# Bisphenol A (BPA)-based miscellaneous polymers: Human health tier II assessment

**08 March 2019**



## Chemicals in this assessment

| Chemical Name in the Inventory | CAS Number |
|---|---|
| **Glycidyl neodecanoate, polymer with, 6 Hexanedio, 2,2'-[Isopropylidenebis(p-phenyleneoxy)]diethanol and Terephthalic acid** | 439600-99-4 |
| **Phenol, 4,4'-(1-methylethylidene)bis-, polymer with 1,1'-sulfonylbis[4-chlorobenzene]** | 25154-01-2 |
| **Cyanic acid, (1-methylethylidene)di-4,1-phenylene ester, homopolymer** | 25722-66-1 |
| **1,3-Benzenedicarboxylic acid, polymer with 1,4-benzenedicarboxylic acid and 4,4'-(1-methylethylidene)bis[phenol]** | 26590-50-1 |
| **2-Butenedioic acid, (E)-, polymer with 1,1'-[(1-methylethylidene)bis(4,1-phenyleneoxy)]bis[2-propanol]** | 27136-00-1 |
| **1,4-Benzenedicarboxylic acid, polymer with 1,4-cyclohexanedimethanol, 4,4'-(1-methylethylidene)bis[phenol] and oxirane** | 147712-65-0 |
| **Phenol, 4,4'-(1-methylethylidene)bis-, polymer with oxirane** | 29086-67-7 |

| Chemical Name in the Inventory | CAS Number |
|---|---|
| **Phenol, 4,4'-(1-methylethylidene)bis-, polymer with methyloxirane** | 29694-85-7 |
| **Phenol, 4,4'-(1-methylethylidene)bis-, polymer with 1,1'-methylenebis[4-isocyanatobenzene] and methyloxirane** | 31227-09-5 |
| **2-Butenedioic acid, (E)-, polymer with .alpha.,.alpha.'-[(1-methylethylidene)di-4,1-phenylene]bis[.omega.-hydroxypoly[oxy(methyl-1,2-ethanediyl)]]** | 39382-25-7 |
| **2-Butenedioic acid, (E)-, polymer with 1,2-ethanediol and 1,1'-[(1-methylethylidene)bis(4,1-phenyleneoxy)]bis[2-propanol]** | 50475-05-3 |
| **2,5-Furandione, polymer with 1,1'-[(1-methylethylidene)bis(4,1-phenyleneoxy)]bis[2-propanol] and 1,2-propanediol** | 56829-22-2 |
| **1,3-Isobenzofurandione, 5,5'-[(1-methylethylidene)bis(4,1-phenyleneoxy)]bis-, polymer with 1,3-benzenediamine** | 61128-46-9 |
| **1,2-Propanediol, polymer with 5-amino-1,3,3-trimethylcyclohexanemethanamine, 1,1'-methylenebis[4-isocyanatocyclohexane]and 4,4'-(1-methylethylidene)bis[phenol]** | 68083-89-6 |
| **Phenol, 4,4'-(1-methylethylidene) bis-, polymer with 5-amino-1,3,3-trimethyl cyclohexane methanamine, 1,3-diisocyanatomethylbenzene and alpha-hydroomegahydroxy poly [oxy(methyl-1,2-ethanediyl)]** | 68109-62-6 |
| **Fatty acids, C18-unsaturated, dimers, polymers with bisphenol A and diethylenetriamine** | 68390-10-3 |
| **1,2,3-Propanetriol, polymer with 4,4'-(1-methylethylidene)bis[phenol], methyloxirane and oxirane** | 68492-64-8 |
| **1,4-Benzenedicarboxylic acid, polymer with 1,3-dihydro-1,3-dioxo-5-isobenzofurancarboxylic acid, 2,2'-[(1-methylethylidene)bis(4,1-phenyleneoxy)]bis[ethanol] and 1,1'-[(1-methylethylidene)bis(4,1-phenyleneoxy)]bis[2-propanol]** | 75214-60-7 |

| Chemical Name in the Inventory | CAS Number |
|---|---|
| **Phenol, 4,4'-(1-methylethylidene)bis-, polymer with 1,1'-sulfonylbis[4-chlorobenzene] and 4,4'-sulfonylbis[phenol]** | 88285-91-0 |
| **1H,3H-Benzo[1,2-c:4,5-c']difuran-1,3,5,7-tetrone, polymer with 1,2-benzenediamine, 1,3-benzenediamine, 1,4-benzenediamine, 4-[4-[1-[4-[(1,3-dihydro-1,3-dioxo-5-isobenzofuranyl)oxy]phenyl]-1-methylethyl]phenoxy]-1,3-isobenzofurandione, 1,3-isobenzofurandione, 4,4'-[(1-methylethylidene)bis(4,1-phenyleneoxy)]bis[1,3-isobenzofurandione] and 5,5'-[(1-methylethylidene)bis(4,1-phenyleneoxy)]bis[1,3-isobenzofurandione]** | 96557-46-9 |
| **1,2-Benzenedicarboxylic acid, polymer with (E)-2-butenedioic acid, .alpha.-hydro-.omega.-hydroxypoly(oxy-1,2-ethanediyl) and .alpha.,.alpha.'-[(1-methylethylidene)di-4,1-phenylene]bis[.omega.-hydroxypoly[oxy(methyl-1,2-ethanediyl)]]** | 99328-60-6 |
| **1,4-Benzenedicarboxylic acid, polymer with 1,3-dihydro-1,3-dioxo-5-isobenzofurancarboxylic acid, 3-(dodecenyl)dihydro-2,5-furandione, .alpha.,.alpha. '- ((1-methylethylidene)di-4,1-phenylene)bis(.omega.-hydroxypoly (oxy-1,2-ethanediyl)) and .alpha.,.alpha.'-((1-methylethylidene) di-4,1-phenylene)bis (.omega.-hydroxypoly (oxy(methyl-1,2-ethanediyl)))** | 99546-37-9 |
| **Phenol, 4,4'-(1-methylethylidene)bis-, reaction products with styrene, ethoxylated, sulfates, sodium salts** | 102262-25-9 |
| **1,3-Benzenedicarboxylic acid, polymer with diethyl propanedioate, 2-ethyl-2-(hydroxymethyl)-1,3-propanediol, hexanedioic acid, 1,6-hexanediol, 1,3-isobenzofurandione, 1,1'-methylenebis[4-isocyanatobenzene], 4,4'-(1-methylethylidene)bis[phenol] and methyloxirane** | 103051-69-0 |
| **1,3-Benzenedicarboxylic acid, polymer with 2,4-diisocyanato-1-methylbenzene, 2-ethyl-2-(hydroxymethyl)-1,3-propanediol,hexahydro-2H-azepin-2-one, hexanedioic acid, 1,6-hexanediol, 1,3-isobenzofuranedione, 4,4'-(1-methylethylidene)bis[phenol], methyloxirane, 2,2'-oxybis[ethanol] and 1,2-propanediol** | 103101-19-5 |

| Chemical Name in the Inventory | CAS Number |
|---|---|
| **2,5-Furandione, polymer with 2,2'-[(1-methylethylidene)bis(4,1-phenyleneoxy)]bis[ethanol], 2-phenoxyethyl ester** | 104376-59-2 |
| **Rosin, hydrogenated, polymer with ethylene glycol, glycerol, isophthalic acid, 1,1'-[(1-methylethylidene)bis(4,1-phenyleneoxy)]bis[2-propanol], terephthalic acid and trimethylolpropane** | 109909-23-1 |
| **Rosin, hydrogenated, polymer with ethylene glycol, isophthalic acid, 1,1'-[(1-methylethylidene)bis(4,1-phenyleneoxy)]bis[2-propanol], terephthalic acid, trimellitic anhydride and trimethylolpropane** | 109909-24-2 |
| **Rosin, hydrogenated, polymer with ethylene glycol, isophthalic acid, polyethylene glycol ether with bisphenol A (2:1), terephthalic acid and trimethylolpropane** | 109909-25-3 |
| **Rosin, maleated, polymer with diethylene glycol, ethylene glycol, glycerol, isophthalic acid, 1,1'-[(1-methylethylidene)bis(4,1-phenyleneoxy)]bis[2-propanol], terephthalic acid and trimellitic anhydride** | 109909-27-5 |
| **1,4-Benzenedicarboxylic acid, polymer with 2-(1,1-dimethylethyl)-1,4-benzenediol, 4-hydroxybenzoic acid, and 4,4'-(1-methylethylidene)bisphenol** | 110411-76-2 |
| **Amines, tallow alkyl, reaction products with 1,1'-[(1-methylethylidene)di-4,1-phenylene]bis[3-amino-2-propanol]-N,N-ditallow alkyl derivatives and oxirane** | 111062-32-9 |
| **Rosin, polymer with ethylene glycol, glycerol, isophthalic acid, polyethylene glycol ether with bisphenol A (2:1) and terephthalic acid** | 111905-76-1 |
| **Rosin, maleated, polymer with diethylene glycol, ethylene glycol, glycerol, isophthalic acid, polyethylene glycol ether with bisphenol A (2:1), rosin and terephthalic acid** | 114352-06-6 |
| **Rosin, polymer with diethylene glycol, ethylene glycol, glycerol, isophthalic acid, polyethylene glycol ether with bisphenol A (2:1) and terephthalic acid** | 114352-07-7 |

