SAFETY DATA SHEET

Updated on 26/09/2024

1. Material Identification

Product Name : Hydrogen cyanide
Catalog Number : io-2513
CAS Number : 74-90-8
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)

Pictogram(s)

GHS Hazard Statements

>> H224 (82.9%): Extremely flammable liquid and vapor [Danger Flammable liquids]

>> H300+H310+H330 (15.5%): Fatal if swallowed, in contact with skin or if inhaled [Danger Acute toxicity, oral; acute toxicity, dermal; acute toxicity, inhalation]

>> H300 (92.6%): Fatal if swallowed [Danger Acute toxicity, oral]

>> H310 (92.6%): Fatal in contact with skin [Danger Acute toxicity, dermal]

>> H330 (100%): Fatal if inhaled [Danger Acute toxicity, inhalation]

>> H372 (41%): Causes damage to organs through prolonged or repeated exposure [Danger Specific target organ toxicity, repeated exposure]

>> H400 (100%): Very toxic to aquatic life [Warning Hazardous to the aquatic environment, acute hazard]

>> H410 (100%): Very toxic to aquatic life with long lasting effects [Warning Hazardous to the aquatic environment, long-term hazard]

Precautionary Statement Codes

>> P210, P233, P240, P241, P242, P243, P260, P262, P264, P270, P271, P273, P280, P284, P301+P316, P302+P352, P303+P361+P353, P304+P340, P316, P319, P320, P321, P330, P361+P364, P370+P378, P391, P403+P233, P403+P235, P405, and P501

NFPA 704 Diamond

NFPA Health Rating

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

NFPA Fire Rating

>> 4 - Materials that rapidly or completely vaporize at atmospheric pressure and normal ambient temperature or that are readily dispersed in air and burn readily.

NFPA Instability Rating

>> 1 - Materials that in themselves are normally stable but that can become unstable at elevated temperatures and pressures.

Highly Hazardous Substance:

This section provides information on this chemical as a highly hazardous substance (due to potential safety and hazards issues from its high toxicity and/or reactivity). The information in this section is from two sources: (1) Annex XVII to REACH (Registration, Evaluation, Authorisation and Restriction of Chemicals) from the European Chemicals Agency (ECHA), (2) ECHA's Candidate List of Substances of Very High Concern (SVHC) for Authorisation and (3) the List of Highly Hazardous Chemicals, Toxics and Reactives (29 CFR 1910.119 Appendix A).

OSHA Highly Hazardous Chemicals, Toxics and Reactives

>> Chemical: Hydrogen Cyanide, Anhydrous

>> Threshold: 1000 [lb]

>> Note: Hydrogen Cyanide, Anhydrous in quantities at or above above 1000lb presents a potential for a catastrophic event as a toxic or reactive highly hazardous chemical.

Health Hazards:

>> Excerpt from ERG Guide 154 [Substances - Toxic and/or Corrosive (Non-Combustible)]:

>> TOXIC and/or CORROSIVE; inhalation, ingestion or skin contact with material may cause severe injury or death. 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 154 (Hydrocyanic acid, aqueous solution, with not more than 20% hydrogen cyanide; Hydrocyanic acid, aqueous solution, with less than 5% hydrogen cyanide)

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

>> 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 154 (Hydrogen cyanide, aqueous solution, with not more than 20% hydrogen cyanide)

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

>> 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 152 (Hydrogen cyanide, stabilized (absorbed))

>> Highly toxic, may be fatal if inhaled, ingested or absorbed through skin.

>> 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 131 (Hydrogen cyanide, solution in alcohol, with not more than 45% hydrogen cyanide)

>> TOXIC; may be fatal if inhaled, ingested or absorbed through skin.

>> Inhalation or contact with some of these materials will irritate or burn skin and eyes.

>> Methyl chloroacetate (UN2295) is an eye irritant/lachrymator (causes flow of tears).

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

>> Vapors may cause dizziness or asphyxiation, especially when in closed or confined areas.

>> Runoff from fire control or dilution water may cause environmental contamination.

>> Excerpt from ERG Guide 154 [Substances - Toxic and/or Corrosive (Non-Combustible)]:

>> Non-combustible, substance itself does not burn but may decompose upon heating to produce corrosive and/or toxic fumes. Some are oxidizers and may ignite combustibles (wood, paper, oil, clothing, etc.). Corrosives in contact with metals may evolve flammable hydrogen gas. Containers may explode when heated. For electric vehicles or equipment, ERG Guide 147 (lithium ion or sodium ion batteries) or ERG Guide 138 (sodium batteries) should also be consulted. (ERG, 2024)

ERG 2024, Guide 154 (Hydrocyanic acid, aqueous solution, with not more than 20% hydrogen cyanide; Hydrocyanic acid, aqueous solution, with less than 5% hydrogen cyanide)

>> Non-combustible, substance itself does not burn but may decompose upon heating to produce corrosive and/or toxic fumes.

