ionz

SAFETY DATA SHEET

Updated on 26/09/2024

1. Material Identification

Product Name : Phenol
Catalog Number : io-2828
CAS Number : 108-95-2
Identified uses : Laboratory chemicals, manufacture of chemical compounds
Company : Ionz

>> R&D Use only

2. Hazards Identification

GHS Classification:

Flammable liquid (category 2)
Acute toxicity, oral (Category 3)
Acute toxicity, dermal (Category 3)
Acute toxicity, inhalation (Category 3)
Specific target organ toxicity, single exposure (Category 1)

Note

>> Pictograms displayed are for > 99.9% (4206 of 4207) of reports that indicate hazard statements. This chemical does not meet GHS hazard criteria for < 0.1% (1 of 4207) of reports.

Pictogram(s)

GHS Hazard Statements

>> H301 (99.9%): Toxic if swallowed [Danger Acute toxicity, oral]

>> H311 (> 99.9%): Toxic in contact with skin [Danger Acute toxicity, dermal]

>> H314 (> 99.9%): Causes severe skin burns and eye damage [Danger Skin corrosion/irritation]

>> H318 (18.4%): Causes serious eye damage [Danger Serious eye damage/eye irritation]

>> H331 (99.7%): Toxic if inhaled [Danger Acute toxicity, inhalation]

>> H341 (99.3%): Suspected of causing genetic defects [Warning Germ cell mutagenicity]

>> H373 (99.7%): May causes damage to organs through prolonged or repeated exposure [Warning Specific target organ toxicity, repeated exposure]

>> H411 (13.8%): Toxic to aquatic life with long lasting effects [Hazardous to the aquatic environment, long-term hazard]

Precautionary Statement Codes

>> P203, P260, P261, P262, P264, P264+P265, P270, P271, P273, P280, P301+P316, P301+P330+P331, P302+P352, P302+P361+P354, P304+P340, P305+P354+P338, P316, P317, P318, P319, P321, P330, P361+P364, P363, P391, P403+P233, P405, and P501

NFPA 704 Diamond

NFPA Health Rating

>> 4 - Materials that, under emergency conditions, can be lethal.

NFPA Fire Rating

>> 2 - Materials that must be moderately heated or exposed to relatively high ambient temperatures before ignition can occur. Materials would not under normal conditions form hazardous atmospheres with air, but under high ambient temperatures or under moderate heating could release vapor in sufficient quantities to produce hazardous atmospheres with air.

NFPA Instability Rating

>> 0 - Materials that in themselves are normally stable, even under fire conditions.

Health Hazards:

>> Excerpt from ERG Guide 153 [Substances - Toxic and/or Corrosive (Combustible)]:

>> TOXIC and/or CORROSIVE; inhalation, ingestion or skin contact with material may cause severe injury or death. Methyl bromoacetate (UN2643) is an eye irritant/lachrymator (causes flow of tears). Contact with molten substance may cause severe burns to skin and eyes. Avoid any skin contact. Fire may produce irritating, corrosive and/or toxic gases. Runoff from fire control or dilution water may be corrosive and/or toxic and cause environmental contamination. (ERG, 2024)

ERG 2024, Guide 153 (Phenol, solid)

>> TOXIC and/or CORROSIVE; inhalation, ingestion or skin contact with material may cause severe injury or death.

>> Methyl bromoacetate (UN2643) is an eye irritant/lachrymator (causes flow of tears).

>> Contact with molten substance may cause severe burns to skin and eyes.

>> Avoid any skin contact.

>> Fire may produce irritating, corrosive and/or toxic gases.

>> Runoff from fire control or dilution water may be corrosive and/or toxic and cause environmental contamination.

ERG 2024, Guide 153 (Phenol, molten)

>> TOXIC and/or CORROSIVE; inhalation, ingestion or skin contact with material may cause severe injury or death.

>> Methyl bromoacetate (UN2643) is an eye irritant/lachrymator (causes flow of tears).

>> Contact with molten substance may cause severe burns to skin and eyes.

>> Avoid any skin contact.

>> Fire may produce irritating, corrosive and/or toxic gases.

>> Runoff from fire control or dilution water may be corrosive and/or toxic and cause environmental contamination.

>> Excerpt from ERG Guide 153 [Substances - Toxic and/or Corrosive (Combustible)]:

>> Combustible material: may burn but does not ignite readily. When heated, vapors may form explosive mixtures with air: indoors, outdoors and sewers explosion hazards. Those substances designated with a (P) may polymerize explosively when heated or involved in a fire. Corrosives in contact with metals may evolve flammable hydrogen gas. Containers may explode when heated. Runoff may pollute waterways. Substance may be transported in a molten form. (ERG, 2024)

ERG 2024, Guide 153 (Phenol, solid)

>> Combustible material: may burn but does not ignite readily.

>> When heated, vapors may form explosive mixtures with air: indoors, outdoors and sewers explosion hazards.

>> Those substances designated with a (P) may polymerize explosively when heated or involved in a fire.

>> Corrosives in contact with metals may evolve flammable hydrogen gas.

>> Containers may explode when heated.

>> Runoff may pollute waterways.

>> Substance may be transported in a molten form.

ERG 2024, Guide 153 (Phenol, molten)

>> Combustible material: may burn but does not ignite readily.

>> When heated, vapors may form explosive mixtures with air: indoors, outdoors and sewers explosion hazards.

>> Those substances designated with a (P) may polymerize explosively when heated or involved in a fire.

>> Corrosives in contact with metals may evolve flammable hydrogen gas.

>> Containers may explode when heated.

>> Runoff may pollute waterways.

>> Substance may be transported in a molten form.

>> Combustible. Above 79 °C explosive vapour/air mixtures may be formed.