| Chemical Name in the Inventory | CAS Number |
|---|---|
| **Rosin, polymer with diethylene glycol, ethylene glycol, glycerol, isophthalic acid, 1,1'-[(1-methylethylidene)bis(4,1-phenyleneoxy)]bis[2-propanol], phthalic anhydride and terephthalic acid** | 114352-08-8 |
| **1,2,4-Benzenetricarboxylic acid, tris(2-ethylhexyl) ester, polymer with 1,4-benzenedicarboxylic acid, alpha, alpha'-[(1-methylethylidene) di-4,1-phenylene]bis[omega-hydroxypoly (oxy-1,2-ethanediyl)] and alpha, alpha'-[(1-methylethylidene)di-4,1-phenylene]bis[omega-hydroxypoly[oxy(methyl-1,2-ethanediyl)]]** | 115172-27-5 |
| **2-Butenedioic acid (E)-, polymer with 1,3-dihydro-1,3-dioxo-5-isobenzofurancarboxylic acid, .alpha.,.alpha.'-[(1-methylethylidene)di-4,1-phenylene]bis[.omega.-hydroxypoly(oxy-1,2-ethanediyl)] and .alpha.,.alpha.'-[(1-methylethylidene)di-4,1-phenylene]bis[.omega.-hydroxypoly[oxy(methyl-1,2-ethanediyl)]]** | 116736-81-3 |
| **1,3-Benzenedicarboxylic acid, polymer with 1,4-benzenedicarboxylic acid, 2-(diethylamino) ethyl 2-methyl-2-propenoate, ethenylbenzene, 2,5-furandione and 2,2'-[(1-methylethylidene)bis(4,1-phenyleneoxy)]bis[ethanol], graft** | 117409-79-7 |
| **Polyphosphoric acids, polymers with castor oil and 1,1'-[(1-methylethylidene)bis(4,1-phenyleneoxy)]bis[2-propanol]** | 117440-19-4 |
| **1,4-Benzenedicarboxylic acid, polymer with 1,3-dihydro-1,3-dioxo-5-isobenzofurancarboxylic acid, dihydro-3-(tetrapropenyl)-2,5-furandione, .alpha.,.alpha.'-[(1-methylethylidene)di-4,1-phenylene]bis[.omega.-hydroxypoly[oxy(methyl-1,2-ethanediyl)]] and .alpha.,.alpha.'-[(1-methylethylidene)di-4,1-phenylene]bis[.omega.-hydroxypoly(oxy-1,2-ethanediyl)]** | 117581-13-2 |
| **1,3-Benzenedicarboxylic acid, polymer with 1,3-diisocyanatomethylbenzene, 2,2-dimethyl-1,3-propanediol, 2-ethyl-2-(hydroxymethyl)-1,3-propanediol and 1,1'-((1-methylethylidene)bis(4,1-phenyleneoxy))bis(2-propanol)** | 118496-39-2 |

| Chemical Name in the Inventory | CAS Number |
|---|---|
| **1,4-Benzenedicarboxylic acid, di-2-propenyl ester, polymer with (1-methylethylidene)bis(4,1-phenyleneoxy-2,1-ethanediyl) bis[2-methyl-2-propenoate] and phenyl 2-methyl-2-propenoate** | 119275-05-7 |
| **1,3-Benzenedicarboxylic acid, polymer with 1,3-diisocyanatomethylbenzene, 2-ethyl-2-(hydroxymethyl)-1,3-propanediol, 1,1'((1-methylethylidene)bis(4,1-oxy))bis(2-propanol) and 2,2'-oxybis(ethanol)** | 123701-48-4 |
| **1,3-Benzenedicarboxylic acid, polymer with 2-ethyl-2-(hydroxymethyl)-1,3-propanediol, 1,1'-methylenebis(4-isocyanatobenzene), 1,1'-((1-methylethylidene)bis(4,1-phenyleneoxy))bis(2-propanol) and 2,2'-oxybis(ethanol)** | 123701-49-5 |
| **1,2-Benzenedicarboxylic acid, polymer with 2-ethyl-2-(hydroxymethyl)-1,3-propanediol, 1,1'-methylenebis(4-isocyanatobenzene), 1,1'-((1-methylethylidene)bis(4,1-phenyleneoxy))bis(2-propanol) and 2,2'-oxybis(ethanol)** | 123701-51-9 |
| **1,4-Benzenedicarboxylic acid, polymer with (E)-2-butenedioic acid, 1,3-dihydro-1,3-dioxo-5-isobenzofurancarboxylic acid, alpha, alpha'-[(1-methylethylidene) di-4,1-phenylene]bis[omega-hydroxypoly(oxy-1,2-ethanediyl) and alpha, alpha'-[(1-methylethylidene)di-4,1-phenylene]bis[omega-hydroxypoly[oxy(methyl-1,2-ethanediyl)]** | 168406-64-2 |
| **1,4-Benzenedicarboxylic acid, polymer with 1,3-dihydro-1,3-dioxo-5-isobenzofurancarboxylic acid, 3-(dodecenyl)dihydro-2,5-furandione, 2,2'-[(1-methylethylidene)bis(4,1-phenyleneoxy)]bis[ethanol] and 1,1'-[(1-methylethylidene)bis(4,1-phenyleneoxy)]bis[2-propanol]** | 185568-18-7 |

# 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

The chemicals in this group are polymers that contain bisphenol A (BPA) (CAS No. 80-05-7) as a monomer. The polymers in this group include polyurethanes, polyesters, alkoxylates and other miscellaneous polymers. No data are available for the polymers. The chemicals in this group are generally expected to be of low concern to the human health. However, the products manufactured using these chemicals may contain BPA (from incomplete polymerisation) or may release BPA (as a result of hydrolysis from the polymers) under certain conditions. The hazardous properties of the polymers is expected to be mostly driven by the toxicity profile of BPA.

Bisphenol A is an industrial chemical that is widely used as a chemical intermediate in manufacturing the lining of food contact articles such as reusable beverage bottles, infant feeding bottles, tableware (plates and mugs), storage containers, food and beverage cans and vats. Its is also used in non-food products such as electronic equipment housing units, including cell phones, laptops, tablet computers, PDAs, electronic game consoles and handheld computer gaming units. BPA-based polymers are also widely used across a wide range of industrial uses. Small amounts of bisphenol A can migrate into food and beverages from containers (NICNASa; EFSA, 2015). This group of polymers exclude the main food contact groups, polycarbonates and epoxies. Therefore, these polymers are less likely to serve as sources of BPA in food.

Some polymers in this group are polyurethanes (isocyanates) reacted with BPA. If the isocyanate group has completely reacted then it is of low concern to human health. However, where the polymers contain free isocyanate group(s), it could have significant health effects (NICNASb).

Polymers that may have other degradation products of concern such as nonylphenols or formaldehyde are not included in this assessment as they may have different risks, both qualitatively and quantitatively, to human health.

# Import, Manufacture and Use

## Australian

No specific Australian use, import, or manufacturing information has been identified.

## International

The following international uses have been identified through Galleria Chemica and the Substances in Preparations in Nordic Countries (SPIN) database.

Some polymers in this group have reported domestic uses including as adhesives and binding agents and as fillers.

Some polymers in this group have reported commercial uses including as photo chemicals and reprographic agents.

Some polymers in this group have reported site-limited uses including as intermediates and in plastics manufacture.

# Restrictions

## Australian

No known restrictions have been identified for the chemicals in this group or BPA itself (SUSMP, 2019).

## International

No known restrictions have been identified.

