Synonyms	**Alcohols, C10-12, ethoxylated propoxylated** (C10-12) Alkyl alcohol, saturated, linear, ethoxylated, propoxylated PPG-6-deceth-4 PPG-6-deceth-9 PPG-8-deceth-6
CAS Number	68154-97-2
Structural Formula	**No Structural Diagram Available**
Molecular Formula	Unspecified
Molecular Weight	

Chemical Name in the Inventory and Synonyms	**Alcohols, C12-16, ethoxylated, propoxylated** Oxirane, methyl-, polymer with oxirane, C12-16-alkyl ethers
CAS Number	68213-24-1
Structural Formula	

	
Molecular Formula	Unspecified
Molecular Weight	

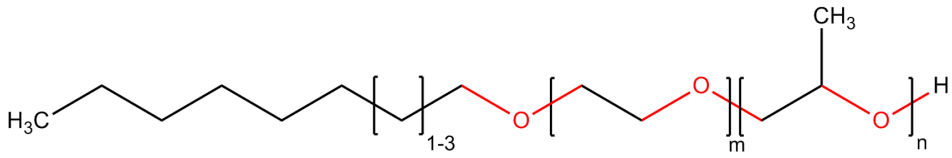
Chemical Name in the Inventory and Synonyms	**Alcohols, C12-20, ethoxylated propoxylated** Polyethoxylated polypropoxylated C12-20-alcohols
CAS Number	68526-95-4
Structural Formula	
Molecular Formula	Unspecified
Molecular Weight	

Chemical Name in the Inventory and Synonyms	**Alcohols, C12-15, ethoxylated propoxylated** Linear C12-15-primary alcohol, ethoxylated and propoxylated PPG-6 C12-15-pareth-12

CAS Number	68551-13-3
Structural Formula	No Structural Diagram Available
Molecular Formula	Unspecified
Molecular Weight	

Chemical Name in the Inventory and Synonyms	**Alcohols, C11-15-secondary, ethoxylated propoxylated** Linear C11-15-secondary alcohol, ethoxylated and propoxylated
CAS Number	68551-14-4
Structural Formula	No Structural Diagram Available
Molecular Formula	Unspecified
Molecular Weight	

Chemical Name in the	**Alcohols, C8-10, ethoxylated propoxylated**

Inventory and Synonyms	Ethoxylated propoxylated C8-10 alcohols Ethoxylated propoxylated alcohols (C=8-10) Mixed octyl/decyl alcohol, ethoxylated propoxylated Alkoxy alcohols, C8-10, ethoxylated propoxylated Ethoxylated alcohols, C8-10, ethoxylated propoxylated
CAS Number	68603-25-8
Structural Formula	
Molecular Formula	Unspecified
Molecular Weight	206.37

Chemical Name in the Inventory and Synonyms	**Alcohols, C6-12, ethoxylated propoxylated** (C6-12) Alkyl alcohol ethoxylate propoxylate
CAS Number	68937-66-6
Structural Formula	**No Structural Diagram Available**
Molecular Formula	Unspecified
Molecular Weight	

Chemical Name in the Inventory and Synonyms	**Alcohols, C8-18, ethoxylated propoxylated** Linear C8-18-alkyl alcohols, ethoxylated, propoxylated

CAS Number	69013-18-9
Structural Formula	No Structural Diagram Available
Molecular Formula	Unspecified
Molecular Weight	

Chemical Name in the Inventory and Synonyms	**Alcohols, C14-18 and C16-18-unsaturated, ethoxylated propoxylated**
CAS Number	72854-13-8
Structural Formula	No Structural Diagram Available
Molecular Formula	Unspecified
Molecular Weight	

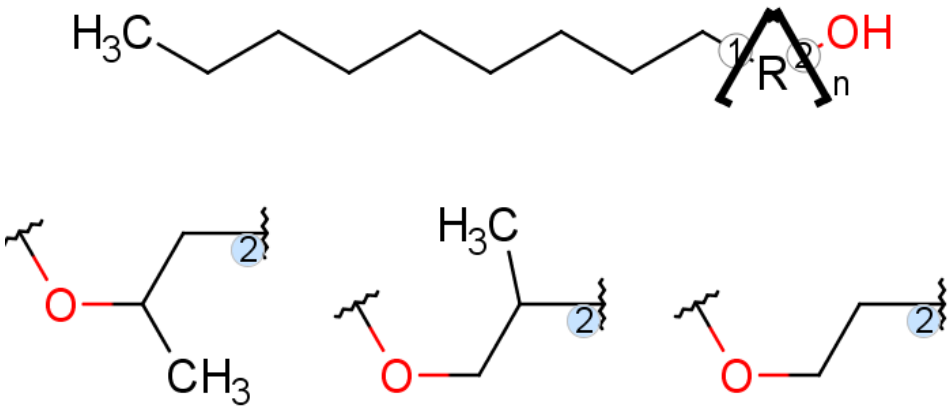
Chemical Name in the	**Alcohols, C16-20, ethoxylated propoxylated**

