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PRODUCT SAFETY SUMMARY:

SOLID BISPHENOL-A-BASED EPOXY RESIN (POLYMER)

This Product Safety Summary is intended to provide a general description of certain Huntsman chemical substances and products containing the chemical substance(s). The information in this Summary is not intended to replace the information included on the Safety Data Sheet (SDS), Product Safety Label, and other safe use and handling literature for the chemical substance(s).

Chemical Identity

This Product Safety Summary covers the chemical substance below:

Name	Other Identifiers
Solid bisphenol-A-based epoxy resin (polymer) **(CAS# 25068-38-6 and CAS# 25036-25-3)***	Bisphenol A diglycidylether (BADGE) 2,2'-[(1-methylethylidene)bis(4,1-phenyleneoxymethylene)]bisoxirane Oxirane, 2,2'-[(1-methylethylidene)bis(4,1-phenyleneoxymethylene)]bis; CAS: 1675-54-3
* Two different CAS numbers cover the entire semi-solid to solid domains. The epoxy resin CAS numbers are process related and not defined on molecular weight.	

General Product Overview

In Huntsman, solid bisphenol-A-based epoxy resins are manufactured and marketed as a raw material to produce formulations and chemicals. Solid bisphenol-A-based epoxy resins are marketed by Huntsman for downstream use to industrial, professional, and competent chemical producers.

Solid bisphenol-A-based epoxy resins are a reaction product of lower molecular weight-based bisphenol-A-based epoxy resins (see also the Product Safety Summary on bisphenol-A-based liquid epoxy resins, or BLR) and bisphenol-A. Monomeric bisphenol-A based liquid epoxy resin (BADGE) and bisphenol-A are fully consumed. However, trace bisphenol-A-based liquid epoxy resin monomer remains unreacted and is detectable at ≤2.0wt%.

Applications and Uses

The bisphenol-A-based epoxy resins are mostly used as part of two-component systems to create epoxy coatings, as processing aids for composites and as modifiers for other applications.

Potential routes of human exposure to solid bisphenol-A-based epoxy resins are through dermal contact and via inhalation due to dust formation. Ingestion is not an anticipated route of exposure. Worker exposure can occur in industrial facilities where the substance is produced or formulated into end-use products or used as an industrial intermediate. Within this assessment both industrial workers and trained professionals are evaluated. In general, all of the worker situations are controlled to avoid any direct contact with the solid bisphenol-A-based epoxy resins, either through process engineering controls, procedural controls and/or through the use of personal protective equipment (PPE).

When cured, the solid bisphenol-A-based epoxy resins are expected to react to a large degree in all applications. Due to the very low concentrations of free (unreacted) bisphenol-A-based epoxy resins in end-use applications (after cure), the development of exposure scenarios covering downstream uses (service life, waste treatment) are not required and have not been conducted. The cure time for these products varies and depends on a hardener component used in the formulation.

Physical and Chemical Properties

Solid bisphenol-A-based epoxy resins, once warmed to temperatures significantly above ambient temperature (for example, >60°C), become sticky, viscous liquids that are difficult to handle.

Certain physical properties for a representative solid bisphenol-A-based epoxy resin are summarized below.

Reference: Araldite GT 7004

Boiling point	>320°C (decomposition temperature stated)
Softening point (Mettler, DIN 51920)	95 - 101°C
Density	1.19 g/cm3 @ 20°C
Partition coefficient (LogKow)	3.242 @ 25°C

Additional physical and chemical property information is available on the product Safety Data Sheet (SDS), which can be requested at SDS@huntsman.com.

Human Health Information

The probability of experiencing health effects associated with exposure to solid bisphenol-A-based epoxy resins is considered negligible providing the recommendations stated in the material safety data sheet are implemented and followed. Adverse health effects are not expected due to the negligible concentration and bioaccessibility of residual monomeric bisphenol-A-based liquid epoxy, subject to dose level, route and duration of exposure. Solid bisphenol-A-based epoxy resins are not classified due the negligible concentration and limited bioaccessibility.

The potential health effects from exposure to solid bisphenol-A-based epoxy resins are discussed below. Different regulatory classification criteria apply in different geographic regions.

These different criteria may result in different human health regulatory classifications for the same product in different geographic regions. Specific regulatory classification information is contained in the Safety Data Sheet for each product in use in specific geographic regions. The acute and chronic health effects information set forth below is based on Safety Data Sheets in use in the United States.

Acute Health Effects

Acute exposure of humans to solid bisphenol-A-based epoxy resins by inhalation is highly unlikely due to the physical state as the material is supplied in flake and granulated form.

Skin contact may cause no to moderate local irritation and may produce an allergic skin reaction in sensitive individuals. Ingestion of solid bisphenol-A-based epoxy resins may cause digestive tract burns.

Eye contact may cause no to moderate eye irritation with symptoms of redness and conjunctivitis.

Chronic Health Effects

Currently there is no toxicological data available for solid bisphenol-A-based epoxy resins. However, it is anticipated that any adverse health effects following an accidental exposure event will be driven by the residual concentrations of bisphenol-A-based liquid epoxy. In the case of solid bisphenol-A-based epoxy resins, residual liquid resin is not expected to be bioaccessible.