# Existing Worker Health and Safety Controls

## Hazard Classification

The chemicals in the group are not listed on the Hazardous Chemical Information System (HCIS) (Safe Work Australia).

BPA is classified as hazardous, with the following hazard categories and hazard statements for human health in the Hazardous Chemical Information System (HCIS) (Safe Work Australia):

Causes serious eye damage - Cat. 1 (H318);

May cause respiratory irritation - Specific target organ tox, single exp Cat. 3 (H335);

May cause an allergic skin reaction - Cat. 1 (H317); and

Suspected of damaging fertility - Cat. 2 (H361f)

## Exposure Standards

### Australian

There are no exposure standards for individual polymers in this group or BPA itself.

### International

There are no exposure standards for individual chemicals in this group.

The following exposure standards are identified for BPA (Galleria Chemica):

Bisphenol A (CAS No. 80-05-7) has an exposure limit of 5–10 mg/m$^3$ time weighted average (TWA) in countries such as France, Germany, Ireland, the Netherlands, Norway, Poland, Russia, Spain, and the United Kingdom.

Bisphenol A (CAS No. 80-05-7) also has an exposure limit of 5–10 mg/m$^3$ short-term exposure limit (STEL) in countries such as Russia and Switzerland.

## Health Hazard Information

The chemicals in this group are BPA-based polymers. There are no data available on the health hazards of the polymers in this group. The bioavailability of these polymers is considered to be negligible due to their large molecular size. It is considered that bisphenol A released from the decomposition of these polymers will generally be the critical driver of toxicity.

The critical health hazards of BPA have been previously identified in the Tier II Human Health assessment of bisphenol A under the Inventory Multi-tiered Assessment and Prioritisation (IMAP) Framework (NICNASa). Bisphenol A is a reproductive toxicant at high dose levels in animals. However, the evidence was not sufficient to infer a causal link between bisphenol A exposure and reproductive effects in humans at current exposure levels. Reproductive or developmental effects at low doses, below the human equivalent dose (HED) of 3.6 mg/kg bw/day, were not assigned overall as being 'likely' to have these effects (EFSA, 2015). Increase in kidney (nephropathy) and liver weight (hepatocellular hypertrophy) changes were observed at high doses in animals. A benchmark dose lower bound (BMDL)10 of 8.96 mg/kg bw/day for changes in relative kidney weight was determined from a two-generation reproductive study in mice. Bisphenol A is unlikely to have any neurological, neurodevelopmental, and or neuroendocrine effects. It is also not considered to have mutagenic, or genotoxic or carcinogenic potential. Although bisphenol A has produced proliferative (abnormal cell growth) changes in the mammary gland in animal studies, including a non-human primate study, these were insufficient to conclude a link to cancer development (NICNASa; EFSA, 2015).

Food Standards Australia New Zealand (FSANZ) has concluded that exposure to bisphenol A in food does not present a significant human health and safety issue at current exposure levels (FSANZ, 2010). FSANZ concurred with the previously performed hazard assessment by other regulatory agencies and also with the tolerable daily intake (TDI) of 50 µg/kg bw/ per day. A FSANZ survey of bisphenol A in food and drinks in the Australian market found only a limited number of products with detectable levels of bisphenol A; and no detectable levels of bisphenol A were found in infant formula. FSANZ concluded that Australians of all ages are exposed to extremely low levels (in the range of ng/kg food to µg/kg food) of bisphenol A via such packaged foodstuffs (FSANZ, 2010). Health Canada (2012) and the US Food and Drug Administration (US FDA, 2014) have drawn similar conclusions. The European Food Safety Authority (EFSA) concluded that bisphenol A poses no health risk to consumers of any age group (including unborn children, infants and adolescents) at the estimated levels of exposure. In addition to dietary exposure, the EFSA report also calculated 'average' and 'high' exposure levels for dust and toys, thermal paper, and cosmetics. Exposure (TDI) from the diet or from a combination of all sources (diet, dust, cosmetics and thermal paper) is considerably under the safe exposure level (EFSA, 2015).

The chemicals are not expected to readily release BPA. Where the polymers in this group do release BPA under extreme conditions, it is considered that the levels may not be of concern to either public or worker health and safety based on the above stated data.

Some polymers in this group are polyurethanes (isocyanates) reacted with BPA. If the isocyanate group has completely reacted then it is of low concern to human health. However, where the polymers a contain free isocyanate group it could have significant health effects (NICNASb). The free isocyanate group(s) is extremely reactive, and its key health hazards are those identified in

the NICNAS assessments of toluene diisocyanates (TDI), methylenediphenyl diisocyanates (MDI), hexamethylene diisocyanate (HDI) and other isocyanates. The common critical health effects for these chemicals include acute toxicity via the inhalation route; irritation to skin, eyes and the respiratory system; and sensitisation by inhalation and skin contact, which are well characterised in the IMAP reports published for these chemicals. Additionally, these common critical health effects have been similarly reported in the exposure standard documentation for isocyanates for isocyanate pre-polymers which may contain TDI, MDI and HDI or other isocyanate monomers. Pre-polymers with TDI, MDI and HDI contain less than 0.7 % residual monomer and are reportedly stable over time. No residual functional isocyanate groups are present in fully cured polyurethane. While some polyurethanes in this group may be terminated with isocyanate functional groups, these are not expected to convert back to TDI, MDI or HDI (NICNASb).

# Risk Characterisation

## Critical Health Effects

These polymers are not expected to readily release BPA. The levels of BPA are expected to be well within the levels where systemic and local effects would not be observed. Therefore, no significant health effects are expected from presence of BPA in the polymers.

Where the polymers in this group contain free isocyanate groups, the critical health effect for risk characterisation is respiratory sensitisation. Other health effects include systemic acute effect (acute toxicity by the inhalation route of exposure) and local effects (skin sensitisation and respiratory irritation). The polymers may also cause skin and eye irritation.

## Public Risk Characterisation

The use(s) of many of these chemicals have not been reported in Australia. However, some have reported to be used domestically overseas. This "miscellaneous" group of polymers excludes the main BPA-based polymer categories used in baby bottle (polycarbonates) and can-linings (epoxy resins). Therefore, food contact is unlikely. In the absence of paths for migration into food and drink, the public risk is expected to be low. Should the polyurethanes in this group be isocyanate terminated, these polymers are expected to be used only in site-limited or commercial applications.

Based on the above information, the risk to public health is not considered to be unreasonable and further risk management of the chemicals is not considered necessary for public safety.

## Occupational Risk Characterisation

During product formulation, dermal, ocular and inhalation exposure might occur, particularly where manual or open processes are used. These could include transfer and blending activities, quality control analysis, and cleaning and maintaining equipment. Worker exposure to the chemicals at lower concentrations could also occur while using formulated products containing the chemicals. The level and route of exposure will vary depending on the method of application and work practices employed.

Companies using or marketing polyurethane polymers that also have the isocyanate functional group should seek sufficient information to determine whether the polymer contains free isocyanate groups. Where the polymers in this group contain free isocyanate groups, given the critical health effects, the chemicals may pose an unreasonable risk to workers unless adequate control measures to minimise dermal, ocular and inhalation exposure to the chemical are implemented. The chemicals should be appropriately classified and labelled to ensure that a person conducting a business or undertaking (PCBU), e.g. employer, at a workplace, has adequate information to determine appropriate controls.

Based on available data, the amount of BPA expected to be available from these chemicals is very low and; therefore, classification (based on BPA) in the Hazardous Chemical Information System (HCIS) is not recommended. Should empirical data become available for the individual polymers indicating that a classification is appropriate, the data may be used to make recommendation(s) for classification.

# NICNAS Recommendation

Current risk management measures are considered adequate to protect public and workers' health and safety, provided that all requirements are met under workplace health and safety, and poisons legislation as adopted by the relevant state or territory. No further assessment is required.

Companies using or marketing these polymers should have sufficient information to determine whether the polymer contains free BPA or releases BPA, and take appropriate risk management measures to control the hazards associated with BPA.

Companies using or marketing polyurethanes polymers containing isocyanate group should have sufficient information to determine whether the polymer contains free isocyanate groups, and take appropriate risk management measures to control the hazards associated with free isocyanate.

## Regulatory Control

### Work Health and Safety

Based on the available data, the polymers in this group are not recommended for hazard classification in the Hazardous Chemical Information System (HCIS) (Safe Work Australia). Should data becomes available for the individual group members indicating that a classification is appropriate, the data may be used to make recommendation(s) for individual classifications.

