Polymers incorporating formaldehyde and bisphenol A: Human health tier II assessment

12 December 2019

Chemicals in this assessment

Chemical Name in the Inventory	CAS Number
Formaldehyde, polymer with (chloromethyl)oxirane, 4,4'-(1-methylethylidene)bis[phenol] and phenol	40216-08-8
Formaldehyde, polymer with 4,4'-(1-methylethylidene)bis[phenol]	25085-75-0
Formaldehyde, polymer with 4-(1,1-dimethylethyl)phenol, 4,4'-(1-methylethylidene)bis[phenol] and 4-methylphenol	26022-00-4
Formaldehyde, polymer with (chloromethyl)oxirane and 4,4'-(1-methylethylidene)bis[phenol]	28906-96-9
Sulfurous acid, monosodium salt, polymer with formaldehyde and 4,4'-(1-methylethylidene)bis[phenol]	39939-92-9
Formaldehyde, polymer with 2-(dimethylamino)ethanol and 4,4'-(1-methylethylidene)bis[phenol]	51877-21-5
Formaldehyde, polymer with phenol, 4-(1,1-dimethylethyl)- and phenol, 4,4'-(1-methylethylidene)bis-	54579-44-1
2-Propenoic acid, 2-methyl-, polymer with (chloromethyl)oxirane, ethenylbenzene, formaldehyde, 4,4'-(1-methylethylidene)bis[phenol] and (phenoxymethyl)oxirane	68072-47-9

Chemical Name in the Inventory	CAS Number
Formaldehyde, polymer with [1,1'-biphenyl]-4-ol and 4,4'-(1-methylethylidene)bis[phenol]	64653-96-9
Formaldehyde, polymer with (chloromethyl)oxirane, 1,3-dimethylbenzene and 4,4'-(1-methylethylidene)bis[phenol]	64913-48-0
Formaldehyde, polymer with 4,4'-(1-methylethylidene)bis[phenol] and 4-(1,1-dimethylpropyl)phenol	65733-73-5
2,2'-[(1-Methylethylidene)bis(4,1-phenyleneoxymethylene)]bis[oxirane] homopolymer, polymer with paraformaldehyde and 4,4'-(1-methylethylidene)bis[phenol]	67626-86-2
o-Cresol formaldehyde bis phenol A epichlorhydrin polymer	67626-89-5
Phenol, 4,4'-(1-methylethylidene)bis-, polymer with (chloromethyl)oxirane, 2-methyl-2-propenoate, reaction products with formaldehyde phenol polymer	68002-44-8
Rosin, fumarated, polymer with bisphenol A, p-tert-butylphenol, formaldehyde and pentaerythritol	68152-46-5
Rosin, maleated, polymer with bisphenol A, formaldehyde and pentaerythritol	68152-61-4
Rosin, polymer with bisphenol A and formaldehyde	68152-68-1
Rosin, polymer with bisphenol A, p-tert-butylphenol and formaldehyde	68152-69-2
Rosin, polymer with bisphenol A, formaldehyde and glycerol	68152-70-5
Formaldehyde, polymer with (chloromethyl) oxirane 4,4'-(methylethylidene) bis (phenol), 2-methylphenol and phenol	68334-79-2
Rosin, polymer with bisphenol A, formaldehyde, glycerol, and pentaerythritol	68458-67-3
Rosin, polymer with bisphenol A, p-tert-butylphenol, formaldehyde and pentaerythritol	68554-29-0
Rosin, polymer with bisphenol A, formaldehyde and pentaerythritol	68554-30-3
Formaldehyde, polymer with 4,4'-(1-methylethylidene) bisphenol and methylphenol	93752-94-4

Chemical Name in the Inventory	CAS Number
Benzoic acid, 2-hydroxy-, polymer with 4-(1,1-dimethylethyl)phenol, formaldehyde and 4,4'-(1-methylethylidene)bis[phenol]	68892-00-2
Linseed oil, polymer with bisphenol A, p-tert-butylphenol, ethylene glycol, formaldehyde, pentaerythritol, phthalic anhydride and rosin	68910-74-7
Castor oil, polymer with bisphenol A, p-tert-butylphenol, formaldehyde and tung oil	68920-99-0
Formaldehyde, polymer with 2-(dimethylamino)ethanol, 4,4'-(1-methylethylidene)bis[phenol] and phenol	102980-03-0
Linseed oil, glycerine, rosin, bisphenol A, formaldehyde, phthalic anhydride polymer	106214-76-0
Formaldehyde, polymer with 4,4'-(1-methylethylidene)bis[phenol], butyl ether	70750-15-1
Urea, polymer with (chloromethyl)oxirane, formaldehyde and 4,4'-(1-methylethylidene)bis[phenol]	81546-24-9
Phenol, 4,4'-(1-methylethylidene)bis, polymer with (chloromethyl)oxirane, polymer with formaldehyde, polymer with 4,4'-(1-methylethylidene)bis[phenol], 1,2-benzenediol, paraformaldehyde, phenol and tar acids, polyalkylphenol fraction	256388-41-7
2,2'-[(1-Methylethylidene)bis(4,1-phenyleneoxymethylene)]bis oxirane homopolymer, polymer with 1-butanol, 4,4'-(1-methylethylidene)bisphenol and paraformaldehyde	258333-52-7
Formaldehyde, polymer with (chloromethyl)oxirane, 4,4'-(1-methylethylidene)bis[phenol] and 2-methylphenol, 2-methyl-2-propenoate	89125-94-0
Castor oil, dehydrated, polymers with bisphenol A, formaldehyde, linseed oil, pentaerythritol, rosin and tung oil	103069-78-9
Linseed oil, polymer with bisphenol A, formaldehyde, penterythritol, rosin and tung oil	103069-94-9
Rosin, polymer with bisphenol A, formaldehyde, pentaerythritol and tung oil	103069-99-4
Fatty acids, C18-unsaturated, trimers, reaction products with bisphenol A diglycidyl ether and butylated formaldehyde-melamine polymer	103331-95-9
Rosin, polymer with bisphenol A, p-tert-butylphenol, formaldehyde and tall oil fatty acids	103759-01-9

Chemical Name in the Inventory	CAS Number
Formaldehyde, polymer with 4,4'-(1-methylethylidene)bis[phenol], sulfomethylated, sodium salts	104717-38-6
Rosin, polymer with 4-(1,1-dimethylethyl)phenol, formaldehyde, 4,4'-(1-methylethylidene)bisphenol and 1,2,3-propanetriol	106523-63-1
Linseed oil, glycerine, rosin, bisphenol A, formaldehyde, tung oil, phthalic anhydride polymer	107541-15-1
Fatty acids, tall oil, polymers with bisphenol A, formaldehyde, maleic anhydride, pentaerythritol and rosin	110775-70-7
Formaldehyde, polymer with 4,4'-(1-methylethylidene)bis[phenol], reaction products with diethylenetriamine	111439-81-7
Fatty acids, sunflower oil, conjugated, polymers with adipic acid, bisphenol A diglycidyl ether, diethylenetriamine, formaldehyde, hexahydro-1H-azepin-2-one and triethylenetetramine	111905-73-8
Hydrogenated C36 dimer fatty acid, polymer with fatty acids, C16-18 and C18-unsaturated, bisphenol A diglycidyl ether, diethylenetriamine, formaldehyde, phenyl glycidyl ether and pentaethylenehexamine	119298-90-7
C18-Unsaturated fatty acid dimers, polymer with tall oil fatty acids, bisphenol A diglycidyl ether, diethylenetriamine,formaldehyde, phenyl glycidyl ether, and polyethylenepolyamines	128824-26-0
2-Propenoic acid, 2-methyl-, polymer with (chloromethyl)oxirane, ethenylbenzene, ethyl 2-propenoate, formaldehyde and 4,4'-(1-methylethylidene)bis[phenol], butyl ester	133673-88-8
Formaldehyde, polymer with 2,2-bis(hydroxymethyl)-1,3-propanediol, 4-(1,1-dimethylethyl) phenol, 1,3-isobenzofurandione, 4,4'-(1-methylethylidene) bis (phenol) and 1,2,3-propanetriol, benzoate octadecadienoate (Z,Z) -9,12-octadecadienoate	140204-23-5
Polyaminoamide of monomer, dimer and trimer fatty acids and ethylenepolyamines, modified with a reaction product of bisphenol A and epichlorohydrin, phenylglycidyl ether, butanediol diglycidyl ether, paraformaldehyde and acetic acid	180898-36-6
Phenol, 4,4'-(1-methylethylidene)bis-, polymer with (chloromethyl)oxirane, polymer with paraformaldehyde, 3-methylphenol, 2-methylphenol and 4-methylphenol	218614-09-6