3. Composition/Information On Ingredients

Chemical name : Phenol
CAS Number : 108-95-2
Molecular Formula : C6H6O
Molecular Weight : 94.1100 g/mol

4. First Aid Measures

First Aid:

>> Excerpt from ERG Guide 153 [Substances - Toxic and/or Corrosive (Combustible)]:

>> Refer to the "General First Aid" section. Specific First Aid: For corrosives, in case of contact, immediately flush skin or eyes with running water for at least 30 minutes. Additional flushing may be required. Removal of solidified molten material from skin requires medical assistance. (ERG, 2024)

ERG 2024, Guide 153 (Phenol, solid)

>> General First Aid:

>> Call 911 or emergency medical service.

>> Ensure that medical personnel are aware of the material(s) involved, take precautions to protect themselves and avoid contamination.

>> Move victim to fresh air if it can be done safely.

>> Administer oxygen if breathing is difficult.

>> If victim is not breathing:

>> DO NOT perform mouth-to-mouth resuscitation; the victim may have ingestedor inhaled the substance.

>> If equipped and pulse detected, wash face and mouth, then give artificial respiration using a proper respiratory medical device (bag-valve mask, pocket mask equipped with a one-way valve or other device).

>> If no pulse detected or no respiratory medical device available, provide continuouscompressions. Conduct a pulse check every two minutes or monitor for any signs of spontaneous respirations.

>> Remove and isolate contaminated clothing and shoes.

>> For minor skin contact, avoid spreading material on unaffected skin.

>> In case of contact with substance, remove immediately by flushing skin or eyes with running water for at least 20 minutes.

>> For severe burns, immediate medical attention is required.

>> Effects of exposure (inhalation, ingestion, or skin contact) to substance may be delayed.

>> Keep victim calm and warm.

>> Keep victim under observation.

>> For further assistance, contact your local Poison Control Center.

>> Note: Basic Life Support (BLS) and Advanced Life Support (ALS) should be done by trained professionals.

>> Specific First Aid:

>> For corrosives, in case of contact, immediately flush skin or eyes with running water for at least 30 minutes. Additional flushing may be required.

>> Removal of solidified molten material from skin requires medical assistance.

>> In Canada, an Emergency Response Assistance Plan (ERAP) may be required for this product. Please consult the shipping paper and/or the "ERAP" section.

ERG 2024, Guide 153 (Phenol, molten)

>> General First Aid:

>> Call 911 or emergency medical service.

>> Ensure that medical personnel are aware of the material(s) involved, take precautions to protect themselves and avoid contamination.

>> Move victim to fresh air if it can be done safely.

>> Administer oxygen if breathing is difficult.

>> If victim is not breathing:

>> DO NOT perform mouth-to-mouth resuscitation; the victim may have ingestedor inhaled the substance.

>> If equipped and pulse detected, wash face and mouth, then give artificial respiration using a proper respiratory medical device (bag-valve mask, pocket mask equipped with a one-way valve or other device).

>> If no pulse detected or no respiratory medical device available, provide continuouscompressions. Conduct a pulse check every two minutes or monitor for any signs of spontaneous respirations.

>> Remove and isolate contaminated clothing and shoes.

>> For minor skin contact, avoid spreading material on unaffected skin.

>> In case of contact with substance, remove immediately by flushing skin or eyes with running water for at least 20 minutes.

>> For severe burns, immediate medical attention is required.

>> Effects of exposure (inhalation, ingestion, or skin contact) to substance may be delayed.

>> Keep victim calm and warm.

>> Keep victim under observation.

>> For further assistance, contact your local Poison Control Center.

>> Note: Basic Life Support (BLS) and Advanced Life Support (ALS) should be done by trained professionals.

>> Specific First Aid:

>> For corrosives, in case of contact, immediately flush skin or eyes with running water for at least 30 minutes. Additional flushing may be required.

>> Removal of solidified molten material from skin requires medical assistance.

>> In Canada, an Emergency Response Assistance Plan (ERAP) may be required for this product. Please consult the shipping paper and/or the "ERAP" section.

First Aid Measures

Inhalation First Aid

>> Fresh air, rest. Half-upright position. Refer for medical attention.

Skin First Aid

>> Wear protective gloves when administering first aid. Remove contaminated clothes. Rinse skin with plenty of water or shower. To remove substance use polyethylene glycol 300 or vegetable oil. Refer immediately for medical attention .

Eye First Aid

>> Rinse with plenty of water for several minutes (remove contact lenses if easily possible). Refer immediately for medical attention.

Ingestion First Aid

>> Rinse mouth. Give one or two glasses of water to drink. Do NOT induce vomiting. Refer immediately for medical attention.

5. Fire Fighting Measures

>> Excerpt from ERG Guide 153 [Substances - Toxic and/or Corrosive (Combustible)]:

>> SMALL FIRE: Dry chemical, CO2 or water spray.

>> LARGE FIRE: Dry chemical, CO2, alcohol-resistant foam or water spray. If it can be done safely, move undamaged containers away from the area around the fire. Dike runoff from fire control for later disposal.

>> FIRE INVOLVING TANKS, RAIL TANK CARS OR HIGHWAY TANKS: Fight fire from maximum distance or use unmanned master stream devices or monitor nozzles. Do not get water inside containers. Cool containers with flooding quantities of water

until well after fire is out. Withdraw immediately in case of rising sound from venting safety devices or discoloration of tank. ALWAYS stay away from tanks in direct contact with flames. (ERG, 2024)

>> Excerpt from ERG Guide 153 [Substances - Toxic and/or Corrosive (Combustible)]:

>> SMALL FIRE: Dry chemical, CO2 or water spray.

>> LARGE FIRE: Dry chemical, CO2, alcohol-resistant foam or water spray. If it can be done safely, move undamaged containers away from the area around the fire. Dike runoff from fire control for later disposal.