Where the polyurethanes polymers contain free isocyanate group, these are recommended for classification and labelling aligned with the Globally Harmonized System of Classification and Labelling of Chemicals (GHS) for respiratory sensitisation, local effects (skin sensitisation and respiratory, skin and eye irritation) and acute toxicity by the inhalation route of exposure (NICNASb).

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.

## Advice for industry

Control measures to minimise the risk from 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 hazardous chemicals 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;
- using local exhaust ventilation to prevent the chemicals from entering the breathing zone of any worker;
- health monitoring for any worker who is at risk of exposure to the chemicals, if valid techniques are available to monitor the effect on the worker's health;
- air monitoring to ensure control measures in place are working effectively and continue to do so;
- 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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SUSMP (2019). The Poisons Standard (the Standard for the Uniform Scheduling of Medicines and Poisons). Commonwealth of Australia. Available: **https://www.tga.gov.au/publication/poisons-standard-susmp**

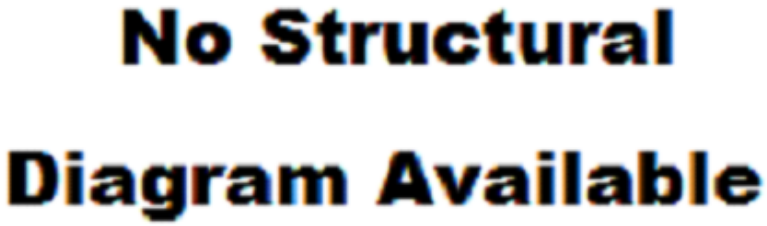
U.S Food and Drug Administration (US FDA) (2014). Bisphenol A (BPA): Use in Food Contact Application. Accessed at **http://www.fda.gov/food/ingredientspackaginglabeling/foodadditivesingredients/ucm064437.htm#summary**

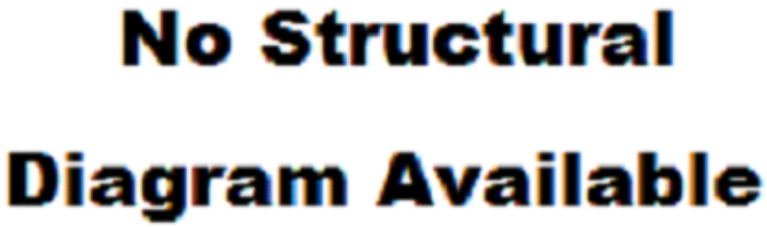
Last Update 08 March 2019

## Chemical Identities

| | |
|---|---|
| Chemical Name in the Inventory and Synonyms | **Glycidyl neodecanoate, polymer with, 6 Hexanedio, 2,2'-[Isopropylidenebis(p-phenyleneoxy)]diethanol and Terephthalic acid** |
| CAS Number | 439600-99-4 |
| Structural Formula | **No Structural Diagram Available** |
| Molecular Formula | (C19H24O4 .C13H24O3.C8H6O4.C6H14O2)x |
| Molecular Weight | Not specified |

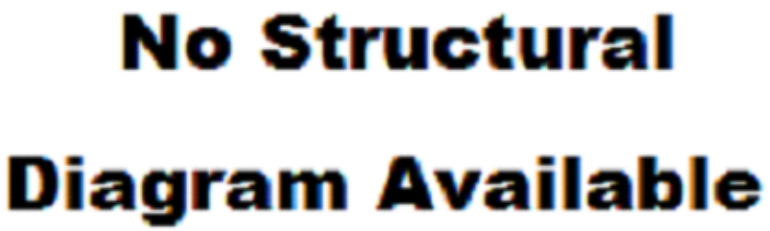
| | |
|---|---|
| Chemical Name in the Inventory and Synonyms | **Phenol, 4,4'-(1-methylethylidene)bis-, polymer with 1,1'-sulfonylbis[4-chlorobenzene]** |
| CAS Number | 25154-01-2 |
| Structural Formula | |

| | |
|---|---|
| |   |
| Molecular Formula | (C15H16O2.C12H8Cl2O2S)x |
| Molecular Weight | Not specified |

| | |
|---|---|
| Chemical Name in the Inventory and Synonyms | **Cyanic acid, (1-methylethylidene)di-4,1-phenylene ester, homopolymer** |
| CAS Number | 25722-66-1 |
| Structural Formula |   |
| Molecular Formula | (C17H14N2O2)x |
| Molecular Weight | Not specified |

| | |
|---|---|
| Chemical Name in the Inventory and Synonyms | **1,3-Benzenedicarboxylic acid, polymer with 1,4-benzenedicarboxylic acid and 4,4'-(1-methylethylidene)bis[phenol]** |

| | |
|---|---|
| | |
| CAS Number | 26590-50-1 |
| Structural Formula |   |
| Molecular Formula | (C15H16O2.C8H6O4.C8H6O4)x |
| Molecular Weight | Not specified |

| | |
|---|---|
| Chemical Name in the Inventory and Synonyms | **2-Butenedioic acid, (E)-, polymer with 1,1'-[(1-methylethylidene)bis(4,1-phenyleneoxy)]bis[2-propanol]** |
| CAS Number | 27136-00-1 |
| Structural Formula |   |
| Molecular Formula | |
| Molecular Weight | Not specified |

| | |
|---|---|
| Chemical Name in the Inventory and Synonyms | **1,4-Benzenedicarboxylic acid, polymer with 1,4-cyclohexanedimethanol, 4,4'-(1-methylethylidene)bis[phenol] and oxirane**<br>1,4-Cyclohexanedimethanol, polymer with 1,4-benzenedicarboxylic acid, oxirane and phenol, 4,4-(1-methylethylidene)bis-<br>705-13-5A |
| CAS Number | 147712-65-0 |
| Structural Formula | |
| Molecular Formula | |
| Molecular Weight | |

| | |
|---|---|
| Chemical Name in the Inventory and Synonyms | **Phenol, 4,4'-(1-methylethylidene)bis-, polymer with oxirane** |
| CAS Number | 29086-67-7 |
| Structural Formula | **No Structural Diagram Available** |
| Molecular Formula | (C15H16O2.C2H4O)x |
| Molecular Weight | Not specified |

| | |
|---|---|
| Chemical Name in the Inventory and Synonyms | **Phenol, 4,4'-(1-methylethylidene)bis-, polymer with methyloxirane**<br>bisphenol A propylene oxide polymer |

| | |
|---|---|
| CAS Number | 29694-85-7 |
| Structural Formula | No Structural Diagram Available |
| Molecular Formula | (C15H16O2.C3H6O)x |
| Molecular Weight | Not specified |

| | |
|---|---|
| Chemical Name in the Inventory and Synonyms | **Phenol, 4,4'-(1-methylethylidene)bis-, polymer with 1,1'-methylenebis[4-isocyanatobenzene] and methyloxirane** |
| CAS Number | 31227-09-5 |
| Structural Formula | No Structural Diagram Available |
| Molecular Formula | (C15H16O2.C15H10N2O2.C3H6O)x |
| Molecular Weight | Not specified |

| | |
|---|---|
| Chemical Name in the Inventory and Synonyms | **2-Butenedioic acid, (E)-, polymer with .alpha.,.alpha.'-[(1-methylethylidene)di-4,1-phenylene]bis[.omega.-hydroxypoly[oxy(methyl-1,2-ethanediyl)]]**<br>bisphenol A, adduct with propylene oxide (1:2), fumaric acid polymer |
| CAS Number | 39382-25-7 |
| Structural Formula | **No Structural Diagram Available** |
| Molecular Formula | (C4H4O4.(C3H6O)n(C3H6O)nC15H16O2)x |
| Molecular Weight | Not specified |

| | |
|---|---|
| Chemical Name in the Inventory and Synonyms | **2-Butenedioic acid, (E)-, polymer with 1,2-ethanediol and 1,1'-[(1-methylethylidene)bis(4,1-phenyleneoxy)]bis[2-propanol]** |
| CAS Number | 50475-05-3 |
| Structural Formula | **No Structural Diagram Available** |
| Molecular Formula | (C21H28O4.C4H4O4.C2H6O2)x |

| | |
|---|---|
| Molecular Weight | Not specified |

| | |
|---|---|
| Chemical Name in the Inventory and Synonyms | **2,5-Furandione, polymer with 1,1'-[(1-methylethylidene)bis(4,1-phenyleneoxy)]bis[2-propanol] and 1,2-propanediol** |
| CAS Number | 56829-22-2 |
| Structural Formula | **No Structural Diagram Available** |
| Molecular Formula | (C21H28O4.C4H2O3.C3H8O2)x |
| Molecular Weight | Not specified |