Chemical Name in the Inventory	CAS Number
2,2'-[(1-Methylethylidene)bis(4,1-phenyleneoxymethylene)]bis[oxirane] homopolymer, polymer with paraformaldehyde, 4,4'-(1-methylethylidene)bis[phenol] and 2-ethylhexyl 2-propenoate	218960-25-9
2,2'-[(1-Methylethylidene)bis(4,1-phenyleneoxymethylene)]bis[oxirane] homopolymer, polymer with paraformaldehyde, 4,4'-(1-methylethylidene)bis[phenol] and butyl 2-propenoate	218960-26-0
Oxirane, 2,2'-[(1-methylethylidene)bis(4,1-phenyleneoxymethylene)]bis-, homopolymer, polymer with ethenylbenzene, 4,4'-(1-methylethylidene)bis[phenol], methyl 2-methyl-2-propenoate, 2-methyl-2-propenoic acid, 2-propenoic acid and phenol, polymer with paraformaldehyde	218963-53-2
4,4'-(1-Methylethylidene)bisphenol, polymer with 2,2'-[(1-methylethylidene)bis(4,1-phenyleneoxymethylene)]bisoxirane, polymer with formaldehyde, 4(1,1-dimethylethyl)phenol and 4,4'-(1-methylethylidene)bisphenol	218966-22-4
Formaldehyde, polymers with 1,3-benzenedimethanamine, bisphenol A, diethylenetriamine-glycidyl Ph ether reaction products, epichlorohydrin, propylene oxide and triethylenetetramine, reaction products with o-cresyl glycidyl ether, sulfamates (salts)	238080-05-2
Linseed oil, polymer with bisphenol A, bisphenol A diglycidyl ether, diethylenetriamine, formaldehyde, glycidyl Ph ether and pentaethylenehexamine	68915-81-1

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 covered by this assessment are polymers that include both formaldehyde (CAS No. 50-0-0) and bisphenol A (4,4’-(1-methylethylidene)bisphenol, BPA, CAS No. 80-05-7).

During polymerisation, chemically inert methylene bridges form between BPA monomers and; therefore, the polymers in this group are not expected to breakdown significantly following biological or chemical degradation (Kopf, 2002).

Depending on polymerisation conditions terminal methylol groups and a small proportion of dimethyl ether bridges may form (Kopf, 2002). This may result in the release of formaldehyde under certain conditions.

This group also contains phenolic epoxy resins formed following o-glycidylation of the phenolic hydroxyl groups with epichlorohydrin. These polymers form highly cross-linked networks and monomers are not expected to be released.

These polymers are generally expected to be of low concern to human health. However, the products manufactured using these polymers may contain low levels of BPA as an impurity following incomplete polymerisation. They may also release formaldehyde (formaldehyde donors) when heated, for example as part of the curing process, or following alkaline or acidic hydrolysis of terminal methylol groups (Danish EPA, 2014).

Import, Manufacture and Use

Australian

No specific Australian use, import, or manufacturing information has been identified for the polymers in this group.

Australian safety data sheets (SDS) for some of the polymers in this group indicate use as components of epoxy coatings, resins and adhesives at concentrations of 40–60 % (CAS No. 40216-08-8), <5 % (CAS No. 28906-96-9) and 10–30 % (CAS No. 238080-05-2), respectively.

Australian uses have been reported under previous mandatory and/or voluntary calls for information for other polymers containing formaldehyde not included in this assessment (CAS Nos. 68002-20-0, 68082-96-2, and 9011-05-6). Further information on the uses of these formaldehyde-based polymers are available at **www.nicnas.gov.au** (NICNASa).

Formaldehyde-based polymers may be used in products such as formaldehyde resins, film processing products, surface coating products, and preservatives in Australia. Other uses for these polymers may include cosmetic products and other consumer products such as fabric softeners, surface liquid cleaners and dishwashing liquids (NICNAS, 2006).

International

The following international uses have been identified through Galleria Chemica; the Substances in Preparations in Nordic countries (SPIN) database; the United States Environmental Protection Agency (US EPA) Chemical and Product Categories (CPCat); and the US household products database (HPD):

The chemicals have reported domestic uses, including in:

- adhesives, binding agents and fillers (CAS Nos. 28906-96-9, 40216-08-8, 26022-00-4, 54579-44-1, 28906-96-9);
- paints, lacquers and varnishes (CAS Nos. 40216-08-8, 54579-44-1, 238080-05-2, 68915-81-1, 68002-44-8, 180898-36-6, 68152-61-4, 68152-70-5 and 68458-67-3);
- arts, crafts and hobby materials (CAS No. 68152-61-4); and
- cleaning and washing agents (CAS No. 40216-08-8).

The chemicals have reported commercial uses, including in:

- construction and flooring materials (CAS Nos. 40216-08-8, 238080-05-2, 68915-81-1 and 68002-44-8);
- reprographic agents (CAS No. 40216-08-8); and
- corrosion inhibitors (CAS No. 40216-08-8).

The chemicals have reported site limited uses, including:

- as process regulators (CAS No. 128824-26-0);
- in hydraulic fracturing products (CAS No. CAS No. 28906-96-9); and
- in the manufacture of rubber and plastic products (CAS Nos. 25085-75-0 and 68002-44-8).

The following non-industrial uses have been identified for various chemicals in the group:

- pesticides (CAS No. 54579-44-1); and
- non-agricultural pesticides and preservatives (CAS No. 40216-08-8).

Some chemicals in this group have reported use in food contact materials including adhesives, coatings and packaging inks (CAS No. 25085-75-0, 68152-61-4, 54579-44-1 and 68152-70-5).

Further information on the uses of formaldehyde-based polymers are available at **www.nicnas.gov.au** (NICNASa).

Restrictions

Australian

No known restrictions have been identified.

International

International restrictions specifically relevant to the monomers released from polymeric substances are as follows:

Bisphenol A

In September 2018, regulations on the use of BPA in food contact materials in the EU came into effect (Regulation (EU) 2018/213). The regulations reduced the specific migration limit (SML) of BPA in food contact articles (including varnishes and coatings applied to these materials) to 0.05 mg/kg food. Specific regulations relating to the use of these materials in foods for infants and young children stipulate that no migration of BPA from these materials is permitted (European Commission, 2018).

In June 2011, restrictions banning the use of BPA in polycarbonate baby bottles came into effect in the EU (European Commission, 2011).

The US Food and Drug Administration (FDA) amended regulations to reflect the market abandoning use of BPA in polycarbonate baby bottles and packaging for infant formula in July 2012 and 2013, respectively (US FDA, 2014).

Existing Worker Health and Safety Controls

Hazard Classification

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

Exposure Standards

Australian

No specific exposure standards are available.

Safe Work Australia has an exposure standard for formaldehyde. Where the polymers in this group contain free formaldehyde or release formaldehyde, exposure standards of 1.2 mg/m^3 (1 part per million) time weighted average (TWA) and 2.5 mg/m^3 (2 parts per million) short term exposure limit (STEL) apply.

International

There are no international exposure standards for the individual polymers in this group.

Health Hazard Information

The polymers in this group contain BPA and formaldehyde. It is considered that the BPA released following incomplete polymerisation, or following partial breakdown of the polymer, and formaldehyde formed as a by-product of some curing processes will generally be the critical drivers of toxicity.

Limited data are available on the health hazards of polymers in this group; however, based on their large molecular size, bioavailability is expected to be limited. One polymer (CAS No. 28906-96-9) was reported to have a median lethal dose (LD50) value of >2000 mg/kg bw for both oral and dermal routes of exposure (Galleria Chemica).

Bisphenol A

BPA causes toxicity in animals at high doses. However, the available data are insufficient to prove a causal link between BPA exposure and reproductive effects in humans at current average exposure levels. The European Food Safety Authority (EFSA) Panel on Food Contact Materials, Enzymes, Flavourings and Processing Aids (CEF), using a weight of evidence approach, assigned BPA a likelihood level of “as likely as not” to cause reproductive and developmental effects at low doses (below the human equivalent dose (HED) of 3.6 mg/kg bw/day) (ESFA, 2015).

Increase in kidney weight (associated with nephropathy) and liver weight (associated with 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 2-generation reproductive toxicity study in mice. BPA is unlikely to have any neurological, neurodevelopmental, and or neuroendocrine effects. It is not mutagenic, genotoxic or carcinogenic. Although BPA produced mammary gland hyperplasia in a non-human primate study, the effects were insufficient to conclude that the chemical can cause cancer in humans (EFSA, 2015; NICNASc).

Food Standards Australia New Zealand (FSANZ) has concluded that exposure to BPA in food does not present a significant human health and safety issue at current exposure levels (FSANZ, 2010). FSANZ supports the risk assessments conducted by other regulatory agencies, as well as with the tolerable daily intake (TDI) value of 50 µg/kg bw/day. A FSANZ survey of BPA in food and drinks in the Australian market found only a limited number of products with detectable levels of the chemical. The same study found no detectable levels of BPA in infant formula. FSANZ concluded that Australians of all ages are exposed to the chemical at extremely low levels (in the range of ng/kg food to µg/kg food) (FSANZ, 2010). Health Canada (2012) and the US Food and Drug Administration (US FDA, 2014) have drawn similar conclusions.