>> FIRE INVOLVING TANKS, RAIL TANK CARS OR HIGHWAY TANKS: Fight fire from maximum distance or use unmanned master stream devices or monitor nozzles. Do not get water inside containers. Cool containers with flooding quantities of water until well after fire is out. Withdraw immediately in case of rising sound from venting safety devices or discoloration of tank. ALWAYS stay away from tanks in direct contact with flames. (ERG, 2024)

>> Excerpt from ERG Guide 153 [Substances - Toxic and/or Corrosive (Combustible)]:

>> SMALL FIRE: Dry chemical, CO2 or water spray.

>> LARGE FIRE: Dry chemical, CO2, alcohol-resistant foam or water spray. If it can be done safely, move undamaged containers away from the area around the fire. Dike runoff from fire control for later disposal.

>> FIRE INVOLVING TANKS, RAIL TANK CARS OR HIGHWAY TANKS: Fight fire from maximum distance or use unmanned master stream devices or monitor nozzles. Do not get water inside containers. Cool containers with flooding quantities of water until well after fire is out. Withdraw immediately in case of rising sound from venting safety devices or discoloration of tank. ALWAYS stay away from tanks in direct contact with flames. (ERG, 2024)

>> Move container from fire area if it can be done without risk; fight fire from maximum distance; dike fire control water for later disposal, do not scatter the material. Small fires: dry chemical, carbon dioxide, water spray or foam (alcohol); large fires: water spray, fog or foam; use water spray to cool containers in fire area. (EPA, 1998)

>> Use water spray, alcohol-resistant foam, powder, carbon dioxide.

6. Accidental Release Measures

Isolation and Evacuation:

Isolation and evacuation measures to take when a large amount of this chemical is accidentally released in an emergency.

>> Excerpt from ERG Guide 153 [Substances - Toxic and/or Corrosive (Combustible)]:

>> IMMEDIATE PRECAUTIONARY MEASURE: Isolate spill or leak area in all directions for at least 50 meters (150 feet) for liquids and at least 25 meters (75 feet) for solids.

>> SPILL: Increase the immediate precautionary measure distance, in the downwind direction, as necessary.

>> FIRE: If tank, rail tank car or highway tank is involved in a fire, ISOLATE for 800 meters (1/2 mile) in all directions; also, consider initial evacuation for 800 meters (1/2 mile) in all directions. (ERG, 2024)

Evacuation: ERG 2024, Guide 153 (Phenol, solid)

>> Immediate precautionary measure

>> Isolate spill or leak area in all directions for at least 50 meters (150 feet) for liquids and at least 25 meters (75 feet) for solids.

>> Spill

>> For non-highlighted materials: increase the immediate precautionary measure distance, in the downwind direction, as necessary.

>> Fire

>> If tank, rail tank car or highway tank is involved in a fire, ISOLATE for 800 meters (1/2 mile) in all directions; also, consider initial evacuation for 800 meters (1/2 mile) in all directions.

Evacuation: ERG 2024, Guide 153 (Phenol, molten)

>> Immediate precautionary measure

>> Isolate spill or leak area in all directions for at least 50 meters (150 feet) for liquids and at least 25 meters (75 feet) for solids.

>> Spill

>> For non-highlighted materials: increase the immediate precautionary measure distance, in the downwind direction, as necessary.

>> Fire

>> If tank, rail tank car or highway tank is involved in a fire, ISOLATE for 800 meters (1/2 mile) in all directions; also, consider initial evacuation for 800 meters (1/2 mile) in all directions.

Spillage Disposal:

Methods for containment and safety measures to protect workers dealing with a spillage of this chemical.

>> Personal protection: chemical protection suit including self-contained breathing apparatus. Do NOT let this chemical enter the environment. Sweep spilled substance into covered sealable containers. If appropriate, moisten first to prevent dusting. Carefully collect remainder. Then store and dispose of according to local regulations.

Accidental Release Measures

Public Safety: ERG 2024, Guide 153 (Phenol, solid)

>> CALL 911. Then call emergency response telephone number on shipping paper. If shipping paper not available or no answer, refer to appropriate telephone number listed on the inside back cover.

>> Keep unauthorized personnel away.

>> Stay upwind, uphill and/or upstream.

>> Ventilate closed spaces before entering, but only if properly trained and equipped.

Spill or Leak: ERG 2024, Guide 153 (Phenol, solid)

>> ELIMINATE all ignition sources (no smoking, flares, sparks or flames) from immediate area.

>> Do not touch damaged containers or spilled material unless wearing appropriate protective clothing.

>> Stop leak if you can do it without risk.

>> Prevent entry into waterways, sewers, basements or confined areas.

>> Absorb or cover with dry earth, sand or other non-combustible material and transfer to containers.

>> DO NOT GET WATER INSIDE CONTAINERS.

Public Safety: ERG 2024, Guide 153 (Phenol, molten)

>> CALL 911. Then call emergency response telephone number on shipping paper. If shipping paper not available or no answer, refer to appropriate telephone number listed on the inside back cover.

>> Keep unauthorized personnel away.

>> Stay upwind, uphill and/or upstream.

>> Ventilate closed spaces before entering, but only if properly trained and equipped.

Spill or Leak: ERG 2024, Guide 153 (Phenol, molten)

>> ELIMINATE all ignition sources (no smoking, flares, sparks or flames) from immediate area.

>> Do not touch damaged containers or spilled material unless wearing appropriate protective clothing.

>> Stop leak if you can do it without risk.

>> Prevent entry into waterways, sewers, basements or confined areas.

>> Absorb or cover with dry earth, sand or other non-combustible material and transfer to containers.

>> DO NOT GET WATER INSIDE CONTAINERS.

7. Handling And Storage

Safe Storage:

>> Provision to contain effluent from fire extinguishing. Separated from strong oxidants and food and feedstuffs. Dry. Well closed. Store only in original container. Keep in a well-ventilated room. Store in an area without drain or sewer access.