| | |
|---|---|
| Chemical Name in the Inventory and Synonyms | **1,3-Isobenzofurandione, 5,5'-[(1-methylethylidene)bis(4,1-phenyleneoxy)]bis-, polymer with 1,3-benzenediamine** |
| CAS Number | 61128-46-9 |
| Structural Formula | |

| | |
|---|---|
| |   |
| Molecular Formula | (C31H20O8.C6H8N2)x |
| Molecular Weight | Not specified |

| | |
|---|---|
| Chemical Name in the Inventory and Synonyms | **1,2-Propanediol, polymer with 5-amino-1,3,3-trimethylcyclohexanemethanamine, 1,1'-methylenebis[4-isocyanatocyclohexane]and 4,4'-(1-methylethylidene)bis[phenol]** propylene glycol, bisphenol A, 4,4-methylenebis(cyclohexyl isocyanate), isophorone diamine polymer |
| CAS Number | 68083-89-6 |
| Structural Formula |   |
| Molecular Formula | (C15H22N2O2.C15H16O2.C10H22N2.C3H8O2)x |
| Molecular Weight | Not specified |

| | |
|---|---|
| Chemical Name in the Inventory and Synonyms | **Phenol, 4,4'-(1-methylethylidene) bis-, polymer with 5-amino-1,3,3-trimethyl cyclohexane methanamine, 1,3-diisocyanatomethylbenzene** |

| | |
|---|---|
| | **and alpha-hydroomegahydroxy poly [oxy(methyl-1,2-ethanediyl)]**<br>phenol 4,4-(1-methylethylidene)bis-, polymer with 5-amino-1,3,3-trimethylcyclohexane methanamine, 1,3-diisocyanatomethylbenzene and alpha-hydro-omega-hydroxypoly[oxy(methyl-1,2-ethanediyl)]<br>RRH-1934 / Spenkel L91-40 |
| CAS Number | 68109-62-6 |
| Structural Formula | **No Structural Diagram Available** |
| Molecular Formula | [C15H16O2.C10H22N2.C9H6N2O2 (C3H6O)n]x |
| Molecular Weight | Not specified |

| | |
|---|---|
| Chemical Name in the Inventory and Synonyms | **Fatty acids, C18-unsaturated, dimers, polymers with bisphenol A and diethylenetriamine**<br>bisphenol A, C36 dimer fatty acid, diethylenetriamine polymer |
| CAS Number | 68390-10-3 |
| Structural Formula | **No Structural Diagram Available** |
| Molecular Formula | (C15H16O2.C4H13N3.)x |

| | |
|---|---|
| Molecular Weight | Not specified |

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|---|---|
| Chemical Name in the Inventory and Synonyms | **1,2,3-Propanetriol, polymer with 4,4'-(1-methylethylidene)bis[phenol], methyloxirane and oxirane**<br>oxirane, polymer with 4,4-(1-methylethylidene)bis[phenol] and methyloxirane |
| CAS Number | 68492-64-8 |
| Structural Formula | **No Structural Diagram Available** |
| Molecular Formula | (C15H16O2.C3H8O3.C3H6O.C2H4O)x |
| Molecular Weight | Not specified |

| | |
|---|---|
| Chemical Name in the Inventory and Synonyms | **1,4-Benzenedicarboxylic acid, polymer with 1,3-dihydro-1,3-dioxo-5-isobenzofurancarboxylic acid, 2,2'-[(1-methylethylidene)bis(4,1-phenyleneoxy)]bis[ethanol] and 1,1'-[(1-methylethylidene)bis(4,1-phenyleneoxy)]bis[2-propanol]** |
| CAS Number | 75214-60-7 |
| Structural Formula | |

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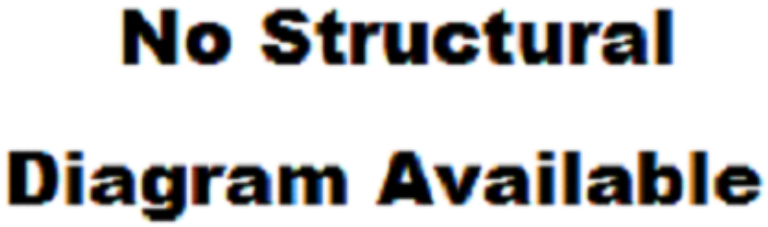
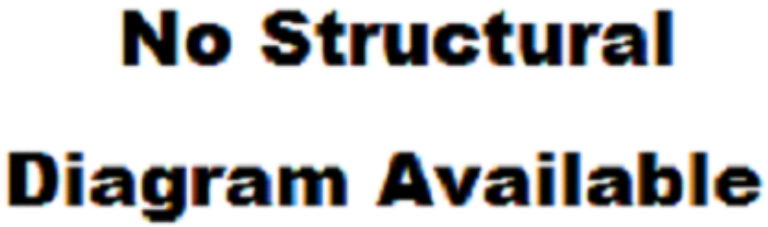
|---|---|
| |   |
| Molecular Formula | (C21H28O4.C19H24O4.C9H4O5.C8H6O4)x |
| Molecular Weight | Not specified |

| | |
|---|---|
| Chemical Name in the Inventory and Synonyms | **Phenol, 4,4'-(1-methylethylidene)bis-, polymer with 1,1'-sulfonylbis[4-chlorobenzene] and 4,4'-sulfonylbis[phenol]** |
| CAS Number | 88285-91-0 |
| Structural Formula |   |
| Molecular Formula | (C15H16O2.C12H10O4S.C12H8Cl2O2S)x |
| Molecular Weight | Not specified |

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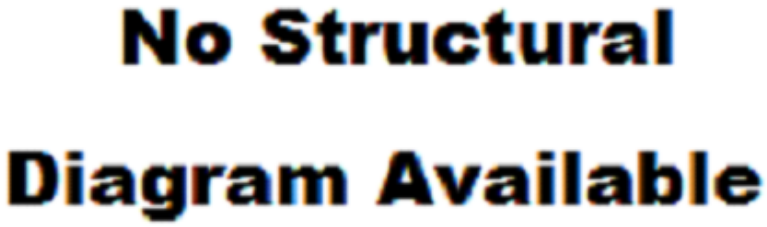
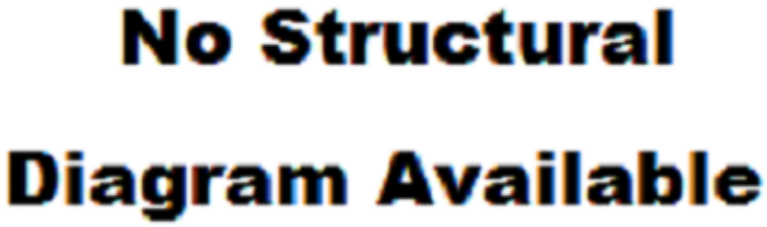
|---|---|
| Chemical Name in the Inventory and Synonyms | **1H,3H-Benzo[1,2-c:4,5-c']difuran-1,3,5,7-tetrone, polymer with 1,2-benzenediamine, 1,3-benzenediamine, 1,4-benzenediamine, 4-[4-[1-[4-[(1,3-dihydro-1,3-dioxo-5-isobenzofuranyl)oxy]phenyl]-1-methylethyl]phenoxy]-1,3-isobenzofurandione, 1,3-** |

| | |
|---|---|
| | **isobenzofurandione, 4,4'-[(1-methylethylidene)bis(4,1-phenyleneoxy)]bis[1,3-isobenzofurandione] and 5,5'-[(1-methylethylidene)bis(4,1-phenyleneoxy)]bis[1,3-isobenzofurandione]** |
| CAS Number | 96557-46-9 |
| Structural Formula | **No Structural Diagram Available** |
| Molecular Formula | (C31H20O8.C31H20O8.C31H20O8.C10H2O6.C8H4O3.C6H8N2.C6H8N2.C6H8N2)x |
| Molecular Weight | Not specified |