EFSA concluded that BPA 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 from the diet or from a combination of all sources (diet, dust, cosmetics and thermal paper) is considerably below the safe exposure level (EFSA, 2015).

Incorporation of BPA into a phenol/formaldehyde type polymer by formation of carbon-carbon bonds is expected to reduce the likelihood of releasing the alkylphenols from the polymeric matrix compared with polymers where these are incorporated by hydrolysable links through oxygen.

The chemicals in this group 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 are unlikely to present a concern to either public or worker health and safety based on the above.

Formaldehyde

Where the polymers in this group contain terminal methylol groups, there is potential for toxicity. Free formaldehyde is extremely reactive. Its key health hazards have been previously described in the NICNAS PEC report (NICNAS, 2006) and in the IMAP Tier II Human Health assessment of formaldehyde donors (NICNASb).

In humans and experimental animals, formaldehyde is readily absorbed via all exposure routes. The critical health effects of formaldehyde for risk characterisation are sensory irritation and skin sensitisation. At higher exposure levels, formaldehyde is a probable carcinogen (IARC, 2006; NICNAS, 2006).

Formaldehyde produces moderate acute toxicity in animals following exposure via the oral, dermal and inhalation routes. When in solution, formaldehyde produces skin irritation and skin sensitisation. Following inhalational exposure, formaldehyde reacts rapidly at the site of contact and is quickly metabolised in the respiratory tissue. Upon inhalation, humans experience sensory irritation, which is defined as irritation of the nerve endings in the eyes and nose, and can produce symptoms including a sensation of stinging or burning in the eyes, nose and/or throat. The concentration of ambient formaldehyde at which these symptoms are reported to begin to occur is at 0.5 ppm and higher (NICNAS, 2006).

Formaldehyde (in solution) does not produce systemic toxicity following repeated oral or dermal exposures in animals. Repeated inhalational exposures to formaldehyde (as a gas) do not produce systemic toxicity. Studies show that the target organ following formaldehyde exposure is the nasal tract, where effects observed have included dose-dependent alterations in mucociliary clearance, cell proliferation and histopathological changes to the nasal epithelium (NICNAS, 2006).

Formaldehyde has been shown to be genotoxic in vitro. The chemical may also produce genotoxicity at the site of contact in vivo. Overall, the chemical is considered to possess weak genotoxic potential. Formaldehyde has been shown to produce squamous cell carcinomas in inhalational studies in rats, but not in mice and hamsters. Several epidemiological studies demonstrated that occupational exposure to formaldehyde may be associated with an increased risk of nasopharyngeal cancers; however, the data are not consistent. Formaldehyde exposure has also been associated with myeloid leukaemia; however, the available data are insufficient to establish a causal link. The International Agency for Research on Cancer has concluded that there are sufficient evidence to classify formaldehyde as a ‘known human carcinogen’ (IARC, 2006).

Risk Characterisation

Critical Health Effects

The polymers in this group are not expected to contain or readily release significant quantities of free BPA or formaldehyde. Any release of BPA from the polymers in this group is expected to be within concentration levels where systemic and local effects would not be observed.

Where the polymers in this group degrade to free formaldehyde or are capable of releasing formaldehyde, the critical health effects for risk characterisation include sensory irritation and allergic skin reactions. Under some circumstances, workers may be exposed at levels where these effects may occur. In worksites where these polymers are produced and/or used, care should be taken to ensure formaldehyde levels are managed to prevent these adverse effects.

Three polymers (CAS Nos. 65733-73-5, 68915-81-1, 68152-68-1) have been evaluated by Health Canada and Environment and Climate Change Canada as part of the Chemicals Management Plan — Rapid Screening of Polymers (Government of Canada, 2016). The polymers were determined ‘not likely to pose a concern’ to human health and the environment. Two additional polymers (CAS Nos. 26022-00-4 and 54579-44-1) were included as part of the ‘Phenol-Formaldehyde Resins group’ and were determined to be ‘not harmful to human health or the environment’ (Government of Canada, 2019).

Public Risk Characterisation

International information indicates the polymers in this group are used in consumer products (e.g. adhesives, paints, hobby materials and cleaning agents) and building materials which may result in exposure to formaldehyde.

Notably, unlike some other BPA-based polymers (NICNASd, NICNASe), release of BPA from the chemicals in this group is not expected except at low concentrations due to incomplete polymerisation (See **Grouping Rationale** section). At these concentrations, systemic and

local effects would not be observed and; therefore, are not considered to pose an unreasonable risk to public health.

The chemicals in this group may be used in food contact materials. The European Commission's Scientific Committee on Food (SCF) estimates total dietary intake of BPA from food contact articles, to be approximately 0.00048 and 0.0016 mg/kg bw/day for adults and infants, respectively. These values are below the Tolerable Daily Intake (TDI) of 0.01 mg/kg bw/day set by the SCF (SCF, 2002). FSANZ reports that there is "negligible to low risk to public health and safety" from dietary exposure of Australian consumers to BPA (FSANZ, 2016).

Food Standards Australia New Zealand (FSANZ) has concluded that exposure to BPA in food does not present a significant human health and safety issue at current exposure levels (FSANZ, 2010). Health Canada (2012) and the US Food and Drug Administration (US FDA, 2014) have drawn similar conclusions. Exposure from the diet or from a combination of all sources (diet, dust, cosmetics and thermal paper) is estimated to be considerably under the suggested safe level for BPA (EFSA, 2015).

Australian Standards limit the amount of formaldehyde that can be released from reconstituted wood-based panels and flooring wood products supplied according to the Australian Standards (AS/NZS 1859.2:2004 - Australian/New Zealand Standard: Reconstituted wood-based panels—Specifications) also have the classification of formaldehyde emission limits indicated on the label (Standards Australia/Standards New Zealand, 2004). Use of wood products labelled in this way should ensure wood products of only low formaldehyde release are used.

Formaldehyde resins can be used in the textile industry as a finishing treatment to produce 'permanent press' fabric products including carpets, curtains, blankets, sheets, bedding, upholstery fabrics and garments. As formaldehyde is highly water soluble, washing these sorts of products where possible will generally reduce the amount of formaldehyde released from the fabric.

The Australian Competition and Consumer Commission (ACCC) has published safety guidance information on acceptable concentrations of formaldehyde in clothing, textiles and clothing finishes (ACCC, 2014).

The main potential for public exposure to formaldehyde-containing products is expected to be via the inhalation of indoor air. The levels of formaldehyde in the air in a home will depend on a number of factors, including the presence of emission sources such as the presence of those products listed above, the age and use patterns of the sources, indoor temperature and humidity, and ventilation of the home. NICNAS has a recommended indoor air guidance value of 80 parts per billion (ppb) for formaldehyde (NICNAS, 2006).

Before allowing occupation of mobile homes and of relocatable buildings by members of the public, manufacturers should aim to minimise levels of formaldehyde in indoor air and these should be designed to ensure the recommended indoor air guidance of 80 ppb is not exceeded. The pressed wood products should also be allowed to outgas under conditions of good ventilation (NICNAS, 2006). The overall risk to the public using the above products is low, both from breathing formaldehyde vapour and from absorption of formaldehyde into the skin, provided these precautions are taken. At these formaldehyde levels in public spaces, the carcinogenic risk is very low (NICNAS, 2006).

While the risk of health effects from exposure via the products listed above is generally low, individuals already sensitised to formaldehyde can experience skin reactions even at low concentrations. Therefore, caution is advised in the use of formaldehyde-containing products that come into contact with the skin. The SUSMP specifies limits for the levels of formaldehyde in cosmetic and domestic products (SUSMP, 2019). The current controls in Schedule 6 and 10 of the *Standard for the Uniform Scheduling of Medicines and Poisons* (SUSMP) are considered adequate to minimise the risk to public health posed by domestic and cosmetic products containing the polymers. Therefore, the polymers in this group are not considered to pose an unreasonable risk to public health provided the concentrations of the free formaldehyde present in products meet the SUSMP limit.

Occupational Risk Characterisation

During product formulation exposure may 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 polymers. The level and route of exposure will vary depending on the method of application and work practices employed.

Given the critical systemic long-term effects of BPA and local effects of formaldehyde, the polymers in this group could pose an unreasonable risk to workers unless adequate control measures to minimise exposure and implemented. These polymers should be appropriately labelled to ensure that a person conducting a business or undertaking, e.g. employer, at a workplace, has adequate information to determine appropriate controls.