Storage Conditions:

>> Phenol should be stored in closed containers in an area which is adequate to ensure that airborne phenol concentrations do not exceed 20 mg/cu m. Conditions shall be controlled to prevent overheating and the buildup of pressure in phenol containers. Storage tanks must be electrically grounded and bonded to transfer lines. Transfer and storage systems shall be designed and operated to prevent blockage by condensed phenol. Open flames are prohibited when drums of phenol are heated to melt the contents. The internal pressure will be vented by placing the drums with

the bung up and the bung loosened. The bungs shall be tightened prior to moving or handling drums. Drums, carboys, or other containers of phenol shall be closed while being handled or moved. Transfer from such containers shall be done carefully to avoid splashes, spills, or other possible circumstances by which an employee may come in contact with phenol. Bulk storage facilities shall be designed and constructed to contain any leaks or spills.

8. Exposure Control/ Personal Protection

REL-TWA (Time Weighted Average)

>> 5 ppm (19 mg/m³)

REL-C (Ceiling)

>> 15.6 ppm (60 mg/m³) [15 minutes]

>> TWA 5 ppm (19 mg/m3) C 15.6 ppm (60 mg/m3) [15-minute] [skin]

>> 5.0 [ppm]

PEL-TWA (8-Hour Time Weighted Average)

>> 5 ppm (19mg/m³)

>> 5.0 [ppm]

>> 5 ppm as TWA; (skin); A4 (not classifiable as a human carcinogen); BEI issued.

TLV-TWA (Time Weighted Average)

>> 5 ppm [1992]

EU-OEL

>> 8 mg/m

MAK (Maximale Arbeitsplatz Konzentration)

>> skin absorption (H); carcinogen category: 3; germ cell mutagen group: 3B.

Emergency Response: ERG 2024, Guide 153 (Phenol, solid)

>> Small Fire

>> Dry chemical, CO2 or water spray.

>> Large Fire

>> Dry chemical, CO2, alcohol-resistant foam or water spray.

>> If it can be done safely, move undamaged containers away from the area around the fire.

>> Dike runoff from fire control for later disposal.

>> Fire Involving Tanks, Rail Tank Cars or Highway Tanks

>> Fight fire from maximum distance or use unmanned master stream devices or monitor nozzles.

>> Do not get water inside containers.

>> Cool containers with flooding quantities of water until well after fire is out.

>> Withdraw immediately in case of rising sound from venting safety devices or discoloration of tank.

>> ALWAYS stay away from tanks in direct contact with flames.

Emergency Response: ERG 2024, Guide 153 (Phenol, molten)

>> Small Fire

>> Dry chemical, CO2 or water spray.

>> Large Fire

>> Dry chemical, CO2, alcohol-resistant foam or water spray.

>> If it can be done safely, move undamaged containers away from the area around the fire.

>> Dike runoff from fire control for later disposal.

>> Fire Involving Tanks, Rail Tank Cars or Highway Tanks

>> Fight fire from maximum distance or use unmanned master stream devices or monitor nozzles.

>> Do not get water inside containers.

>> Cool containers with flooding quantities of water until well after fire is out.

>> Withdraw immediately in case of rising sound from venting safety devices or discoloration of tank.

>> ALWAYS stay away from tanks in direct contact with flames.

>> ERPG-1: 10 ppm - one hour exposure limit: 1 = mild transient health effects or objectionable odor [AIHA]

>> ERPG-2: 50 ppm - one hour exposure limit: 2 = impaired ability to take protective action [AIHA]

>> ERPG-3: 200 ppm - one hour exposure limit: 3 = life threatening health effects [AIHA]

Inhalation Risk:

>> A harmful concentration of airborne particles can be reached quickly when dispersed, especially if powdered.

Effects of Short Term Exposure:

>> The substance and the vapour are corrosive to the eyes, skin and respiratory tract. Corrosive on ingestion. Inhalation of the vapour may cause lung oedema, but only after initial corrosive effects on eyes and/or airways have become manifest. The substance may cause effects on the central nervous system, heart and kidneys. This may result in convulsions, coma, cardiac disorders, respiratory failure and collapse. The effects may be delayed. Medical observation is indicated. Exposure could cause death.

Effects of Long Term Exposure:

>> The substance may have effects on the liver, kidneys and nervous system.

Acceptable Daily Intakes:

An estimate of the amount of a chemical in food or drinking water that can be consumed daily over a lifetime without presenting an appreciable risk to health. It is usually expressed as milligrams of the substance per kilogram of body weight per day and applies to chemicals such as food additives, pesticide residues and veterinary drugs.

>> Calculated acceptable daily intake= 0.1 mg/kg.

Fire Prevention

>> NO open flames. NO contact with strong oxidizing agents. Above 79 °C use a closed system and ventilation.

Exposure Prevention

>> AVOID ALL CONTACT! FIRST AID: USE PERSONAL PROTECTION. IN ALL CASES CONSULT A DOCTOR!

Inhalation Prevention

>> Avoid inhalation of dust and mist. Use ventilation, local exhaust or breathing protection.

Skin Prevention

>> Protective gloves. Protective clothing.

Eye Prevention

>> Wear face shield or eye protection in combination with breathing protection.

Ingestion Prevention

>> Do not eat, drink, or smoke during work. Wash hands before eating.

Exposure Control and Personal Protection

Protective Clothing: ERG 2024, Guide 153 (Phenol, solid)

>> Wear positive pressure self-contained breathing apparatus (SCBA).

>> Wear chemical protective clothing that is specifically recommended by the manufacturer when there is NO RISK OF FIRE.

>> Structural firefighters' protective clothing provides thermal protection but only limited chemical protection.

