

# Product Stewardship Summary

## Phenol

### General Statement

Pure phenol exists as colorless-to-white, flammable crystals with a distinctive “sickly sweet” odor detectable at very low concentrations. It is used directly in a number of consumer products as a disinfectant. Phenol is also used in the production of many high-performance resins. Phenolic resins are used in applications as diverse as aerospace heat shields and automotive clutches. Phenolic adhesives are used extensively to bond high performance automotive parts.

Exposure to the low levels of phenol typically present in the natural environment and consumer products is not expected to be harmful to human health or the environment. However, exposure to highly concentrated phenol in the work environment can be extremely and immediately hazardous to workers. Therefore, exposure must be adequately controlled.

### Chemical Identity

Name: Phenol

Brand Names: Used in the production of Arofene™ resins and Pliobond™ adhesives

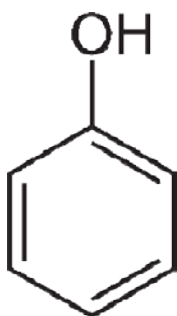
Chemical name (IUPAC): phenol

CAS number(s): 108-95-2

EC number: 203-632-7

Molecular formula: C<sub>6</sub>H<sub>6</sub>O

Structure:



### Uses and Applications

Phenol occurs naturally as well as through deliberate manufacture. Phenol is used in the creation of many consumer products such as plastics, disinfectants in household cleaning products, and in the production of mouthwashes, throat sprays, and throat lozenges. Ashland uses phenol in the production of a number of resins and adhesives. These products are used in a variety of applications including aerospace, automotive, and filtration systems. Phenolic adhesives are used in many high-performance applications, including drum and disc brakes, clutch plates, brake shims, and vibration dampers.



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## Physical/Chemical Properties

### Phys/Chem Safety Assessment

Property	Value
Form	Colorless to yellow or light pink crystals
Physical state	Solid
Color	Colorless to yellow or light pink
Odor	Aromatic
Density	1.07 g/cm <sup>3</sup> @ 20°C
Melting / boiling point	40.9°C / 191.8°C
Flammability	Not classified
Explosive properties	Not classified
Self-ignition temperature	505°C
Vapor pressure	0.2 hPa @ 25°C
Mol weight	94.11 g/mol
Water solubility	70 g/L @ 25°C
Flash point	82°C
Octanol-water partition coefficient (Log <sub>K<sub>ow</sub></sub> )	1.37 @ 30°C

### Exposure, Hazard and Safety Assessment

The following section describes possible exposures scenarios and hazards associated with phenol. The exposure assessment describes both the amount of and the frequency with which a chemical substance reaches a person, a population of people, or the environment. Hazard refers to the inherent properties of a substance that make it capable of causing harm to human health or the environment. The safety assessment reports the possibility of a harmful event arising from exposure to a chemical or physical agent under specific conditions. Just because a substance may possess potentially harmful properties does not mean that it automatically poses a risk. It is not possible to make that determination without understanding the exposure.

#### Human Health Effects

##### Human Exposure Assessment

**Consumer:** Airborne phenol arises from many sources, including automobile exhaust, primary and secondhand cigarette smoke, wood burning, and industrial release. Phenol may also be present in surface waters, rainwater, drinking water, industrial and urban runoff, and in the soils around hazardous waste sites. Low levels of phenol are also found in fried or smoked foods such as smoked summer sausage, fried bacon, fried chicken, and black fermented tea. Ingestion also occurs through several consumer products containing phenol, such as throat lozenges or sore throat sprays.

**Worker:** Workers in several industries may also be exposed to phenol, such as the petroleum, plastics, herbicide, and wood preservative treatment industries. Workplace exposure occurs through breathing, dermal exposure from contaminated air, or by direct dermal exposure to phenol-containing products.

## Human Hazard Assessment

Effect Assessment	Result
Acute Toxicity Oral / inhalation / dermal	H301: Toxic if swallowed H311: Toxic in contact with skin H331: Toxic if inhaled
Irritation / corrosion Skin / eye / respiratory test	H314: Causes severe skin burns and eye damage.
Sensitization	Does not cause allergic reactions upon contact with skin
Toxicity after repeated exposure Oral / inhalation / dermal	H373: May cause damage to organs through prolonged or repeated exposure.
Genotoxicity / Mutagenicity	H341: Suspected of causing genetic defects.
Carcinogenicity	Not considered as a carcinogen
Reproductive / Developmental Toxicity	Not toxic to reproduction or to unborn children
Aspiration hazard	Not applicable

## Human Health Safety Assessment

**Consumer:** Consumer exposure to dangerous levels of phenol is unlikely under normal use of consumer products. Overuse of products containing phenol such as sore throat sprays or throat lozenges may be hazardous.

**Worker:** Exposure to highly concentrated phenol is very hazardous. Inhalation and dermal exposure are highly irritating to skin, eyes, and mucous membranes. A minimum lethal oral dose of approximately 70mg/kg has been estimated for human adults (just over one teaspoon for an average adult male). Primary phenol toxicity is at the site of contact, though prolonged and/or excessive exposure may lead to liver, immune system, and cardiovascular toxicity. Phenol is rapidly absorbed through the skin, and large dermal exposures can quickly lead to severe systemic toxicity, including excitability, loss of balance and coordination, confusion, unconsciousness, coma, respiratory failure, and death. Phenol acts as a local anesthetic, so injuries from direct exposure may feel less severe than they actually are.