Workers may be inhalationally exposed to formaldehyde during off-gassing from unsealed or freshly cut pressed wood products, and from the associated dust particles.

Occupational risks from exposure to formaldehyde from these polymers can be mitigated by ensuring effective ventilation when these products are used in indoor environments. Handling and storage of pressed wood products should only be undertaken in well ventilated areas. When machining pressed wood products, the use

of local exhaust ventilation which extracts dusts and vapours at source is recommended in controlling exposure to formaldehyde. If symptoms of burning, stinging or itching of the eyes and/or nose, sore throat, watery eyes, blocked sinuses, runny nose or sneezing occurs, the worker

is advised to move to an area with fresh air.

NICNAS Recommendation

Assessment of these polymers is considered to be sufficient, provided that all requirements are met under workplace health and safety and poisons legislation as adopted by the relevant state or territory.

NICNAS recommends that formulators of products containing these polymers should take into account the concentration or potential release of BPA, and formaldehyde in the products when determining label instructions in order to take appropriate risk management measures to control the hazards stipulated in the HCIS.

It is recommended that occupational and public health controls for the formaldehyde vapours released from these polymers be implemented in line with the recommendations of the NICNAS PEC assessment report on formaldehyde (NICNAS 2006).

Regulatory Control

Public Health

At present, free formaldehyde or formaldehyde released from the products fall within the scope of the listing of 'Formaldehyde' in Schedules 6 and 10 of the SUSMP. Therefore, products containing the polymers in this group with more than 0.05 % free or readily available formaldehyde should be labelled in accordance with state and territory legislation (SUSMP, 2019).

Work Health and Safety

Based on available data, the amount of BPA expected to be available from these polymers is very low and; therefore, the health risk to workers from these polymers is controlled when adequate control measures to minimise occupational exposure and protective clothing are implemented.

Based on the available data, the polymers in this group are not recommended for hazard classification in the HCIS (Safe Work Australia). 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.

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

Advice for consumers

Products containing the chemicals should be used according to the instructions on the label.

Advice for industry

Control measures

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 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:

- 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 12 December 2019

Chemical Identities

Chemical Name in the	**Formaldehyde, polymer with (chloromethyl)oxirane, 4,4'-(1-**

Inventory and Synonyms	**methylethylidene)bis[phenol] and phenol** phenol, formaldehyde, biphenol A, epichlorohydrin polymer phenol, polymer with formaldehyde, bisphenol A and epichlorohydrin
CAS Number	40216-08-8
Structural Formula	**No Structural Diagram Available**
Molecular Formula	(C15H16O2.C6H6O.C3H5ClO.CH2O)x
Molecular Weight	Unspecified

Chemical Name in the Inventory and Synonyms	**Formaldehyde, polymer with 4,4'-(1-methylethylidene)bis[phenol]** phenol, 4,4-(1-methylethylidene)bis-, polymer with formaldehyde
CAS Number	25085-75-0
Structural Formula	**No Structural Diagram Available**
Molecular Formula	(C15H16O2.CH2O)x
Molecular Weight	Unspecified

Chemical Name in the Inventory and Synonyms	**Formaldehyde, polymer with 4-(1,1-dimethylethyl)phenol, 4,4'-(1-methylethylidene)bis[phenol] and 4-methylphenol** formaldehyde, polymer with p-cresol, p-tert-butyl phenol and 4,4-isopropylidine diphenol
CAS Number	26022-00-4
Structural Formula	No Structural Diagram Available
Molecular Formula	(C15H16O2.C10H14O.C7H8O.CH2O)x
Molecular Weight	Unspecified

Chemical Name in the Inventory and Synonyms	**Formaldehyde, polymer with (chloromethyl)oxirane and 4,4'-(1-methylethylidene)bis[phenol]** bisphenol A, formaldehyde, epichlorohydrin polymer
CAS Number	28906-96-9
Structural Formula	No Structural Diagram Available
Molecular Formula	(C15H16O2.C3H5ClO.CH2O)x
Molecular Weight	Unspecified

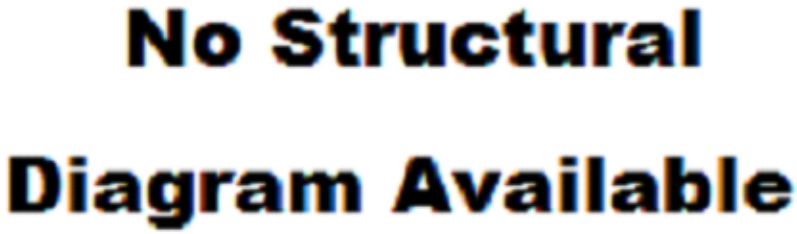
Chemical Name in the Inventory and Synonyms	**Sulfurous acid, monosodium salt, polymer with formaldehyde and 4,4'-(1-methylethylidene)bis[phenol]** phenol, 4,4-(1-methylethylidene)bis-, polymer with formaldehyde and sodium hydrogen sulfite
CAS Number	39939-92-9
Structural Formula	No Structural Diagram Available
Molecular Formula	(C15H16O2.CH2O.H2O3S.Na)x
Molecular Weight	Unspecified

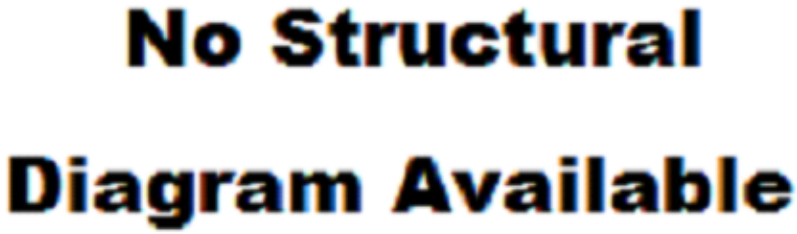
Chemical Name in the Inventory and Synonyms	**Formaldehyde, polymer with 2-(dimethylamino)ethanol and 4,4'-(1-methylethylidene)bis[phenol]**
CAS Number	51877-21-5
Structural Formula	No Structural Diagram Available

Molecular Formula	(C15H16O2.C4H11NO.CH2O)x
Molecular Weight	Unspecified

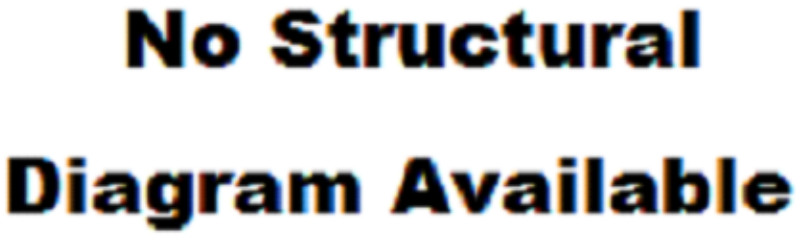
Chemical Name in the Inventory and Synonyms	**Formaldehyde, polymer with phenol, 4-(1,1-dimethylethyl)- and phenol, 4,4'-(1-methylethylidene)bis-** 4-(1,1-dimethylethyl)phenol, polymer with formaldehyde and 4,4-(1-methylethylidene)bis[phenol
CAS Number	54579-44-1
Structural Formula	**No Structural Diagram Available**
Molecular Formula	(C15H16O2.C10H14O.CH2O)x
Molecular Weight	Unspecified

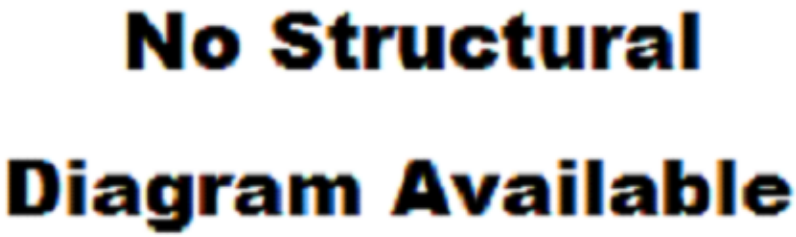
Chemical Name in the Inventory and Synonyms	**2-Propenoic acid, 2-methyl-, polymer with (chloromethyl)oxirane, ethenylbenzene, formaldehyde, 4,4'-(1-methylethylidene)bis[phenol] and (phenoxymethyl)oxirane** oxirane, (phenoxymethyl)-, polymer with formaldehyde, 4,4-(1-methylethylidene)bis[phenol
CAS Number	68072-47-9
Structural Formula	

	
Molecular Formula	(C15H16O2.C9H10O2.C8H8.C4H6O2.C3H5ClO.CH2O)x
Molecular Weight	Unspecified

Chemical Name in the Inventory and Synonyms	**Formaldehyde, polymer with [1,1'-biphenyl]-4-ol and 4,4'-(1-methylethylidene)bis[phenol]** p-phenylphenol, bisphenol A, formaldehyde polymer
CAS Number	64653-96-9
Structural Formula	
Molecular Formula	(C15H16O2.C12H10O.CH2O)x
Molecular Weight	Unspecified