Protective Clothing: ERG 2024, Guide 153 (Phenol, molten)

>> Wear positive pressure self-contained breathing apparatus (SCBA).

>> Wear chemical protective clothing that is specifically recommended by the manufacturer when there is NO RISK OF FIRE.

>> Structural firefighters' protective clothing provides thermal protection but only limited chemical protection.

Exposure Summary

>> Biological Exposure Indices (BEI) [ACGIH] - Total phenol in urine = 250 mg/g creatinine; end of shift;

RD50 (Exposure concentration producing a 50% respiratory rate decrease)

>> 166.0 [mmHg]

9. Physical And Chemical Properties

Molecular Weight:

>> 94.11

Exact Mass:

>> 94.041864811

Physical Description:

>> Phenol solution, [aqueous] is a white crystalline mass dissolved in an aqueous solution. Solution may be colorless to slightly pink in color with a distinctive phenol odor; sharp burning taste. Aqueous solution will be acidic and act as such. Toxic by ingestion, inhalation and skin absorption; strong irritant to tissues.

>> COLOURLESS-TO-YELLOW OR LIGHT PINK CRYSTALS WITH CHARACTERISTIC ODOUR.

Color/Form:

>> Colorless acicular crystals or white, crystalline mass

Odor:

>> Distinct aromatic, somewhat sickening sweet and acrid odor, discernable at 0.5 to 5 ppm

Taste:

The sensation of flavor perceived in the mouth and throat on contact with a substance.

>> Sharp, burning taste

Boiling Point:

>> 360 °F at 760 mmHg (NTP, 1992)

>> 182 °C

Melting Point:

>> 109 °F (NTP, 1992)

>> 41 °C

Flash Point:

>> 175 °F (NTP, 1992)

>> 79 °C c.c.

Solubility:

>> 50 to 100 mg/mL at 66 °F (NTP, 1992)

>> Solubility in water, g/l at 20 °C: 84 (moderate)

Density:

>> 1.04 at 105.8 °F (USCG, 1999) - Denser than water; will sink

>> 1.06 g/cm³

Vapor Density:

>> 3.24 (NTP, 1992) - Heavier than air; will sink (Relative to Air)

>> Relative vapor density (air = 1): 3.2

Vapor Pressure:

>> 0.2 mmHg at 68 °F ; 0.35 mmHg at 77 °F (NTP, 1992)

>> Vapor pressure, Pa at 20 °C: 47

LogP:

>> 1.46

LogS:

The base-10 logarithm of the aqueous solubility of this compound.

Stability/Shelf Life:

>> Prone to redden on exposure to air and light, hastened by presence of alkalinity.

Autoignition Temperature:

>> 1319 °F (USCG, 1999)

>> 715 °C

Decomposition:

>> When heated to decomposition it emits acrid smoke and irritating fumes.

Viscosity:

>> 3.437 mPa s @ 50 °C; 1.784 mPa s @ 75 °C; 1.099 mPa s @ 100 °C

Corrosivity:

The ability of a chemical to damage or destroy other substances when it comes into contact.

>> Caustic

Heat of Combustion:

>> 3053.5 kJ/mol (solid)

Heat of Vaporization:

>> 57.82 kJ/mol @ 25 °C

pH:

pH is an expression of hydrogen ion concentration in water. Specifically, pH is the negative logarithm of hydrogen ion (H+) concentration (mol/L) in an aqueous solution. The term is used to indicate basicity or acidity of a solution on a scale of 0 to 14, with pH 7 being neutral.

>> about 6.0 (aq soln)

Surface Tension:

>> 38.20 mN/m @ 50 °C; 35.53 mN/m @ 75 °C; 32.86 mN/m @ 100 °C

Ionization Potential:

>> 8.50 eV

Odor Threshold:

>> Odor Threshold Low: 0.0045 [mmHg]

>> Odor Threshold High: 1.0 [mmHg]

>> Detection odor threshold from AIHA (mean = 0.060 ppm)

Refractive Index:

>> Index of refraction: 1.5408 @ 41 °C

Dissociation Constants:

pKa

>> 9.99 (at 25 °C)

>> pKa = 9.99 @ 25 °C

10. Stability And Reactivity

>> Water soluble.

CSL No

>> CSL00154

Reactants/Reagents

>> Phenol + Paraformaldehyde

Warning Message

>> Unexpected raise of pressure due to closure of venting system. The formation of phenol-formaldehyde resins in batch reactors is known for potential runaway reactions.

Functional Group

>> Aldehyde

Reaction Scale

>> Not Available

Additional Information

>> Substance identification sources: Phenol. CAS Common Chemistry. CAS, a division of the American Chemical Society, n.d. https://commonchemistry.cas.org/detail?cas_rn=108-95-2 (retrieved 2022-01-27) (CAS RN: 108-95-2). Paraformaldehyde. CAS Common Chemistry. CAS, a division of the American Chemical Society, n.d. https://commonchemistry.cas.org/detail?cas_rn=30525-89-4 (retrieved 2022-01-27) (CAS RN: 30525-89-4).