## Environmental Effects

### Environmental Exposures

Phenol is not expected to bioaccumulate, and low doses of phenol are quickly metabolized. Phenol quickly breaks down in the air, with a half-life of about 3/5 of a day. Phenol is readily biodegradable in natural waters, as long as concentrations are not high enough to kill aquatic organisms prior to metabolism. Phenol can accumulate in dry soil, but the presence of moisture will cause it to tend to leach into groundwater or soil moisture.

### Environmental Hazard Assessment:

Effect Assessment	Result
Aquatic toxicity	Not toxic to aquatic organisms

Fate and behavior	Result
Biodegradation	Readily biodegradable
Bioaccumulation potential	Unlikely to bioaccumulate.
PBT / vPvB conclusion	This substance is not considered to be persistent, bioaccumulating and toxic (PBT) or very persistent and very bioaccumulating (vPvB)

### Environmental Safety Assessment

High concentrations of phenol are very toxic to aquatic, terrestrial, and plant life. Low concentrations are not very toxic, and are rapidly biodegraded.

### Risk Management Recommendations

Exposure to phenol in the workplace can be controlled by sufficient ventilation and proper handling and storage techniques. Examples include: ventilation system, proper protective equipment such as eye protection (i.e., splash proof goggles), normal work clothing which covers arms and legs, and phenol resistant gloves.

Consumer exposure to phenol rarely occurs at levels known to cause either acute or chronic toxicity. In the case of dermal exposure to concentrated phenol, it is vital to thoroughly wash the affected areas as soon as possible. Industrial exposure should be managed by the use of adequate ventilation, gloves, goggles, protective clothing, and good hygiene.

Exposure to phenol in the workplace is covered by established exposure limits. A partial list of references follows:

US OSHA PEL: 5 ppm (8h TWA)

ACGIH TLV: 5 ppm (8h TWA)

EU and member states: <http://osha.europa.eu/en/topics/ds/oel/index.stm/members.stm> China: 10 mg/m<sup>3</sup> (8h TWA)

### Regulatory Agency Review

Phenol is listed on:

- REACH registered substances (EC) 1907/2006
- TSCA inventory
- Canada's DSL list
- Australia Index of Chemical Substances
- China Inventory of Existing Chemical Substances
- Japan Inventory of Existing and New Chemical Substances
- Korea Existing Chemicals Inventory
- New Zealand Inventory of Chemicals
- Philippines Inventory of Chemicals and Chemical Substances
- Group 3 carcinogen by the International Agency for Research on Cancer (IARC)

### Regulatory Information / Classification and Labeling

Under the Globally Harmonized System for classification and labeling (GHS), substances are classified according to their physical, health, and environmental hazards. The hazards are communicated via specific labels and the (Extended) SDS. 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.

## GHS Classification:

Acute toxicity (oral): Category 3

Acute toxicity (inhalation): Category 3

Acute toxicity (dermal): Category 3

Skin corrosion/irritation: Category 1

Serious eye damage/eye irritation: Category 1

Germ cell mutagenicity: Category 2

Specific target organ toxicity (repeated exposure): Category 2 (skin, nervous system, liver, kidney)

Aquatic acute toxicity: Category 2

Aquatic chronic toxicity: Category 2

## Hazard Statements:

H301: Toxic if swallowed

H311: Toxic in contact with skin

H314: Causes severe skin burns and eye damage

H318: Causes serious eye damage

H331: Toxic if inhaled

H341: Suspected of causing genetic defects

H373: May cause damage to organs through prolonged or repeated exposure

## Signal Word:

Danger

## Precautionary Statements:

P262: Do not get in eyes, on skin, or on clothing

P281: Use personal protective equipment as required

P302+P352: IF ON SKIN: Wash with plenty of soap and water

P305+P351+P338: IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing.

P309+P311: IF exposed or if you feel unwell: Call a POISON CENTER or doctor/physician

P405: Store locked up.

## Hazard Pictograms:



## Conclusion

While concentrated phenol is very hazardous, exposure to small amounts of phenol from consumer products and foods is not expected to be hazardous. Industrial use of phenol must involve precautions to limit the potential for exposure to concentrated phenol or phenol vapor.

## Contact Information with Company

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## Additional Information

For more information on GHS, visit <http://www.osha.gov/dsg/hazcom/ghsguideoct05.pdf> or [http://live.unece.org/trans/danger/publi/ghs/ghs\\_welcome\\_e.html](http://live.unece.org/trans/danger/publi/ghs/ghs_welcome_e.html).  
Ashland product stewardship summaries are located at <http://www.ashland.com/sustainability/product/product-stewardship>

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*REACH registration is specific to Importers/Manufacturers that place the chemical on the EU market, and is specific to registered uses. Inclusion on the list of REACH Registered Substances does not automatically imply registration by Ashland.*

*Inclusion on the New Zealand Inventory of Chemicals applies only to the pure substance listed. The importer of record must determine whether or not their substances are in compliance.*