Chemical Name in the Inventory and Synonyms	**Formaldehyde, polymer with (chloromethyl)oxirane, 1,3-dimethylbenzene and 4,4'-(1-methylethylidene)bis[phenol]** phenol, 4,4-(1-methylethylidene)bis-, polymer with (chloromethyl)oxirane, 1,3-dimethylbenzene and formaldehyde

CAS Number	64913-48-0
Structural Formula	
Molecular Formula	(C15H16O2.C8H10.C3H5ClO.CH2O)x
Molecular Weight	Unspecified

Chemical Name in the Inventory and Synonyms	**Formaldehyde, polymer with 4,4'-(1-methylethylidene)bis[phenol] and 4-(1,1-dimethylpropyl)phenol** 4-(1,1-dimethylpropyl)phenol, polymer with formaldehyde and 4,4-(1-methylethylidene)bis[phenol
CAS Number	65733-73-5
Structural Formula	
Molecular Formula	(C15H16O2.C11H16O.CH2O)x
Molecular Weight	Unspecified

Chemical Name in the Inventory and Synonyms	**2,2'-[(1-Methylethylidene)bis(4,1-phenyleneoxymethylene)]bis[oxirane] homopolymer, polymer with paraformaldehyde and 4,4'-(1-**

	methylethylidene)bis[phenol]
CAS Number	67626-86-2
Structural Formula	**No Structural Diagram Available**
Molecular Formula	
Molecular Weight	Unspecified

Chemical Name in the Inventory and Synonyms	**o-Cresol formaldehyde bis phenol A epichlorhydrin polymer** cresol formaldehyde bisphenol A epichlorhydrin polymer
CAS Number	67626-89-5
Structural Formula	**No Structural Diagram Available**
Molecular Formula	Not specified
Molecular Weight	Unspecified

Chemical Name in the Inventory and Synonyms	**Phenol, 4,4'-(1-methylethylidene)bis-, polymer with (chloromethyl)oxirane, 2-methyl-2-propenoate, reaction products with formaldehyde phenol polymer**
CAS Number	68002-44-8
Structural Formula	**No Structural Diagram Available**
Molecular Formula	(C15H16O2.C6H6O.C4H6O2.C3H5ClO.CH2O)x
Molecular Weight	Unspecified

Chemical Name in the Inventory and Synonyms	**Rosin, fumarated, polymer with bisphenol A, p-tert-butylphenol, formaldehyde and pentaerythritol** rosin, bisphenol A, p-tert-butylphenol, formaldehyde, fumaric acid, pentaerythritol polymer
CAS Number	68152-46-5
Structural Formula	**No Structural Diagram Available**
Molecular Formula	(C15H16O2.C10H14O.C5H12O4.CH2O.)x
Molecular Weight	Unspecified

Chemical Name in the Inventory and Synonyms	**Rosin, maleated, polymer with bisphenol A, formaldehyde and pentaerythritol** rosin, maleated, bisphenol A, formaldehyde, pentaerythritol polymer rosin, maleic anhydride, pentaerythritol, bisphenol A, formaldehyde polymer
CAS Number	68152-61-4
Structural Formula	**No Structural Diagram Available**
Molecular Formula	(C15H16O2.C5H12O4.CH2O.)x
Molecular Weight	Unspecified

Chemical Name in the Inventory and Synonyms	**Rosin, polymer with bisphenol A and formaldehyde**
CAS Number	68152-68-1
Structural Formula	**No Structural Diagram Available**
Molecular Formula	(C15H16O2.CH2O.)x

Molecular Weight	Unspecified

Chemical Name in the Inventory and Synonyms	**Rosin, polymer with bisphenol A, p-tert-butylphenol and formaldehyde**
CAS Number	68152-69-2
Structural Formula	**No Structural Diagram Available**
Molecular Formula	(C15H16O2.C10H14O.CH2O.)x
Molecular Weight	Unspecified

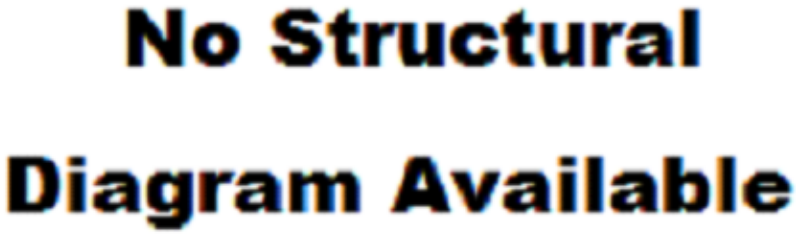
Chemical Name in the Inventory and Synonyms	**Rosin, polymer with bisphenol A, formaldehyde and glycerol** phenol, 4,4-(1-methylethylidine)bis-, paraformaldehyde modified rosin, glycerin ester rosin, bisphenol A, formaldehyde, glycerol polymer
CAS Number	68152-70-5
Structural Formula	**No Structural Diagram Available**
Molecular Formula	(C15H16O2.C3H8O3.CH2O.)x

Molecular Weight	Unspecified

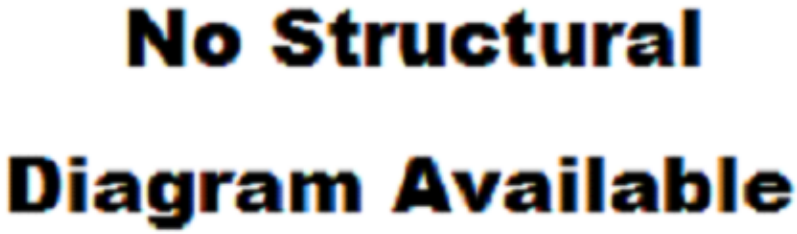
Chemical Name in the Inventory and Synonyms	**Formaldehyde, polymer with (chloromethyl) oxirane 4,4'-(methylethylidene) bis (phenol), 2-methylphenol and phenol**
CAS Number	68334-79-2
Structural Formula	**No Structural Diagram Available**
Molecular Formula	[(CH2O).(C3H5ClO).(C15H16O2). (C7H8O).(C6H6O)]x
Molecular Weight	Unspecified

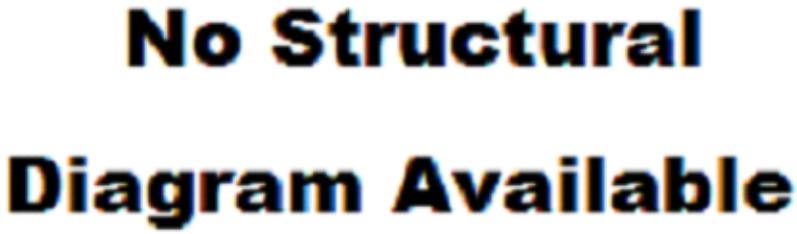
Chemical Name in the Inventory and Synonyms	**Rosin, polymer with bisphenol A, formaldehyde, glycerol, and pentaerythritol** bisphenol A, paraformaldehyde, rosin pentaerythritol, glycerol polymer
CAS Number	68458-67-3
Structural Formula	**No Structural Diagram Available**

Molecular Formula	(C15H16O2.C5H12O4.C3H8O3.CH2O.)x
Molecular Weight	Unspecified

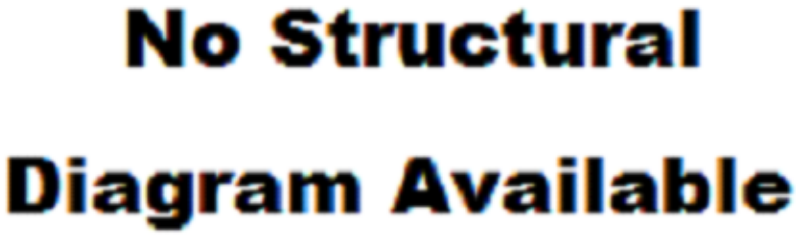
Chemical Name in the Inventory and Synonyms	**Rosin, polymer with bisphenol A, p-tert-butylphenol, formaldehyde and pentaerythritol** rosin, pentaerythritol ester, bisphenol A, p-tert-butylphenol, formaldehyde reaction products
CAS Number	68554-29-0
Structural Formula	
Molecular Formula	(C15H16O2.C10H14O.C5H12O4.CH2O.)x
Molecular Weight	Unspecified

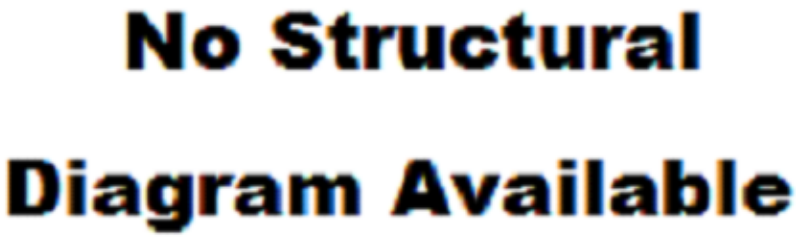
Chemical Name in the Inventory and Synonyms	**Rosin, polymer with bisphenol A, formaldehyde and pentaerythritol** rosin, pentaerythritol ester, bisphenol A, formaldehyde reaction products
CAS Number	68554-30-3
Structural Formula	