Extensive in-vitro and in-vivo animal studies have been conducted, and the weight of evidence indicates that bisphenol-A-based liquid epoxy appears to be genotoxic in some in-vitro test systems. Following the in-vivo tests (transgenic rodent assay), bisphenol-A-based epoxy resins did not show evidence for mutagenicity or genotoxicity. In the case of solid bisphenol-A-based epoxy resins, residual liquid resin is also not expected to be bioaccessible.

More information can be obtained in the specific product Safety Data Sheet.

Environmental Information

In Huntsman, solid bisphenol-A-based epoxy resins are industrial raw materials. During normal operating conditions, solid bisphenol-A-based epoxy resins are not expected to be released to the air, soil or water. Procedural and/or control technologies are used to minimize emissions and potential exposure during cleaning and maintenance activities. Prior to use, solid bisphenol-A-based epoxy resins are mixed in semi-closed systems with other chemicals and/or monomers

(additives/colorants and hardeners) which inherently mitigates any hazardous properties via dilution.

Environmental Fate

Solid bisphenol-A-based epoxy resins are susceptible to indirect photolysis, which results in yellowing of cured products. Solid bisphenol-A-based epoxy resins are insoluble due to the physical state. Solid bisphenol-A-based epoxy resins are not expected to be bioaccumulative.

Environmental Toxicity Testing

As stated above, currently there is no environmental toxicological data available for solid bisphenol-A-based epoxy resins. However, it is anticipated that any adverse effects following an accidental exposure event will be driven by the residual concentrations of bisphenol-A-based liquid epoxy. In the case of solid bisphenol-A-based epoxy resins, residual liquid resin is also not expected to be bioaccessible.

Potential Occupational Exposure

In Huntsman, solid bisphenol-A-based epoxy resins are manufactured in closed systems. During normal operating conditions, occupational exposure to solid bisphenol-A-based epoxy resins is not expected in the manufacturing process. Procedural and/or control technologies are used to minimize exposure during sampling, cleaning, maintenance or in more open handling systems. In those cases, appropriate engineering controls (such as ventilation) and personal protective equipment (PPE) should be used in accordance with the exposure guidelines and workplace practices identified in the Safety Data Sheet.

Potential Consumer Exposure

Solid bisphenol-A-based epoxy resins are not used in do-it-yourself (DIY) applications.

Safe Use Recommendations/Workplace Exposure Controls

Huntsman follows and recommends that customers follow workplace exposure guidelines through a variety of industrial hygiene and ventilation measures. Workplace exposure guidelines include workplace limit values.

The following values are referenced by the National Institute for Occupational Safety and Health (NIOSH) for diglycidyl ether[1], which may be considered protective of workplace exposure to solid bisphenol-A-based epoxy resins.

Diglycidyl ether

- Occupational Safety and Health Administration (OSHA): 2.8 mg/m^3 (TWA)
- (NIOSH: 1 mg/m^3 (ceiling 15 min)

Because of the possibility of sensitization, employees who are assigned to an epoxy resin work area should undergo a pre-placement medical evaluation and be part of a comprehensive medical surveillance program. Once a worker has been diagnosed as sensitized to any epoxy resins, no further epoxy resin exposure should be permitted.

See the Safety Data Sheets for solid bisphenol-A-based epoxy resins and specific epoxy-based products for additional information about first aid measures, accidental releases (spills and leaks), waste disposal, toxicity, transportation, regulatory requirements and other important topics.

Regulatory Information/Classification and Labeling

Under the Globally Harmonized System (GHS) for Hazard Communication, substances are classified according to their physical, health, and environmental hazards. The hazards are communicated via specific labels and the Safety Data Sheets. GHS attempts to standardize hazard communication so that the intended audience (workers, consumers, transport workers, and emergency responders) can better understand the hazards of the chemicals in use.

The hazard statements and symbols presented here refer to the hazard properties of the concentrated substance and are meant to provide a brief overview of the substance's labeling. It is not intended to be comprehensive or to replace information found in the Safety Data Sheet.

Labeling according to OSHA 1910.1200 (GHS)

Not a hazardous substance or mixture.

[1] https://www.cdc.gov/niosh/docs/79-104/default.html

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Additional Information

Information on registered substances is available on the European Chemicals Agency (ECHA) website at https://echa.europa.eu.

References

Pearce, D., (2013) Bisphenol A Diglycidyl Ether of Bisphenol A, Methods Development Team Industrial Hygiene Chemistry Division, OSHA Salt Lake Technical Center, Sandy UT 84070-6406.

Glycidyl ethers, IARC Monographs Vol. 47, pp 238 - 261.

Disclaimer

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THE PRODUCT MAY PRESENT HAZARDS AND SHOULD BE USED WITH CAUTION. WHILE CERTAIN HAZARDS ARE DESCRIBED IN THIS PUBLICATION, NO GUARANTEE IS MADE THAT THESE ARE THE ONLY HAZARDS THAT EXIST.

Hazards, toxicity, and behavior of the products may differ when used with other materials and are dependent upon the manufacturing circumstances or other processes. Such hazards, toxicity, and behavior should be determined by the user and made known to handlers, processors, and end users.

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