>> Some are oxidizers and may ignite combustibles (wood, paper, oil, clothing, etc.).

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

>> Containers may explode when heated.

>> For electric vehicles or equipment, GUIDE 147 (lithium ion or sodium ion batteries) or GUIDE 138 (sodium batteries) should also be consulted.

ERG 2024, Guide 154 (Hydrogen cyanide, aqueous solution, with not more than 20% hydrogen cyanide)

>> Non-combustible, substance itself does not burn but may decompose upon heating to produce corrosive and/or toxic fumes.

>> Some are oxidizers and may ignite combustibles (wood, paper, oil, clothing, etc.).

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

>> Containers may explode when heated.

>> For electric vehicles or equipment, GUIDE 147 (lithium ion or sodium ion batteries) or GUIDE 138 (sodium batteries) should also be consulted.

ERG 2024, Guide 152 (Hydrogen cyanide, stabilized (absorbed))

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

>> Containers may explode when heated.

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

>> Runoff may pollute waterways.

>> Substance may be transported in a molten form.

ERG 2024, Guide 131 (Hydrogen cyanide, solution in alcohol, with not more than 45% hydrogen cyanide)

>> HIGHLY FLAMMABLE: Will be easily ignited by heat, sparks or flames.

>> CAUTION: Methanol (UN1230) will burn with an invisible flame. Use an alternate method of detection (thermal camera, broom handle, etc.)

>> Vapors may form explosive mixtures with air.

>> Vapors may travel to source of ignition and flash back.

>> Most vapors are heavier than air. They will spread along the ground and collect in low or confined areas (sewers, basements, tanks, etc.).

>> Vapor explosion and poison hazard indoors, outdoors or in sewers.

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

>> Runoff to sewer may create fire or explosion hazard.

>> Containers may explode when heated.

>> Many liquids will float on water.

>> Extremely flammable. Gives off irritating or toxic fumes (or gases) in a fire. Gas/air mixtures are explosive.

Hazards Identification

ERG Hazard Classes

>> Toxic/poison by inhalation (TIH/PIH)

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3. Composition/Information On Ingredients

Chemical name : Hydrogen cyanide
CAS Number : 74-90-8
Molecular Formula : CHN
Molecular Weight : 27.0250 g/mol

4. First Aid Measures

First Aid:

>> Excerpt from ERG Guide 154 [Substances - Toxic and/or Corrosive (Non-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. (ERG, 2024)

ERG 2024, Guide 154 (Hydrocyanic acid, aqueous solution, with not more than 20% hydrogen cyanide; Hydrocyanic acid, aqueous solution, with less than 5% hydrogen cyanide)

>> 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.

>> 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 154 (Hydrogen cyanide, aqueous solution, with not more than 20% hydrogen cyanide)

>> 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.

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>> 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.

>> 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 152 (Hydrogen cyanide, stabilized (absorbed))

>> 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:

>> 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 131 (Hydrogen cyanide, solution in alcohol, with not more than 45% hydrogen cyanide)

>> 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:

>> Wash skin with soap and water.

>> In case of burns, immediately cool affected skin for as long as possible with cold water. Do not remove clothing if adhering to skin.

>> 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

>> Administration of oxygen may be needed. Fresh air, rest. Half-upright position. No mouth-to-mouth artificial respiration. Refer immediately for medical attention.

Skin First Aid

>> Wear protective gloves when administering first aid. Remove contaminated clothes. Rinse skin with plenty of water or shower. Refer immediately for medical attention.

Eye First Aid

>> First rinse with plenty of water for several minutes (remove contact lenses if easily possible), then refer for medical attention.

Ingestion First Aid

>> Rinse mouth. Administration of oxygen may be needed. NO mouth-to-mouth artificial respiration. Do NOT induce vomiting. Refer immediately for medical attention.

5. Fire Fighting Measures

>> Flashback along vapor trail may occur.

>> Excerpt from ERG Guide 154 [Substances - Toxic and/or Corrosive (Non-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 117 [Gases - Toxic - Flammable (Extreme Hazard); polymerization hazard]:

>> DO NOT EXTINGUISH A LEAKING GAS FIRE UNLESS LEAK CAN BE STOPPED.