Reference Source

>> User Reported

Modified Date

>> 01/27/2022

Create Date

>> 01/27/2022

GHS Category

>> Explosive

11. Toxicological Information

Toxicity Summary:

>> HUMAN TOXICITY: Phenol is toxic with a probable oral lethal dose to humans of 50-500 mg/kg. Some individuals may be hypersensitive with lethality or serious effects at very low exposures. Rapid absorption and severe systemic toxicity can occur after any route of exposure including skin. Death and severe toxicity are usually due to effects on the CNS, heart, blood vessels, lung, and kidneys. However, toxic manifestations may vary somewhat with the route. Observed effects from acute exposure may include: shock, delirium, coma, pulmonary distress, phenolic breath, scanty/dark urine, and death. Protracted or chronic exposure usually results in major damage to the liver, kidneys and eyes. Pigmentary changes of the skin have been noted. Consumption of water contaminated with phenol resulted in diarrhea, mouth sores, burning of the mouth, and dark urine. Phenol is highly caustic to tissues. Skin exposure results in pain, then numbness, blanching, severe burns, and eschar formation. Ingestion leads to burning of throat and severe gastrointestinal inflammation. Inhalation can result in pulmonary irritation and edema. ANIMAL TOXICITY: Toxicity in animals is similar to that of humans, although additional effects have been observed. LD50's in animals range from 250-500 mg/kg, differing very little with route of exposure or species, except for the cat which is unusually susceptible with an oral lethal dose of 80 mg/kg. Additional reported toxic effects include irritation and corrosivity of skin and eyes in rabbits, induction of skin tumors in mice, reproductive effects in rats, and mutagenicity with Salmonella, E coli and Drosophila. Phenol is also highly toxic to aquatic life and frogs. METABOLISM: Phenol is metabolized and excreted principally by the kidneys as the sulfate or glucuronide, although some phenol may be excreted unchanged, especially at high doses. Other reported metabolites include hydroquinone, other quinones and catechols.

USGS Health-Based Screening Levels for Evaluating Water-Quality:

This section provides the USGS Health-Based Screening Levels for Evaluating Water-Quality data.

Chemical

>> Phenol

Noncancer HBSL (Health-Based Screening Level)[µg/L]

>> 2000

Benchmark Remarks

>> An exception to the HBSL methodology was made as recommended by USEPA OW and OPP to use the RfD from IRIS instead of the more recent RfD from OPP.

Reference

>> Smith, C.D. and Nowell, L.H., 2024. Health-Based Screening Levels for evaluating water-quality data (3rd ed.). DOI:10.5066/F71C1TWP

Evidence for Carcinogenicity:

Evidence that this chemical does or may cause cancer. The information here is collected from various sources by the Hazardous Substances Data Bank (HSDB).

>> Evaluation: There is inadequate evidence in humans for the carcinogenicity of phenol. There is inadequate evidence in experimental animals for the carcinogenicity of phenol. Overall evaluation: Phenol is not classifiable as to its carcinogenicity to humans (Group 3).

Carcinogen Classification:

This section provides the International Agency for Research on Cancer (IARC) Carcinogenic Classification and related monograph links. In the IARC Carcinogenic classification, chemicals are categorized into four groups: Group 1 (carcinogenic to humans), Group 2A (probably carcinogenic to humans), Group 2B (possibly carcinogenic to humans), and Group 3 (not classifiable as to its carcinogenicity to humans).

IARC Carcinogenic Agent

>> Phenol

IARC Carcinogenic Classes

>> Group 3: Not classifiable as to its carcinogenicity to humans

IARC Monographs

>> Volume 47: (1989) Some Organic Solvents, Resin Monomers and Related Compounds, Pigments and Occupational Exposures in Paint Manufacture and Painting

>> Volume 71: (1999) Re-evaluation of Some Organic Chemicals, Hydrazine and Hydrogen Peroxide (Part 1, Part 2, Part 3)

>> 3, not classifiable as to its carcinogenicity to humans. (L135)

Health Effects:

>> Long-term exposure to phenol at work has been associated with cardiovascular disease, irritation of the respiratory tract and muscle twitching depedning of the route of exposure. Ingestion of liquid products containing concentrated phenol can cause serious gastrointestinal damage and even death. Application of concentrated phenol to the skin can cause severe skin damage. Longer-term exposure to high levels of phenol caused damaged to the heart, kidneys, liver, and lungs. Liver effects, as judged by increased serum activities of alanine aminotransferase (ALT) and aspartate amino transferase (AST), were also reported in a case of prolonged inhalation exposure to phenol. (L624)

Exposure Routes:

>> Serious local effects by all routes of exposure.

>> inhalation, skin absorption, ingestion, skin and/or eye contact

Inhalation Exposure

>> Sore throat. Burning sensation. Cough. Dizziness. Headache. Shortness of breath. Laboured breathing. Unconsciousness. Symptoms may be delayed.

Skin Exposure

>> MAY BE ABSORBED! Serious skin burns. Numbness. Convulsions. Collapse. Unconsciousness.

Eye Exposure

>> Pain. Redness. Loss of vision. Severe burns.

Ingestion Exposure

>> Sore throat. Burns in mouth and throat. Convulsions. Abdominal pain. Diarrhoea. Shock or collapse.

>> irritation eyes, nose, throat; anorexia, weight loss; lassitude (weakness, exhaustion), muscle ache, pain; dark urine; cyanosis; liver, kidney damage; skin burns; dermatitis; ochronosis; tremor, convulsions, twitching

Target Organs:

Organs that are affected by exposure to this chemical. Information in this section reflects human data unless otherwise noted.

>> Body Weight, Dermal (Skin), Hepatic (Liver), Renal (Urinary System or Kidneys), Respiratory (From the Nose to the Lungs)

Adverse Effects:

An adverse effect is an undesired harmful effect resulting from a medical treatment or other intervention.

>> Neurotoxin - Other CNS neurotoxin

>> Occupational hepatotoxin - Secondary hepatotoxins: the potential for toxic effect in the occupational setting is based on cases of poisoning by human ingestion or animal experimentation.

>> Nephrotoxin - The chemical is potentially toxic to the kidneys in the occupational setting.

>> Methemoglobinemia - The presence of increased methemoglobin in the blood; the compound is classified as secondary toxic effect

>> Dermatotoxin - Skin burns.

>> ACGIH Carcinogen - Not Classifiable.