| | |
|---|---|
| Chemical Name in the Inventory and Synonyms | **1,2-Benzenedicarboxylic acid, polymer with (E)-2-butenedioic acid, .alpha.-hydro-.omega.-hydroxypoly(oxy-1,2-ethanediyl) and .alpha.,.alpha.'-[(1-methylethylidene)di-4,1-phenylene]bis[.omega.-hydroxypoly[oxy(methyl-1,2-ethanediyl)]]**<br>2-butenedioic acid, (E)-, polymer with 1,2-benzenedicarboxylic acid, .alpha.-hydro-.omega.-hydroxypoly(oxy-1,2-ethanediyl) and .alpha.,.alpha.-[(1-methylethylidene)di-4,1-phenylene |
| CAS Number | 99328-60-6 |
| Structural Formula | |

| | |
|---|---|
| |   |
| Molecular Formula | (C8H6O4.C4H4O4.(C3H6O)n(C3H6O)nC15H16O2.(C2H4O)nH2O)x |
| Molecular Weight | Not specified |

| | |
|---|---|
| Chemical Name in the Inventory and Synonyms | **1,4-Benzenedicarboxylic acid, polymer with 1,3-dihydro-1,3-dioxo-5-isobenzofurancarboxylic acid, 3-(dodecenyl)dihydro-2,5-furandione, .alpha.,.alpha. '- ((1-methylethylidene)di-4,1-phenylene)bis(.omega.-hydroxypoly (oxy-1,2-ethanediyl)) and .alpha.,.alpha.'-((1-methylethylidene) di-4,1-phenylene)bis (.omega.-hydroxypoly (oxy(methyl-1,2-ethanediyl)))** |
| CAS Number | 99546-37-9 |
| Structural Formula |   |
| Molecular Formula | (C16H26O3.C9H4O5.C8H6O4.(C3H6O)n(C3H6O)nC15H16O2. (C2H4O)n(C2H4O)nC15H16O2)x |
| Molecular Weight | Not specified |

| | |
|---|---|
| Chemical Name in the Inventory and Synonyms | **Phenol, 4,4'-(1-methylethylidene)bis-, reaction products with styrene, ethoxylated, sulfates, sodium salts** |
| CAS Number | 102262-25-9 |
| Structural Formula | **No Structural Diagram Available** |
| Molecular Formula | Unspecified |
| Molecular Weight | Not specified |

| | |
|---|---|
| Chemical Name in the Inventory and Synonyms | **1,3-Benzenedicarboxylic acid, polymer with diethyl propanedioate, 2-ethyl-2-(hydroxymethyl)-1,3-propanediol, hexanedioic acid, 1,6-hexanediol, 1,3-isobenzofurandione, 1,1'-methylenebis[4-isocyanatobenzene], 4,4'-(1-methylethylidene)bis[phenol] and methyloxirane** |
| CAS Number | 103051-69-0 |
| Structural Formula | **No Structural Diagram Available** |

| | |
|---|---|
| Molecular Formula | (C15H16O2.C15H10N2O2.C8H6O4.C8H4O3.C7H12O4.C6H14O3.C6H14O2.C6H10O4.C3H6O)x |
| Molecular Weight | Not specified |

| | |
|---|---|
| Chemical Name in the Inventory and Synonyms | **1,3-Benzenedicarboxylic acid, polymer with 2,4-diisocyanato-1-methylbenzene, 2-ethyl-2-(hydroxymethyl)-1,3-propanediol,hexahydro-2H-azepin-2-one, hexanedioic acid, 1,6-hexanediol, 1,3-isobenzofuranedione, 4,4'-(1-methylethylidene)bis[phenol], methyloxirane, 2,2'-oxybis[ethanol] and 1,2-propanediol** |
| CAS Number | 103101-19-5 |
| Structural Formula | **No Structural Diagram Available** |
| Molecular Formula | (C15H16O2.C9H6N2O2.C8H6O4.C8H4O3.C6H14O3.C6H14O2.C6H11NO.C6H10O4.C4H10O3.C3H8O2.C3H6O)x |
| Molecular Weight | Not specified |

| | |
|---|---|
| Chemical Name in the Inventory and Synonyms | **2,5-Furandione, polymer with 2,2'-[(1-methylethylidene)bis(4,1-phenyleneoxy)]bis[ethanol], 2-phenoxyethyl ester** |
| CAS Number | 104376-59-2 |
| Structural Formula | |

| | |
|---|---|
| | No Structural Diagram Available |
| Molecular Formula | Unspecified |
| Molecular Weight | Not specified |

| | |
|---|---|
| Chemical Name in the Inventory and Synonyms | **Rosin, hydrogenated, polymer with ethylene glycol, glycerol, isophthalic acid, 1,1'-[(1-methylethylidene)bis(4,1-phenyleneoxy)]bis[2-propanol], terephthalic acid and trimethylolpropane** |
| CAS Number | 109909-23-1 |
| Structural Formula | No Structural Diagram Available |
| Molecular Formula | (C21H28O4.C8H6O4.C8H6O4.C6H14O3.C3H8O3.C2H6O2.)x |
| Molecular Weight | Not specified |

| | |
|---|---|
| Chemical Name in the Inventory and Synonyms | **Rosin, hydrogenated, polymer with ethylene glycol, isophthalic acid, 1,1'-[(1-methylethylidene)bis(4,1-phenyleneoxy)]bis[2-propanol], terephthalic acid, trimellitic anhydride and trimethylolpropane** |

| | |
|---|---|
| | |
| CAS Number | 109909-24-2 |
| Structural Formula |   |
| Molecular Formula | (C21H28O4.C9H4O5.C8H6O4.C8H6O4.C6H14O3.C2H6O2.)x |
| Molecular Weight | Not specified |

| | |
|---|---|
| Chemical Name in the Inventory and Synonyms | **Rosin, hydrogenated, polymer with ethylene glycol, isophthalic acid, polyethylene glycol ether with bisphenol A (2:1), terephthalic acid and trimethylolpropane** |
| CAS Number | 109909-25-3 |
| Structural Formula |   |
| Molecular Formula | (C8H6O4.C8H6O4.C6H14O3.C2H6O2.(C2H4O)n(C2H4O)nC15H16O2.)x |
| Molecular Weight | Not specified |

| | |
|---|---|
| Chemical Name in the Inventory and Synonyms | **Rosin, maleated, polymer with diethylene glycol, ethylene glycol, glycerol, isophthalic acid, 1,1'-[(1-methylethylidene)bis(4,1-phenyleneoxy)]bis[2-propanol], terephthalic acid and trimellitic anhydride** |
| CAS Number | 109909-27-5 |
| Structural Formula | **No Structural Diagram Available** |
| Molecular Formula | (C21H28O4.C9H4O5.C8H6O4.C8H6O4.C4H10O3.C3H8O3.C2H6O2.)x |
| Molecular Weight | Not specified |

| | |
|---|---|
| Chemical Name in the Inventory and Synonyms | **1,4-Benzenedicarboxylic acid, polymer with 2-(1,1-dimethylethyl)-1,4-benzenediol, 4-hydroxybenzoic acid, and 4,4'-(1-methylethylidene)bisphenol** |
| CAS Number | 110411-76-2 |
| Structural Formula | |

| | |
|---|---|
| |   |
| Molecular Formula | |
| Molecular Weight | Not specified |

| | |
|---|---|
| Chemical Name in the Inventory and Synonyms | **Amines, tallow alkyl, reaction products with 1,1'-[(1-methylethylidene)di-4,1-phenylene]bis[3-amino-2-propanol]-N,N-ditallow alkyl derivatives and oxirane** |
| CAS Number | 111062-32-9 |
| Structural Formula |   |
| Molecular Formula | C21H30N2O2.C2H4O. |
| Molecular Weight | Not specified |

| | |
|---|---|
| Chemical Name in the Inventory and Synonyms | **Rosin, polymer with ethylene glycol, glycerol, isophthalic acid, polyethylene glycol ether with bisphenol A (2:1) and terephthalic acid** |

| | |
|---|---|
| | |
| CAS Number | 111905-76-1 |
| Structural Formula |   |
| Molecular Formula | (C15H16O2.C8H6O4.C8H6O4.C3H8O3.C2H6O2. (C2H4O)n(C2H4O)nC15H16O2.)x |
| Molecular Weight | Not specified |

| | |
|---|---|
| Chemical Name in the Inventory and Synonyms | **Rosin, maleated, polymer with diethylene glycol, ethylene glycol, glycerol, isophthalic acid, polyethylene glycol ether with bisphenol A (2:1), rosin and terephthalic acid**<br>rosin, polymer with diethylene glycol, ethylene glycol, glycerol, isophthalic acid, maleated rosin, polyethylene glycol ether with bisphenol A (2:1) and terephthalic acid |
| CAS Number | 114352-06-6 |
| Structural Formula |   |
| Molecular Formula | (C8H6O4.C8H6O4.C4H10O3.C3H8O3.C2H6O2. (C2H4O)n(C2H4O)nC15H16O2.)x |