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

>> LARGE FIRE: Water spray, fog or regular foam. If it can be done safely, move undamaged containers away from the area around the fire. Damaged cylinders should be handled only by specialists.

>> FIRE INVOLVING TANKS: Fight fire from maximum distance or use unmanned master stream devices or monitor nozzles. Cool containers with flooding quantities of water until well after fire is out. Do not direct water at source of leak or safety devices; icing may occur. 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)

>> For information on chemical warfare blood agents see the ERG Criminal or Terrorist Use of CBR Agents. (ERG, 2024)

>> Firefighting should be done from a safe distance. A few whiffs of gas, or liquid penetrating firefighter's protective clothing, could be fatal. Only special protective clothing should be worn. Water spray should be used to keep containers cool. Keep unnecessary people away; isolate hazard area and deny entry. Stay upwind; keep out of low areas. Ventilate closed spaces before entering them. Wear positive pressure breathing apparatus and special protective clothing. Evacuate area endangered by gas. Isolate for 1/2 mile in all directions if tank car or truck is involved in fire.

>> Use dry chemicals, alcohol foam, or carbon dioxide. Small fires: let burn unless leak can be stopped immediately. Large fires: water spray, fog or foam. Move container from fire area if you can do it without risk. Stay away from ends of tanks. Withdraw immediately in case of rising sound from venting safety device or any discoloration of tank due to fire. Cool container with water using unmanned device until well after fire is out. Isolate area until gas has dispersed. (EPA, 1998)

>> Excerpt from ERG Guide 152 [Substances - Toxic (Combustible)]:

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

>> LARGE FIRE: Water spray, fog or regular foam. If it can be done safely, move undamaged containers away from the area around the fire. Dike runoff from fire control for later disposal. Avoid aiming straight or solid streams directly onto the product.

>> 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. For massive fire, use unmanned master stream devices or monitor nozzles; if this is impossible, withdraw from area and let fire burn. (ERG, 2024)

>> Shut off supply; if not possible and no risk to surroundings, let the fire burn itself out. In other cases extinguish with powder, water spray, alcohol-resistant foam, carbon dioxide. In case of fire: keep cylinder cool by spraying with water. Combat fire from a sheltered position.

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

>> UN 1051, hydrogen cyanide (AC), >20% solution or anhydrous, is extremely flammable.

>> UN 1051 may be ignited by heat, sparks, or flames.

>> UN 1614, hydrogen cyanide (AC), stabilized and UN 3294, hydrogen cyanide (AC) solution in alcohol, are highly flammable.

>> UN 1614 and UN 3294 will be easily ignited by heat, sparks, or flames.

>> Caution: UN 1614 and UN 3294 have very low flash points. Use of water spray when fighting fires may be inefficient.

>> UN 1613, hydrogen cyanide (AC), not more than 20% solution, is non-combustible.

>> UN 1613 itself does not burn, but it may decompose upon heating to produce corrosive and/or toxic fumes.

>> UN 1613 may be an oxidant, and it may ignite combustibles (wood, paper, oil, clothing, etc.).

>> Vapors of UN 1051, UN 1614, or UN 3294 may travel to the source of ignition and flash back.

>> Run-off of UN 1051, UN 1614, or UN 3294 may create a fire hazard.

>> Do not extinguish a leaking gas fire of UN 1051 unless the leak can be stopped.

>> For small fires, use dry chemical, carbon dioxide, or water spray. Regular foam may also be used on small fires involving UN 1051. Alcohol-resistant foam may also be used on small fires involving UN 1614 or UN 3294.

>> For large fires involving UN 1051, use water spray, fog, or regular foam. For UN 1614 or UN 3294, use water spray, fog, or alcohol-resistant foam. For UN 1613, use dry chemical, carbon dioxide, alcohol-resistant foam, or water spray. Move containers from the fire area if it is possible to do so without risk to personnel. Dike fire control water for later disposal; do not scatter the agent. Use water spray or fog; do not use straight streams. Damaged cylinders of UN 1051 should be handled only by specialists.

>> For fire involving tanks or car/trailer loads, fight the fire from maximum distance or use unmanned hose holders or monitor nozzles. Do not get water inside containers of UN 1613. Cool containers with flooding quantities of water until well after the fire is out. Do not direct water at the source of the leak of UN 1051 or at safety devices; icing may occur. Withdraw immediately in case of rising sound from venting safety devices or discoloration of tanks. Always stay away from tanks engulfed in fire.

>> For massive fire involving UN 1614 or UN 3294, use unmanned hose holders or monitor nozzles; if this is impossible, withdraw from the area and let the fire burn.

>> Run-off from fire control or dilution water may be corrosive and/or toxic, and it may cause pollution.