Toxicity Data:

>> LC50 (rat) = 316 mg/m3 (duration not stated);

Minimum Risk Level:

The minimal risk level (MRL) is an estimate of the amount of a chemical a person can eat, drink, or breathe each day without a detectable risk to health

>> Acute Oral: 1 mg/kg/day (Rat) (L624)

Interactions:

>> ...Nine primates received 0.5 ml of either 3% phenol in saline (n=4) or 6% phenol in saline (n=5) via lumbar epidural injection. Two additional primates received three consecutive daily epidural doses of 0.5 ml of 3% phenol in saline. Finally, 5 unoperated primates and 5 primates that received only 2 ml of radiographic contrast material served as control subjects. Two weeks after the epidural injection, spinal cords were removed and processed for histopathologic study by a neuropathologist blinded to the soln administered. None of the control animals demonstrated histopathologic changes. One animal that received 6% phenol died 3 days after injection. All phenol-treated animals demonstrated predominantly posterior root damage. Spinal cord damage was seen in all animals receiving 6% phenol, in 2 animals receiving 3% phenol single doses, and in neither animal receiving 3% phenol multiple doses. Anterior root damage occurred in all phenol-treated animals except the 4 that received single 3% phenol injections. Animals that received 6% phenol demonstrated greater lower extremity motor weakness than those in the other groups, but no clear correlation existed between extent of histopathologic changes and motor weakness.

Antidote and Emergency Treatment:

>> Because of the rapid onset of symptoms, possible increased phenol absorption with dilution, and the potential for development of seizures, activated charcoal (1 g/kg) is preferable to lavage or syrup of ipecac. In vitro studies indicated that activated charcoal efficiently absorbs phenol. A cathartic should be given after oral activated charcoal.

Human Toxicity Excerpts:

>> /HUMAN EXPOSURE STUDIES/ Chemexfoliation (chemical peeling) is being used to obtain both therapeutic (eg, actinic keratoses) and cosmetic (eg, removal of fine facial rhytides) benefits. Phenol .../is an/ agent for inducing cutaneous exfoliation, may induce cardiac arrhythmias and is toxic to the liver and kidneys. Both phenol and trichloroacetic acid may produce hypertrophic scars and/or keloids and pigmentation irregularities, may accentuate preexisting abnormalities (eg, telangiectasias, nevi, and pores), and may be associated with a flare of latent herpes virus infection. Prolonged erythema of the treated areas and persistent rhytids have been reported with both agents.

Non-Human Toxicity Excerpts:

>> /LABORATORY ANIMALS: Acute Exposure/ Inhalation of phenol was related to stimulation of central nervous system, followed by severe depression. Exposure of animals to phenol resulted in paralysis in some animal species, but not in others.

Human Toxicity Values:

Quantitative human toxicity values (e.g., lethal dose) for this compound.

>> ... Summarized oral lethality data from numerous case reports... estimated 140 mg/kg to be the minimal human oral dose at which death occurs.

Non-Human Toxicity Values:

>> LD50 Rat oral 530 mg/kg

National Toxicology Program Studies:

Reports from the National Toxicology Program, an interagency program supported by three government agencies (NIH, FDA, and CDC) within the Department of Health and Human Services. This program plays a critical role in generating, interpreting, and sharing toxicological information about chemicals of public health concerns.

>> A bioassay of phenol to test for possible carcinogenicity was conducted by providing this substance in drinking water to F344 rats and B6C3F1 mice. Groups of 50 rats and 50 mice of each sex were given drinking water containing 2,500 or 5,000 ppm phenol for 103 wk. As matched controls, groups of 50 rats and 50 mice of each sex received tap water. ... Under the conditions of this bioassay, phenol was not carcinogenic for either male or female F344 rats or male and female B6C3F1 mice. Levels of Evidence of Carcinogenicity: Male Rats: Negative; Female Rats: Negative; Male Mice: Negative; Female Mice: Negative.

TSCA Test Submissions:

Under the Toxic Substances Control Act (TSCA), EPA has broad authority to issue regulations designed to require manufacturers (including importers) or processors to test chemical substances and mixtures for health and environmental effects. This section provides information on test reports submitted for this chemical under TSCA.

>> Phenol (CAS # 108-95-2) was evaluated for subchronic dietary toxicity. The test substance was administered to male albino rats (10/group) for 28-days at a concentration level of 100 ppm (8.22 mg/kg/day); 500 ppm (42.8 mg/kg/day); and 1000 ppm (86.2 mg/kg/day). No deaths or signs of intoxication were noted among any of the animals. At autopsy, no significant gross pathologic lesions were found.

Populations at Special Risk:

>> Those affected with hepatic or kidney diseases should not be exposed to phenol for any length of time, because even intermittent exposure to vapors ... may become dangerous, particularly when ... handled at elevated temp.

12. Ecological Information

Resident Soil (mg/kg)

>> 1.90e+04

Industrial Soil (mg/kg)

>> 2.50e+05

Resident Air (ug/m3)

>> 2.10e+02

Industrial Air (ug/m3)

>> 8.80e+02

Tapwater (ug/L)

>> 5.80e+03

MCL (ug/L)

>> 1.5E+01(G)

Risk-based SSL (mg/kg)

>> 3.30e+00

Chronic Oral Reference Dose (mg/kg-day)

>> 3.00e-01

Chronic Inhalation Reference Concentration (mg/m3)

>> 2.00e-01

Volatile

>> Volatile

Mutagen

>> Mutagen

Fraction of Contaminant Absorbed in Gastrointestinal Tract

>> 1

Fraction of Contaminant Absorbed Dermally from Soil

>> 0.1

ICSC Environmental Data:

>> The substance is toxic to aquatic organisms.

Sediment/Soil Concentrations:

Concentrations of this compound in sediment/soil.

>> SOIL: Phenol concns in 21 Canadian agricultural soils exceeded the 0.02 mg/kg dry weight detection limit, and in 5 soils phenol concns exceeded 0.15 mg/kg dry weight(1). No samples exceeded 1 mg/kg dry weight(1).