| | |
|---|---|
| Molecular Weight | Not specified |

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|---|---|
| Chemical Name in the Inventory and Synonyms | **Rosin, polymer with diethylene glycol, ethylene glycol, glycerol, isophthalic acid, polyethylene glycol ether with bisphenol A (2:1) and terephthalic acid** |
| CAS Number | 114352-07-7 |
| Structural Formula | **No Structural Diagram Available** |
| Molecular Formula | (C8H6O4.C8H6O4.C4H10O3.C3H8O3.C2H6O2. (C2H4O)n(C2H4O)nC15H16O2.)x |
| Molecular Weight | Not specified |

| | |
|---|---|
| Chemical Name in the Inventory and Synonyms | **Rosin, polymer with diethylene glycol, ethylene glycol, glycerol, isophthalic acid, 1,1'-[(1-methylethylidene)bis(4,1-phenyleneoxy)]bis[2-propanol], phthalic anhydride and terephthalic acid** |
| CAS Number | 114352-08-8 |
| Structural Formula | |

| | |
|---|---|
| | No Structural Diagram Available |
| Molecular Formula | (C21H28O4.C8H6O4.C8H6O4.C8H4O3.C4H10O3.C3H8O3.C2H6O2.)x |
| Molecular Weight | Not specified |

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|---|---|
| Chemical Name in the Inventory and Synonyms | **1,2,4-Benzenetricarboxylic acid, tris(2-ethylhexyl) ester, polymer with 1,4-benzenedicarboxylic acid, alpha, alpha'-[(1-methylethylidene) di-4,1-phenylene]bis[omega-hydroxypoly (oxy-1,2-ethanediyl)] and alpha, alpha'-[(1-methylethylidene)di-4,1-phenylene]bis[omega-hydroxypoly[oxy(methyl-1,2-ethanediyl)]]** |
| CAS Number | 115172-27-5 |
| Structural Formula | No Structural Diagram Available |
| Molecular Formula | (C33H54O6 . C8H6O4 . (C3H6O)n (C3H6O)n C15H16O2 . (C2H4O)n (C2H4O)n C15H16O2)x |
| Molecular Weight | Not specified |

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| Chemical Name in the Inventory and Synonyms | **2-Butenedioic acid (E)-, polymer with 1,3-dihydro-1,3-dioxo-5-isobenzofurancarboxylic acid, .alpha.,.alpha.'-[(1-methylethylidene)di-4,1-phenylene]bis[.omega.-hydroxypoly(oxy-1,2-ethanediyl)] and .alpha.,.alpha.'-[(1-methylethylidene)di-4,1-phenylene]bis[.omega.-hydroxypoly[oxy(methyl-1,2-ethanediyl)]]** |
| CAS Number | 116736-81-3 |
| Structural Formula | **No Structural Diagram Available** |
| Molecular Formula | (C9H4O5.C4H4O4.(C3H6O)n(C3H6O)nC15H16O2.(C2H4O)n(C2H4O)nC15H16O2)x |
| Molecular Weight | Not specified |

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| Chemical Name in the Inventory and Synonyms | **1,3-Benzenedicarboxylic acid, polymer with 1,4-benzenedicarboxylic acid, 2-(diethylamino) ethyl 2-methyl-2-propenoate, ethenylbenzene, 2,5-furandione and 2,2'-[(1-methylethylidene)bis(4,1-phenyleneoxy)]bis[ethanol], graft** |
| CAS Number | 117409-79-7 |
| Structural Formula | |

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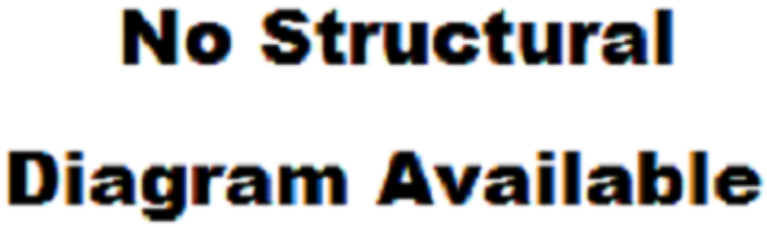
|---|---|
| |   |
| Molecular Formula | (C19H24O4 . C10H19NO2.C8H8. C8H6O4.C8H6O4. C4H2 |
| Molecular Weight | Not specified |

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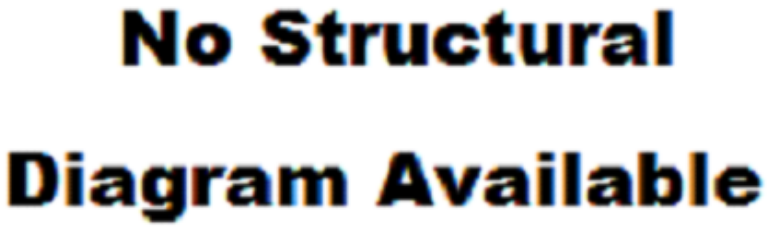
|---|---|
| Chemical Name in the Inventory and Synonyms | **Polyphosphoric acids, polymers with castor oil and 1,1'-[(1-methylethylidene)bis(4,1-phenyleneoxy)]bis[2-propanol]** |
| CAS Number | 117440-19-4 |
| Structural Formula |   |
| Molecular Formula | (C21H28O4..)x |
| Molecular Weight | Not specified |

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|---|---|
| Chemical Name in the Inventory and Synonyms | **1,4-Benzenedicarboxylic acid, polymer with 1,3-dihydro-1,3-dioxo-5-isobenzofurancarboxylic acid, dihydro-3-(tetrapropenyl)-2,5-furandione, .alpha.,.alpha.'-[(1-methylethylidene)di-4,1-phenylene]bis[.omega.-hydroxypoly[oxy(methyl-1,2-ethanediyl)]] and** |

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| | **.alpha.,.alpha.'-[(1-methylethylidene)di-4,1-phenylene]bis[.omega.-hydroxypoly(oxy-1,2-ethanediyl)]** |
| CAS Number | 117581-13-2 |
| Structural Formula | **No Structural Diagram Available** |
| Molecular Formula | (C16H26O3.C9H4O5.C8H6O4.(C3H6O)n(C3H6O)nC15H16O2.(C2H4O)n(C2H4O)nC15H16O2)x |
| Molecular Weight | Not specified |

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| Chemical Name in the Inventory and Synonyms | **1,3-Benzenedicarboxylic acid, polymer with 1,3-diisocyanatomethylbenzene, 2,2-dimethyl-1,3-propanediol, 2-ethyl-2-(hydroxymethyl)-1,3-propanediol and 1,1'-((1-methylethylidene)bis(4,1-phenyleneoxy))bis(2-propanol)**<br>1,3-propanediol, 2,2-dimethyl-, polymer with 1,3-benzenedicarboxylic acid, 1,3-diisocyanatomethylbenzene, 2-ethyl-2-(hydroxymethyl)-1,3-propanediol and 1,1-((1-methylethylidene)bis(4,1-phenyleneoxy))bis(2-propanol)<br>1,3-propanediol, 2,2-dimethyl-, polymer with 1,3-benzenedicarboxylic acid, 2-ethyl-2-(hydroxymethyl)-1,3-propanediol, 5-isocyanato-1-(isocyanatomethyl)-1,3,3-trimethylcyclohexane and 1,1-((1-methylethylidene)bis(4,1-phenyleneoxy))bis(2-propanol)<br>1,3-propanediol, 2-ethyl-2-(hydroxymethyl)-, polymer with 1,3-benzenedicarboxylic acid, 1,3-diisocyanatomethylbenzene, 2,2-dimethyl-1,3-propanediol and 1,1-((1-methylethylidene)bis(4,1-phenyleneoxy))bis(2-propanol)<br>1,3-propanediol, 2-ethyl-2-(hydroxymethyl)-, polymer with 1,3-benzenedicarboxylic acid, 2,2-dimethyl-1,3-propanediol, 5-isocyanato-1-(isocyanatomethyl)-1,3,3-trimethylcyclohexane and 1,1-((1-methylethylidene)bis(4,1-phenyleneoxy))bis(2-propanol)<br>2-propanol, 1,1-((1-methylethylidene)bis(4,1-phenyleneoxy))bis-, polymer with 1,3-benzenedicarboxylic acid, 2,2-dimethyl-1,3-propanediol, 2-ethyl-2-(hydroxymethyl)-1,3-propanediol and 5-isocyanato-1-(isocyanatomethyl)-1,3,3-trimethylcyclohexane |
| CAS Number | 118496-39-2 |
| Structural Formula | |