>> If the situation allows, control and properly dispose of run-off (effluent).

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 154 [Substances - Toxic and/or Corrosive (Non-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: See ERG Table 1 - Initial Isolation and Protective Action Distances on the UN/NA 1613 datasheet.

>> 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 154 (Hydrocyanic acid, aqueous solution, with not more than 20% hydrogen cyanide; Hydrocyanic acid, aqueous solution, with less than 5% hydrogen cyanide)

>> 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.

Isolation

>> Small spill:

>> ISOLATE in all directions: 60 m (200 ft)

>> Large spill:

>> ISOLATE in all directions: 200 m (600 ft)

Protection

>> Small spill:

>> PROTECT people from downwind during DAY time: 0.2 km (0.1 mi)

>> PROTECT people from downwind during NIGHT time: 0.7 km (0.4 mi)

>> Large spill:

>> PROTECT people from downwind during DAY time: 0.7 km (0.5 mi)

>> PROTECT people from downwind during NIGHT time: 1.8 km (1.1 mi)

Evacuation: ERG 2024, Guide 154 (Hydrogen cyanide, aqueous solution, with not more than 20% hydrogen cyanide)

>> 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 152 (Hydrogen cyanide, stabilized (absorbed))

>> 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 131 (Hydrogen cyanide, solution in alcohol, with not more than 45% hydrogen cyanide)

>> Immediate precautionary measure

>> Isolate spill or leak area for at least 50 meters (150 feet) in all directions.

>> 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.

>> Remove all ignition sources. Evacuate danger area! Consult an expert! Personal protection: gas-tight chemical protection suit including self-contained breathing apparatus. Do NOT let this chemical enter the environment. Ventilation. Absorb remaining liquid in sand or inert absorbent. Then store and dispose of according to local regulations. NEVER direct water jet on liquid.

Accidental Release Measures

Public Safety: ERG 2024, Guide 154 (Hydrocyanic acid, aqueous solution, with not more than 20% hydrogen cyanide; Hydrocyanic acid, aqueous solution, with less than 5% hydrogen cyanide)

>> 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 154 (Hydrocyanic acid, aqueous solution, with not more than 20% hydrogen cyanide; Hydrocyanic acid, aqueous solution, with less than 5% hydrogen cyanide)

>> 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 154 (Hydrogen cyanide, aqueous solution, with not more than 20% hydrogen cyanide)

>> 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.

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

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>> 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 152 (Hydrogen cyanide, stabilized (absorbed))

>> 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.

Spill or Leak: ERG 2024, Guide 152 (Hydrogen cyanide, stabilized (absorbed))

>> 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.

>> Cover with plastic sheet to prevent spreading.

>> 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 131 (Hydrogen cyanide, solution in alcohol, with not more than 45% hydrogen cyanide)

>> 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 131 (Hydrogen cyanide, solution in alcohol, with not more than 45% hydrogen cyanide)

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

>> All equipment used when handling the product must be grounded.

>> Do not touch or walk through spilled material.

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

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

>> A vapor-suppressing foam may be used to reduce vapors.

>> Small Spill

>> Absorb with earth, sand or other non-combustible material and transfer to containers for later disposal.

>> Use clean, non-sparking tools to collect absorbed material.

>> Large Spill

>> Dike far ahead of liquid spill for later disposal.

>> Water spray may reduce vapor, but may not prevent ignition in closed spaces.

7. Handling And Storage

Safe Storage:

>> Store only if stabilized. Fireproof. Cool. Separated from food and feedstuffs and incompatible materials. See Chemical Dangers. Store in an area without drain or sewer access.

Storage Conditions:

>> Keep cylinders of hydrogen cyanide (HCN) cool and away from open flames. Make certain that HCN cylinders are adequately supported and grounded during storage and emptying. Store cylinders in a vertical position. Do not drop cylinders or damage them by impact. Cylinders must be returned to the supplier within 90 days of the filling date marked on the cylinders, regardless of whether or not the contents have been used. This is due to the possibility of HCN becoming unstable over time. If there is any indication that the HCN is becoming unstable, such as a darkening of the product or an increase in cylinder pressure, contact the supplier immediately for instructions.

8. Exposure Control/ Personal Protection

REL-STEL (Short Term Exposure Limit)

>> 4.7 ppm (5 mg/m³)

>> ST 4.7 ppm (5 mg/m3) [skin]

>> 10.0 [ppm]

PEL-TWA (8-Hour Time Weighted Average)

>> 10 ppm (11 mg/m³)

TLV-Ceiling

>> 4.7 [ppm], as CN

>> Ceiling Limit: 4.7 ppm, skin.