	
Molecular Formula	(C15H16O2.C5H12O4.CH2O.)x
Molecular Weight	Unspecified

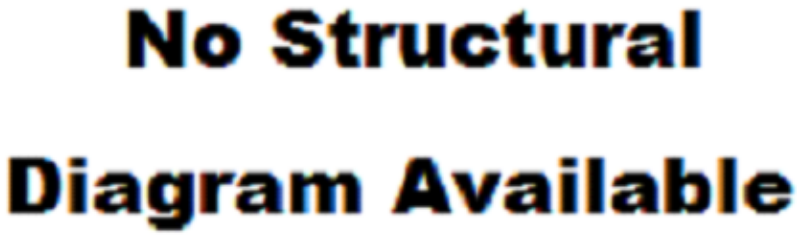
Chemical Name in the Inventory and Synonyms	**Formaldehyde, polymer with 4,4'-(1-methylethylidene) bisphenol and methylphenol**
CAS Number	93752-94-4
Structural Formula	
Molecular Formula	(C15H16O2.C7H8O.CH2O)n
Molecular Weight	Unspecified

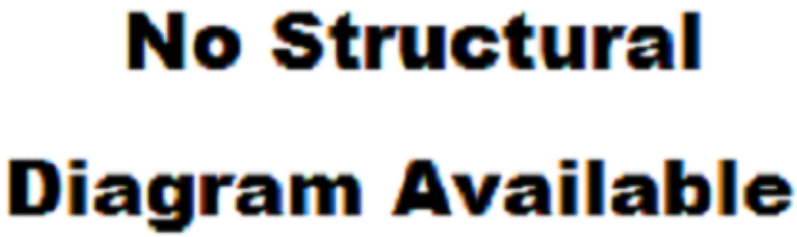
Chemical Name in the Inventory and Synonyms	**Benzoic acid, 2-hydroxy-, polymer with 4-(1,1-dimethylethyl)phenol, formaldehyde and 4,4'-(1-methylethylidene)bis[phenol]** salicylic acid, p-tert-butylphenol, bisphenol A, formaldehyde polymer

CAS Number	68892-00-2
Structural Formula	
Molecular Formula	(C15H16O2.C10H14O.C7H6O3.CH2O)x
Molecular Weight	Unspecified

Chemical Name in the Inventory and Synonyms	**Linseed oil, polymer with bisphenol A, p-tert-butylphenol, ethylene glycol, formaldehyde, pentaerythritol, phthalic anhydride and rosin** phthalic anhydride, pentaerythritol, ethylene glycol, linseed oil, rosin, p-tert-butylphenol, formaldehyde, bisphenol A polymer
CAS Number	68910-74-7
Structural Formula	
Molecular Formula	(C15H16O2.C10H14O.C8H4O3.C5H12O4.C2H6O2.CH2O..)x
Molecular Weight	Unspecified

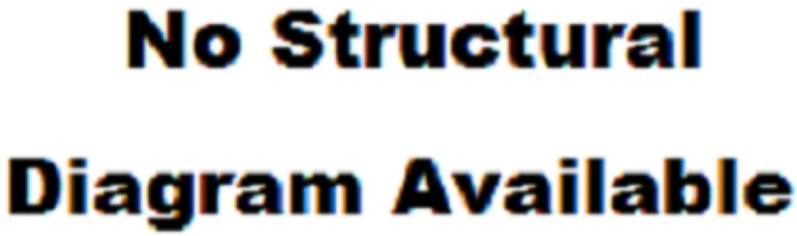
Chemical Name in the Inventory and Synonyms	**Castor oil, polymer with bisphenol A, p-tert-butylphenol, formaldehyde and tung oil** tung oil, castor oil, 4-tert-butylphenol, bisphenol A, formaldehyde polymer

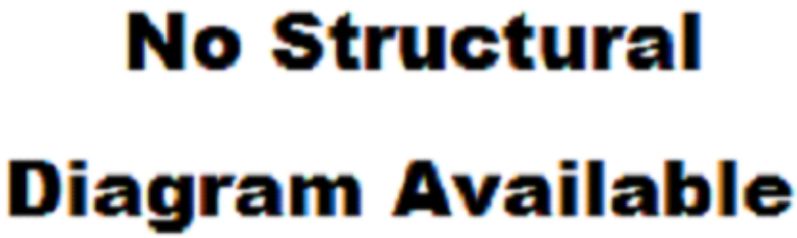
CAS Number	68920-99-0
Structural Formula	
Molecular Formula	(C15H16O2.C10H14O.CH2O..)x
Molecular Weight	Unspecified

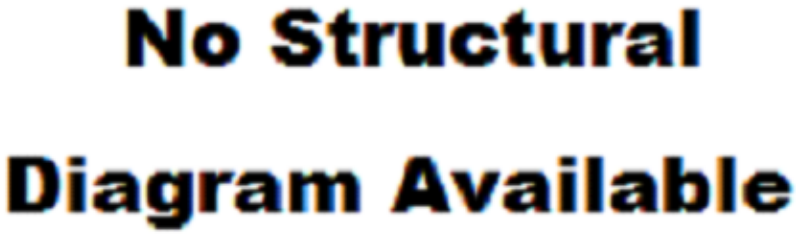
Chemical Name in the Inventory and Synonyms	**Formaldehyde, polymer with 2-(dimethylamino)ethanol, 4,4'-(1-methylethylidene)bis[phenol] and phenol**
CAS Number	102980-03-0
Structural Formula	
Molecular Formula	(C15H16O2.C6H6O.C4H11NO.CH2O)x
Molecular Weight	Unspecified

Chemical Name in the Inventory and Synonyms	**Linseed oil, glycerine, rosin, bisphenol A, formaldehyde, phthalic anhydride polymer**
CAS Number	106214-76-0
Structural Formula	**No Structural Diagram Available**
Molecular Formula	(C15H16O2.C8H4O3.C3H8O3.CH2O..)x
Molecular Weight	Unspecified

Chemical Name in the Inventory and Synonyms	**Formaldehyde, polymer with 4,4'-(1-methylethylidene)bis[phenol], butyl ether** phenol, 4,4-(1-methylethylidene)bis-, polymer with formaldehyde, butylated
CAS Number	70750-15-1
Structural Formula	**No Structural Diagram Available**
Molecular Formula	(C15H16O2.CH2O)x
Molecular Weight	Unspecified

Chemical Name in the Inventory and Synonyms	**Urea, polymer with (chloromethyl)oxirane, formaldehyde and 4,4'-(1-methylethylidene)bis[phenol]** bisphenol A, epichlorohydrin, formaldehyde, urea copolymer
CAS Number	81546-24-9
Structural Formula	
Molecular Formula	(C15H16O2.C3H5ClO.CH4N2O.CH2O)x
Molecular Weight	Unspecified

Chemical Name in the Inventory and Synonyms	**Phenol, 4,4'-(1-methylethylidene)bis, polymer with (chloromethyl)oxirane, polymer with formaldehyde, polymer with 4,4'-(1-methylethylidene)bis[phenol], 1,2-benzenediol, paraformaldehyde, phenol and tar acids, polyalkylphenol fraction**
CAS Number	256388-41-7
Structural Formula	
Molecular Formula	
Molecular Weight	Unspecified

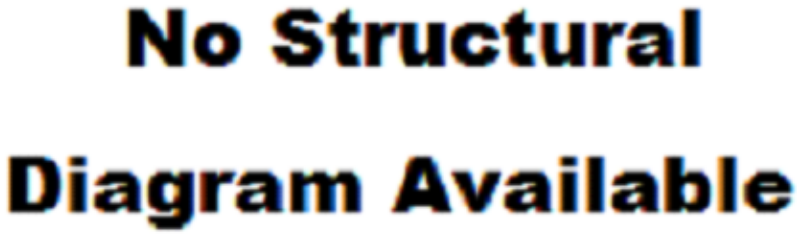
Chemical Name in the Inventory and Synonyms	**2,2'-[(1-Methylethylidene)bis(4,1-phenyleneoxymethylene)]bis oxirane homopolymer, polymer with 1-butanol, 4,4'-(1-methylethylidene)bisphenol and paraformaldehyde**
CAS Number	258333-52-7
Structural Formula	
Molecular Formula	
Molecular Weight	Unspecified