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| |   |
| Molecular Formula | (C21H28O4.C9H6N2O2.C8H6O4.C6H14O3.C5H12O2)x |
| Molecular Weight | Not specified |

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|---|---|
| Chemical Name in the Inventory and Synonyms | **1,4-Benzenedicarboxylic acid, di-2-propenyl ester, polymer with (1-methylethylidene)bis(4,1-phenyleneoxy-2,1-ethanediyl) bis[2-methyl-2-propenoate] and phenyl 2-methyl-2-propenoate** |
| CAS Number | 119275-05-7 |
| Structural Formula |   |
| Molecular Formula | (C27H32O6.C14H14O4.C10H10O2)x |
| Molecular Weight | Not specified |

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|---|---|
| Chemical Name in the Inventory and Synonyms | **1,3-Benzenedicarboxylic acid, polymer with 1,3-diisocyanatomethylbenzene, 2-ethyl-2-(hydroxymethyl)-1,3-propanediol, 1,1'((1-methylethylidene)bis(4,1-oxy))bis(2-propanol) and** |

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| | **2,2'-oxybis(ethanol)**<br>1,3-propanediol, 2-ethyl-2-(hydroxymethyl)-, polymer with 1,3-benzenedicarboxylic acid, 1,3-diisocyanatomethylbenzene, 1,1-((1-methylethylidene)bis(4,1-phenyleneoxy))bis(2-propanol) and 2,2-oxybis(ethanol)<br>2-propanol, 1,1-((1-methylethylidene)bis(4,1-phenyleneoxy))bis-, polymer with 1,3-benzenedicarboxylic acid, 1,3-diisocyanatomethylbenzene, 2-ethyl-2-(hydroxymethyl)-1,3-propanediol and 2,2-oxybis(ethanol)<br>benzene, 1,3-diisocyanatomethyl-, polymer with 1,3-benzenedicarboxylic acid, 2-ethyl-2-(hydroxymethyl)-1,3-propanediol, 1,1-((1-methylethylidene)bis(4,1-phenyleneoxy))bis(2-propanol) and 2,2-oxybis(ethanol) |
| CAS Number | 123701-48-4 |
| Structural Formula | **No Structural Diagram Available** |
| Molecular Formula | (C21H28O4.C9H6N2O2.C8H6O4.C6H14O3.C4H10O3)x |
| Molecular Weight | Not specified |

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|---|---|
| Chemical Name in the Inventory and Synonyms | **1,3-Benzenedicarboxylic acid, polymer with 2-ethyl-2-(hydroxymethyl)-1,3-propanediol, 1,1'-methylenebis(4-isocyanatobenzene), 1,1'-((1-methylethylidene)bis(4,1-phenyleneoxy))bis(2-propanol) and 2,2'-oxybis(ethanol)**<br>1,3-propanediol, 2-ethyl-2-(hydroxymethyl)-, polymer with 1,3-benzenedicarboxylic acid, 1,1-methylenebis(4-isocyanatobenzene), 1,1-((1-methylethylidene)bis(4,1-phenyleneoxy))bis(2-propanol) and 2,2-oxybis(ethanol)<br>2-propanol, 1,1-((1-methylethylidene)bis(4,1-phenyleneoxy))bis-, polymer with 1,3-benzenedicarboxylic acid, 2-ethyl-2-(hydroxymethyl)-1,3-propanediol, 1,1-methylenebis(4-isocyanatobenzene) and 2,2-oxybis(ethanol)<br>ethanol, 2,2-oxybis-, polymer with 1,3-benzenedicarboxylic acid, 2-ethyl-2-(hydroxymethyl)-1,3-propanediol, 1,1-methylenebis(4-isocyanatobenzene) and 1,1-((1-methylethylidene)bis(4,1-phenyleneoxy))bis(2-propanol) |
| CAS Number | 123701-49-5 |
| Structural Formula | |

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|---|---|
| | No Structural Diagram Available |
| Molecular Formula | (C21H28O4.C15H10N2O2.C8H6O4.C6H14O3.C4H10O3)x |
| Molecular Weight | Not specified |

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|---|---|
| Chemical Name in the Inventory and Synonyms | **1,2-Benzenedicarboxylic acid, polymer with 2-ethyl-2-(hydroxymethyl)-1,3-propanediol, 1,1'-methylenebis(4-isocyanatobenzene), 1,1'-((1-methylethylidene)bis(4,1-phenyleneoxy))bis(2-propanol) and 2,2'-oxybis(ethanol)**<br>1,3-propanediol, 2-ethyl-2-(hydroxymethyl)-, polymer with 1,2-benzenedicarboxylic acid, 1,1-methylenebis(4-isocyanatobenzene), 1,1-((1-methylethylidene)bis(4,1-phenyleneoxy))bis(2-propanol) and 2,2-oxybis(ethanol)<br>2-propanol, 1,1-((1-methylethylidene)bis(4,1-phenyleneoxy))bis-, polymer with 1,2-benzenedicarboxylic acid, 2-ethyl-2-(hydroxymethyl)-1,3t-propanediol, 1,1-methylenebis(4-isocyanatobenzene) and 2,2-oxybis(ethanol)<br>ethanol, 2,2-oxybis-, polymer with 1,2-benzenedicarboxylic acid, 2-ethyl-2-(hydroxymethyl)-1,3-propanediol, 1,1-methylenebis(4-isocyanatobenzene) and 1,1-((1-methylethylidene)bis(4,1-phenyleneoxy))bis(2-propanol) |
| CAS Number | 123701-51-9 |
| Structural Formula | No Structural Diagram Available |
| Molecular Formula | (C21H28O4.C15H10N2O2.C8H6O4.C6H14O3.C4H10O3)x |
| Molecular Weight | Not specified |

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|---|---|
| Chemical Name in the Inventory and Synonyms | **1,4-Benzenedicarboxylic acid, polymer with (E)-2-butenedioic acid, 1,3-dihydro-1,3-dioxo-5-isobenzofurancarboxylic acid, alpha, alpha'-[(1-methylethylidene) di-4,1-phenylene]bis[omega-hydroxypoly(oxy-1,2-ethanediyl) and alpha, alpha'-[(1-methylethylidene)di-4,1-phenylene]bis[omega-hydroxypoly[oxy(methyl-1,2-ethanediyl)]]**<br>ethoxylated bisphenol A-fumaric acid-propoxylated bisphenol A-terephthalic acid-trimellitic acid anhydride copolymer<br>RSE-825<br>RSE-825<br>RSE-825 |
| CAS Number | 168406-64-2 |
| Structural Formula | **No Structural Diagram Available** |
| Molecular Formula | Unspecified |
| Molecular Weight | Not specified |

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|---|---|
| Chemical Name in the Inventory and Synonyms | **1,4-Benzenedicarboxylic acid, polymer with 1,3-dihydro-1,3-dioxo-5-isobenzofurancarboxylic acid, 3-(dodecenyl)dihydro-2,5-furandione, 2,2'-[(1-methylethylidene)bis(4,1-phenyleneoxy)]bis[ethanol] and 1,1'-[(1-methylethylidene)bis(4,1-phenyleneoxy)]bis[2-propanol]** |
| CAS Number | 185568-18-7 |
| Structural Formula | |

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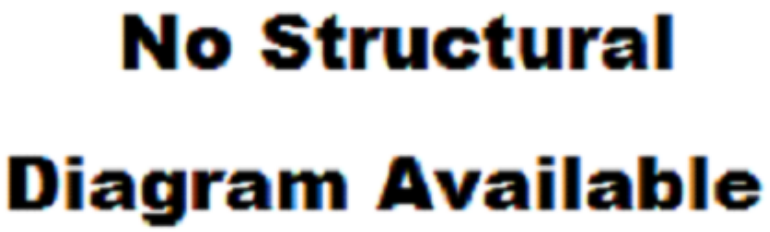
| |   |
| Molecular Formula | (C21H28O4.C19H24O4.C16H26O3.C9H4O5.C8H6O4)x |
| Molecular Weight | Not specified |

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