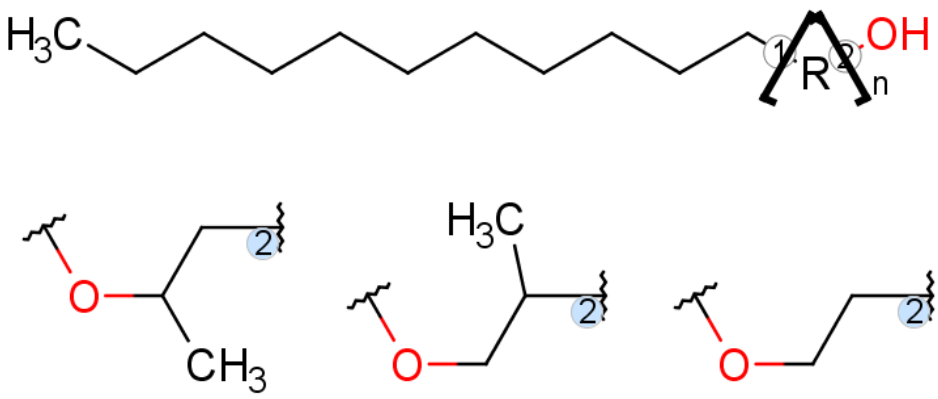
Inventory and Synonyms	(C16-20) Alcohols, ethoxylated and propoxylated
CAS Number	73049-34-0
Structural Formula	
Molecular Formula	Unspecified
Molecular Weight	

Chemical Name in the Inventory and Synonyms	**Alcohols, tallow, ethoxylated propoxylated**
CAS Number	103819-03-0
Structural Formula	
Molecular Formula	Unspecified
Molecular Weight	

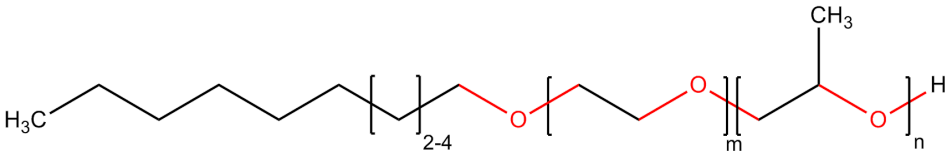
Chemical Name in the Inventory and Synonyms	**Alcohols, C9-11, branched and linear, ethoxylated propoxylated**
CAS Number	102782-43-4
Structural Formula	**No Structural Diagram Available**
Molecular Formula	Unspecified
Molecular Weight	

Chemical Name in the Inventory and Synonyms	**Alcohols, C12-14-secondary, ethoxylated, propoxylated** PPG-3 C12-14-sec-pareth-7
CAS Number	103331-86-8
Structural Formula	**No Structural Diagram Available**
Molecular Formula	Unspecified
Molecular Weight	

Chemical Name in the Inventory and Synonyms	**Oxirane, methyl-, polymer with oxirane, monononyl ether** Oxirane, methyl-, polymer with oxirane, monoether with 1-nonanol
CAS Number	103657-84-7
Structural Formula	
Molecular Formula	C9H20O.(C3H6O.C2H4O)x
Molecular Weight	

Chemical Name in the Inventory and Synonyms	**Oxirane, methyl-, polymer with oxirane, monoundecyl ether** Oxirane, methyl-, polymer with oxirane, monoether with 1-undecanol
CAS Number	103657-85-8
Structural Formula	
Molecular Formula	C11H24O.(C3H6O.C2H4O)x

Molecular Weight	

Chemical Name in the Inventory and Synonyms	**Alcohols, C9-11, ethoxylated propoxylated** PPG-2 C9-11-pareth-5
CAS Number	103818-93-5
Structural Formula	
Molecular Formula	Unspecified
Molecular Weight	

Chemical Name in the Inventory and Synonyms	**Alcohols, C13-15-branched and linear, ethoxylated propoxylated**
CAS Number	111905-54-5
Structural Formula	**No Structural Diagram Available**
Molecular Formula	Unspecified
Molecular Weight	

Chemical Name in the Inventory and Synonyms	**Alcohols, C16 and C18-unsaturated, alkyl, ethoxylated propoxylated**
CAS Number	116810-31-2
Structural Formula	**No Structural Diagram Available**
Molecular Formula	Unspecified
Molecular Weight	

Chemical Name in the Inventory and Synonyms	**Alcohols, C8-12-alkyl, ethoxylated propoxylated**
CAS Number	116810-33-4
Structural Formula	**No Structural Diagram Available**
Molecular Formula	Unspecified
Molecular Weight	

Chemical Name in the Inventory and Synonyms	**Alcohols, C12-15-branched and linear, ethoxylated propoxylated**
CAS Number	120313-48-6
Structural Formula	**No Structural Diagram Available**
Molecular Formula	Unspecified
Molecular Weight	

Chemical Name in the Inventory and Synonyms	**Alcohols, C6-10, ethoxylated propoxylated**
CAS Number	68987-81-5
Structural Formula	**No Structural Diagram Available**

Molecular Formula	Unspecified
Molecular Weight	

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