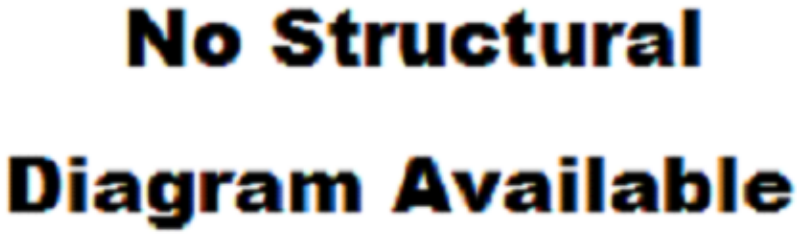
Chemical Name in the Inventory and Synonyms	**Formaldehyde, polymer with (chloromethyl)oxirane, 4,4'-(1-methylethylidene)bis[phenol] and 2-methylphenol, 2-methyl-2-propenoate**
CAS Number	89125-94-0
Structural Formula	

Molecular Formula	(C15H16O2.C7H8O.C3H5ClO.CH2O)x.xC4H6O2
Molecular Weight	Unspecified

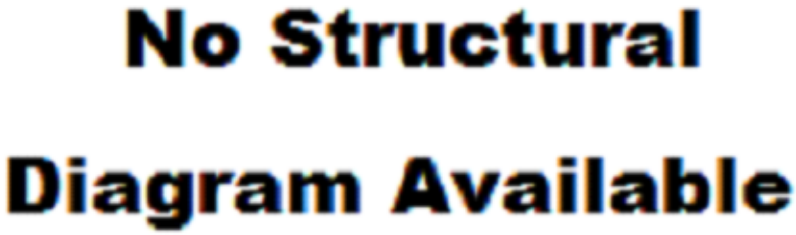
Chemical Name in the Inventory and Synonyms	**Castor oil, dehydrated, polymers with bisphenol A, formaldehyde, linseed oil, pentaerythritol, rosin and tung oil**
CAS Number	103069-78-9
Structural Formula	**No Structural Diagram Available**
Molecular Formula	(C15H16O2.C5H12O4.CH2O....)x
Molecular Weight	Unspecified

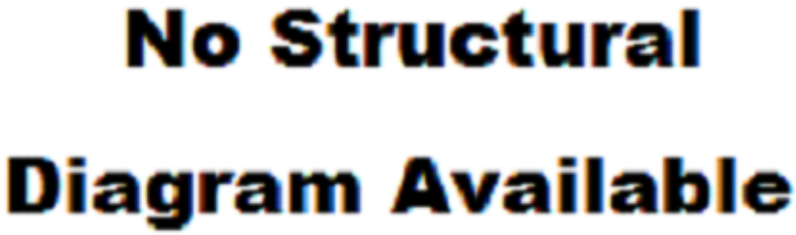
Chemical Name in the Inventory and Synonyms	**Linseed oil, polymer with bisphenol A, formaldehyde, penterythritol, rosin and tung oil**
CAS Number	103069-94-9
Structural Formula	

	
Molecular Formula	(C15H16O2.C5H12O4.CH2O...)x
Molecular Weight	Unspecified

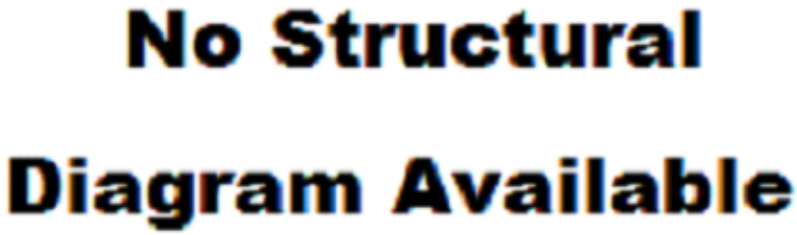
Chemical Name in the Inventory and Synonyms	**Rosin, polymer with bisphenol A, formaldehyde, pentaerythritol and tung oil**
CAS Number	103069-99-4
Structural Formula	
Molecular Formula	(C15H16O2.C5H12O4.CH2O..)x
Molecular Weight	Unspecified

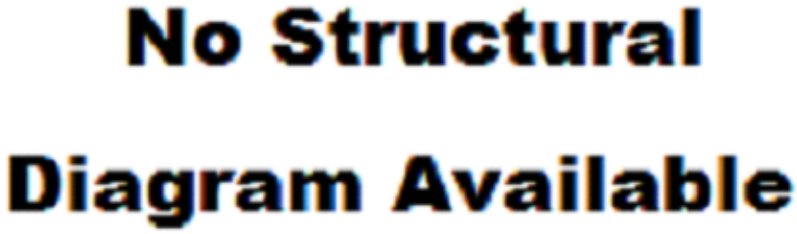
Chemical Name in the Inventory and Synonyms	**Fatty acids, C18-unsaturated, trimers, reaction products with bisphenol A diglycidyl ether and butylated formaldehyde-melamine polymer**

CAS Number	103331-95-9
Structural Formula	
Molecular Formula	C21H24O4.C3H6N6.CH2O.
Molecular Weight	Unspecified

Chemical Name in the Inventory and Synonyms	**Rosin, polymer with bisphenol A, p-tert-butylphenol, formaldehyde and tall oil fatty acids**
CAS Number	103759-01-9
Structural Formula	
Molecular Formula	(C15H16O2.C10H14O.CH2O..)x
Molecular Weight	Unspecified

Chemical Name in the Inventory and Synonyms	**Formaldehyde, polymer with 4,4'-(1-methylethylidene)bis[phenol], sulfomethylated, sodium salts**

CAS Number	104717-38-6
Structural Formula	
Molecular Formula	(C15H16O2.CH2O.Na)x
Molecular Weight	Unspecified

Chemical Name in the Inventory and Synonyms	**Rosin, polymer with 4-(1,1-dimethylethyl)phenol, formaldehyde, 4,4'-(1-methylethylidene)bisphenol and 1,2,3-propanetriol** Rosin, polymer with bisphenol A, formaldehyde, glycerin and p-tert-butylphenol
CAS Number	106523-63-1
Structural Formula	
Molecular Formula	(C15H16O2.C10H14O.C3H8O3.CH2O.)x
Molecular Weight	Unspecified

Chemical Name in the Inventory and Synonyms	**Linseed oil, glycerine, rosin, bisphenol A, formaldehyde, tung oil, phthalic anhydride polymer**
CAS Number	107541-15-1
Structural Formula	**No Structural Diagram Available**
Molecular Formula	(C15H16O2.C8H4O3.C3H8O3.CH2O...)x
Molecular Weight	Unspecified

Chemical Name in the Inventory and Synonyms	**Fatty acids, tall oil, polymers with bisphenol A, formaldehyde, maleic anhydride, pentaerythritol and rosin** rosin, polymer with bisphenol A, formaldehyde, maleic anhydride, pentaerythritol and tall oil fatty acids
CAS Number	110775-70-7
Structural Formula	**No Structural Diagram Available**
Molecular Formula	(C15H16O2.C5H12O4.C4H2O3.CH2O..)x
Molecular Weight	Unspecified

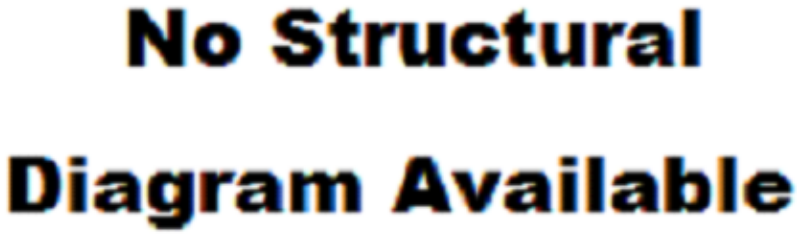
Chemical Name in the Inventory and Synonyms	**Formaldehyde, polymer with 4,4'-(1-methylethylidene)bis[phenol], reaction products with diethylenetriamine** formaldehyde, polymer with N-(2-aminoethyl)-1,2-ethanediamine and 4,4-(1-methylethylidene)bis[phenol
CAS Number	111439-81-7
Structural Formula	**No Structural Diagram Available**
Molecular Formula	(C15H16O2.C4H13N3.CH2O)x
Molecular Weight	Unspecified

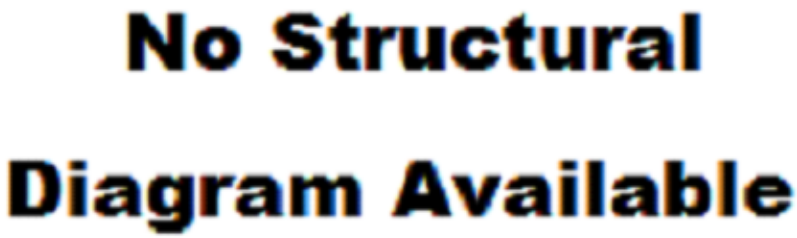
Chemical Name in the Inventory and Synonyms	**Fatty acids, sunflower oil, conjugated, polymers with adipic acid, bisphenol A diglycidyl ether, diethylenetriamine, formaldehyde, hexahydro-1H-azepin-2-one and triethylenetetramine**
CAS Number	111905-73-8
Structural Formula	**No Structural Diagram Available**
Molecular Formula	(C21H24O4.C6H18N4.C6H11NO.C6H10O4.C4H13N3.CH2O.)x