Fish/Seafood Concentrations:

Concentrations of this compound in fish or seafood.

>> The USEPA caught bottomfish from 4 sites along Commencement Bay, Tacoma, WA, and edible portions of the fish were analyzed for priority pollutants, heavy metals, and pesticides(1). The highest mean level of phenol was 0.1415 ppm (Point Defiance), and the highest level was 0.22 ppm(1). In a 1983 survey of composite, nearshore whole fish samples collected from 13 Lake Michigan tributaries and Grand Traverse Bay (2 species from each site), phenol was only detected in common carp (0.16 ppm) and channel catfish (0.06 ppm) from Grand River, common carp (0.02 ppm) from Muskegon River, and common carp (0.09 ppm) from Pere Marquette River(2). In northern Alberta in a region near a pulp mill, phenol was not detected (detection limit 0.03 ppm) in 22 fish (muscle) collected in the summer and fall of 1990(3). Phenol concns (wet weight) in white croaker samples from southern California were 42 ug/kg (White Point), 96 ug/kg (Santa Monica Bay), 100 ug/kg (Belmont Pier), 116 ug/kg (Cabrillo Pier) and 231 ug/kg (Orange County)(4). Phenol was the only compound present above the GC/MS detection limit(4).

Animal Concentrations:

Concentrations of this compound in animals.

>> Phenol is a natural component of animal matter(1). Phenol concns (mg/kg) in various rabbit (n=6) tissues and wastes were: 0-0.7 (blood); 0 (CNS); 0-1.0 (kidney); 0-2.3 (lung); 0-1.6 (muscle); 0-1.6 (G.I. tract, including contents); 0-0.3 (heart, spleen, thymus, testes, adrenals); 0-3.9 (urine, 24 hr volume); 0.4-5.3 (feces, 24 hr volume)(1). Eggs (white and yolk combined) of 15 bird species were collected in the Lake Baikal region (Selenga river estuary) in Russia(2). Phenol concns ranged from <20 (Gallus gallus, domestic fowl) to 840 (Podiceps auritus, Slavonian grebe) ug/kg dry weight(2).

13. Disposal Considerations

Spillage Disposal

>> Personal protection: chemical protection suit including self-contained breathing apparatus. Do NOT let this chemical enter the environment. Sweep spilled substance into covered sealable containers. If appropriate, moisten first to prevent dusting. Carefully collect remainder. Then store and dispose of according to local regulations.

Disposal Methods

>> Incineration is the recommended method of disposal. Dissolve or mix the material with a combustible solvent and burn in a chemical incinerator equipped with an afterburner or scrubber.

>> Generators of waste (equal to or greater than 100 kg/mo) containing this contaminant, EPA hazardous waste number U188, must conform with USEPA regulations in storage, transportation, treatment and disposal of waste.

>> Waste liquor containing 50,000 ppm was adjusted to give effluent containing 1 ppm then treated with activated sludge to give final effluent containing 0.07 ppm, 10% of which was recycled to conditioning tank.

>> Chemical Treatability of Phenol; Concentration Process: Reverse Osmosis; Chemical Classification: Phenol; Scale of Study: Batch Flow; Type of Wastewater Used: Pure; Results of Study: -5.7% reduction w/CA membrane; 76.5% reduction w/C-PE1 membrane.

>> For more Disposal Methods (Complete) data for PHENOL (12 total), please visit the HSDB record page.

14. Transport Information

DOT

Phenol
6.1
UN Pack Group: II
Reportable Quantity of 1000 lb or 454 kg

IATA

Phenol
6.1,
UN Pack Group: II

15. Regulatory Information

Federal Drinking Water Guidelines:

Federal drinking water guidelines (e.g. maximum containment level (MCL)) for this chemical. In general, these guidelines are recommendations and not legally enforceable.

>> EPA 2000 ug/l

Clean Water Act Requirements:

The Clean Water Act (CWA) of 1972 establishes the basic structure for regulating discharges of pollutants into the waters of the United States and regulating quality standards for surface waters. Under CWA, the U.S. Environmental Protection Agency (EPA) developed the Toxic Pollutant List (40 CFR Part 401.15) and the Priority Pollutant List (40 CFR Part 423, Appendix A). These lists are to be used by EPA and States to develop the Effluent Guidelines regulations and ensure water quality criteria and standards.

>> Criterion (permissible level) for ambient water= 0.3 mg phenol/l.

TSCA Requirements:

This section provides information on requirements concerning this chemical under the Toxic Substances Control Act (TSCA) of 1976. TSCA provides EPA with authority to require reporting, record-keeping and testing requirements, and restrictions relating to chemical substances and/or mixtures. Certain substances are generally excluded from TSCA, including, among others, food, drugs, cosmetics and pesticides.

>> Pursuant to section 8(d) of TSCA, EPA promulagated a model Health and Safety Data Reporting Rule. The section 8(d) model rule requires manufacturers, importers, and processors of listed chemical substances and mixtures to submit to EPA copies and lists of unpublished health and safety studies. Phenol is included on this list.

Regulatory Information

The Australian Inventory of Industrial Chemicals

>> Chemical: Phenol

REACH Registered Substance

>> Status: Active Update: 04-05-2023 https://echa.europa.eu/registration-dossier/-/registered-dossier/15508

>> Status: Active Update: 23-03-2018 https://echa.europa.eu/registration-dossier/-/registered-dossier/23019

New Zealand EPA Inventory of Chemical Status

>> Phenol, molten: HSNO Approval: HSR006982 Approved with controls

16. Other Information

Toxic Combustion Products:

Toxic products (e.g., gases and vapors) produced from the combustion of this chemical.

>> Toxic and irritating vapors are generated when heated.

Other Safety Information

Chemical Assessment

>> IMAP assessments - Phenol: Human health tier II assessment