Molecular Weight	Unspecified

Chemical Name in the Inventory and Synonyms	**Hydrogenated C36 dimer fatty acid, polymer with fatty acids, C16-18 and C18-unsaturated, bisphenol A diglycidyl ether, diethylenetriamine, formaldehyde, phenyl glycidyl ether and pentaethylenehexamine**
CAS Number	119298-90-7
Structural Formula	**No Structural Diagram Available**
Molecular Formula	(C21H24O4.C10H28N6.C9H10O2.C4H13N3.CH2O..)x
Molecular Weight	Unspecified

Chemical Name in the Inventory and Synonyms	**C18-Unsaturated fatty acid dimers, polymer with tall oil fatty acids, bisphenol A diglycidyl ether, diethylenetriamine,formaldehyde, phenyl glycidyl ether, and polyethylenepolyamines**
CAS Number	128824-26-0
Structural Formula	

	
Molecular Formula	(C21H24O4.C9H10O2.C4H13N3.CH2O...)x
Molecular Weight	Unspecified

Chemical Name in the Inventory and Synonyms	**2-Propenoic acid, 2-methyl-, polymer with (chloromethyl)oxirane, ethenylbenzene, ethyl 2-propenoate, formaldehyde and 4,4'-(1-methylethylidene)bis[phenol], butyl ester** formaldehyde, polymer with (chloromethyl)oxirane, ethenylbenzene, ethyl 2-propenoate, 4,4-(1-methylethylidene)bis[phenol] and 2-methyl-2-propenoic acid, butylester oxirane, (chloromethyl)-, polymer with ethenylbenzene, ethyl 2-propenoate, formaldehyde, 4,4-(1-methylethylidene)bis[phenol] and 2-methyl-2-propenoic acid, butyl ester phenol, 4,4-(1-methylethylidene)bis-, polymer with (chloromethyl)oxirane, ethenylbenzene, ethyl 2-propenoate, formaldehyde and 2-methyl-2-propenoic acid, butyl ester styrene, polymer with ethyl acrylate, methacrylic acid, n-butanol, formaldehyde, bisphenol A and epichlorohydrin
CAS Number	133673-88-8
Structural Formula	
Molecular Formula	
Molecular Weight	Unspecified

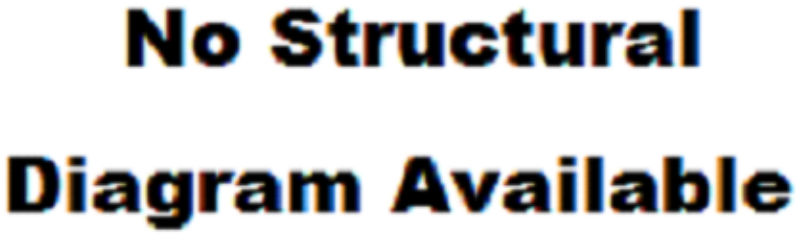
Chemical Name in the Inventory and Synonyms	**Formaldehyde, polymer with 2,2-bis(hydroxymethyl)-1,3-propanediol, 4-(1,1-dimethylethyl) phenol, 1,3-isobenzofurandione, 4,4'-(1-methylethylidene) bis (phenol) and 1,2,3-propanetriol, benzoate octadecadienoate (Z,Z) -9,12-octadecadienoate** alkyd resin polymer
CAS Number	140204-23-5
Structural Formula	**No Structural Diagram Available**
Molecular Formula	Not specified
Molecular Weight	Unspecified

Chemical Name in the Inventory and Synonyms	**Polyaminoamide of monomer, dimer and trimer fatty acids and ethylenepolyamines, modified with a reaction product of bisphenol A and epichlorohydrin, phenylglycidyl ether, butanediol diglycidyl ether, paraformaldehyde and acetic acid**
CAS Number	180898-36-6
Structural Formula	**No Structural Diagram Available**
Molecular Formula	Not specified

Molecular Weight	Unspecified

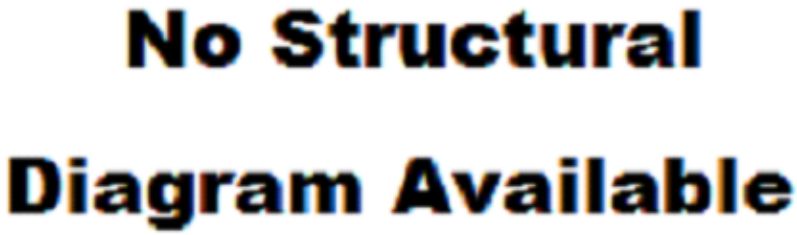
Chemical Name in the Inventory and Synonyms	**Phenol, 4,4'-(1-methylethylidene)bis-, polymer with (chloromethyl)oxirane, polymer with paraformaldehyde, 3-methylphenol, 2-methylphenol and 4-methylphenol**
CAS Number	218614-09-6
Structural Formula	**No Structural Diagram Available**
Molecular Formula	
Molecular Weight	Unspecified

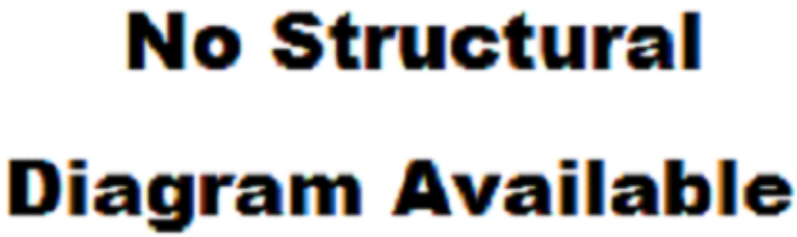
Chemical Name in the Inventory and Synonyms	**2,2'-[(1-Methylethylidene)bis(4,1-phenyleneoxymethylene)]bis[oxirane] homopolymer, polymer with paraformaldehyde, 4,4'-(1-methylethylidene)bis[phenol] and 2-ethylhexyl 2-propenoate**
CAS Number	218960-25-9
Structural Formula	

	
Molecular Formula	
Molecular Weight	Unspecified

Chemical Name in the Inventory and Synonyms	**2,2'-[(1-Methylethylidene)bis(4,1-phenyleneoxymethylene)]bis[oxirane] homopolymer, polymer with paraformaldehyde, 4,4'-(1-methylethylidene)bis[phenol] and butyl 2-propenoate**
CAS Number	218960-26-0
Structural Formula	
Molecular Formula	
Molecular Weight	Unspecified

Chemical Name in the Inventory and Synonyms	**Oxirane, 2,2'-[(1-methylethylidene)bis(4,1-phenyleneoxymethylene)]bis-, homopolymer, polymer with ethenylbenzene, 4,4'-(1-methylethylidene)bis[phenol], methyl 2-methyl-2-propenoate, 2-methyl-2-propenoic acid, 2-propenoic acid and phenol, polymer with paraformaldehyde**

CAS Number	218963-53-2
Structural Formula	
Molecular Formula	
Molecular Weight	Unspecified

Chemical Name in the Inventory and Synonyms	**4,4'-(1-Methylethylidene)bisphenol, polymer with 2,2'-[(1-methylethylidene)bis(4,1-phenyleneoxymethylene)]bisoxirane, polymer with formaldehyde, 4(1,1-dimethylethyl)phenol and 4,4'-(1-methylethylidene)bisphenol**
CAS Number	218966-22-4
Structural Formula	
Molecular Formula	
Molecular Weight	Unspecified

Chemical Name in the Inventory and Synonyms	**Formaldehyde, polymers with 1,3-benzenedimethanamine, bisphenol A, diethylenetriamine-glycidyl Ph ether reaction products, epichlorohydrin, propylene oxide and triethylenetetramine, reaction products with o-cresyl glycidyl ether, sulfamates (salts)**
CAS Number	238080-05-2
Structural Formula	**No Structural Diagram Available**
Molecular Formula	Unspecified
Molecular Weight	Unspecified

Chemical Name in the Inventory and Synonyms	**Linseed oil, polymer with bisphenol A, bisphenol A diglycidyl ether, diethylenetriamine, formaldehyde, glycidyl Ph ether and pentaethylenehexamine**
CAS Number	68915-81-1
Structural Formula	**No Structural Diagram Available**
Molecular Formula	(C21H24O4.C15H16O2.C10H28N6.C9H10O2.C4H13N3.CH2O.Unspecified)x

Molecular Weight	Unspecified

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