>> (ceiling value): 4.7 ppm as STEL; (skin).

TLV-C (Ceiling)

>> 4.7 ppm [1991]

EU-OEL

>> 1 mg/m

Emergency Response: ERG 2024, Guide 154 (Hydrocyanic acid, aqueous solution, with not more than 20% hydrogen cyanide; Hydrocyanic acid, aqueous solution, with less than 5% hydrogen cyanide)

>> 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 154 (Hydrogen cyanide, aqueous solution, with not more than 20% hydrogen cyanide)

>> 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 152 (Hydrogen cyanide, stabilized (absorbed))

>> Small Fire

>> Dry chemical, CO2 or water spray.

>> Large Fire

>> Water spray, fog or regular foam.

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

>> Dike runoff from fire control for later disposal.

>> Avoid aiming straight or solid streams directly onto the product.

>> 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.

>> For massive fire, use unmanned master stream devices or monitor nozzles; if this is impossible, withdraw from area and let fire burn.

Emergency Response: ERG 2024, Guide 131 (Hydrogen cyanide, solution in alcohol, with not more than 45% hydrogen cyanide)

>> CAUTION: The majority of these products have a very low flash point. Use of water spray when fighting fire may be inefficient.

>> CAUTION: Methanol (UN1230) will burn with an invisible flame. Use an alternate method of detection (thermal camera, broom handle, etc.)

>> Small Fire

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

>> Large Fire

>> Water spray, fog or alcohol-resistant foam.

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

>> Dike runoff from fire control for later disposal.

>> Avoid aiming straight or solid streams directly onto the product.

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

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

>> 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.

>> For massive fire, use unmanned master stream devices or monitor nozzles; if this is impossible, withdraw from area and let fire burn.

>> ERPG-1: Not appropriate - one hour exposure limit: 1 = mild transient health effects or objectionable odor [AIHA]

>> ERPG-2: 10 ppm - one hour exposure limit: 2 = impaired ability to take protective action [AIHA]

>> ERPG-3: 25 ppm - one hour exposure limit: 3 = life threatening health effects [AIHA]

Inhalation Risk:

>> A harmful contamination of the air will be reached very quickly on evaporation of this substance at 20 °C.

Effects of Short Term Exposure:

>> The substance is irritating to the eyes and respiratory tract. The substance may be irritating to the skin. The substance may cause effects on the cellular respiration. This may result in convulsions and unconsciousness. Exposure could cause death. Medical observation is indicated.

>> Hydrogen cyanide (AC) has not been classified for cancer-causing (carcinogenic) effects, and no carcinogenic effects have been reported for hydrogen cyanide (AC). No reproductive or developmental effects of hydrogen cyanide (AC) have been reported in humans. Chronically exposed workers may complain of headache, eye irritation, easy fatigue, chest discomfort, palpitations, loss of appetite (anorexia), and nosebleeds (epistaxis). Workers such as electroplaters and picklers, who are daily exposed to cyanide solutions, may develop a “cyanide” rash, characterized by itching and by macular, papular, and vesicular eruptions. Exposure to small amounts of cyanide compounds over long periods of time is reported to cause loss of appetite, headache, weakness, nausea, dizziness, and symptoms of irritation of the upper respiratory tract and eyes.

Effects of Long Term Exposure:

>> The substance may have effects on the thyroid.

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.

>> 8.4 mg/day

Fire Prevention

>> NO open flames, NO sparks and NO smoking. Closed system, ventilation, explosion-proof electrical equipment and lighting.

Exposure Prevention

>> AVOID ALL CONTACT! IN ALL CASES CONSULT A DOCTOR!

Inhalation Prevention

>> 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 154 (Hydrocyanic acid, aqueous solution, with not more than 20% hydrogen cyanide; Hydrocyanic acid, aqueous solution, with less than 5% hydrogen cyanide)

>> 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 154 (Hydrogen cyanide, aqueous solution, with not more than 20% hydrogen cyanide)

>> 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 152 (Hydrogen cyanide, stabilized (absorbed))

>> 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 131 (Hydrogen cyanide, solution in alcohol, with not more than 45% hydrogen cyanide)

>> 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

>> TIH (Toxic Inhalation Hazard) - Term used to describe gases and volatile liquids that are toxic when inhaled. Some are TIH materials themselves, e.g., chlorine, and some release TIH gases when spilled in water, e.g., chlorosilanes. [ERG 2016].

Maximum Allowable Concentration (MAK)

>> 1.9 [ppm]

9. Physical And Chemical Properties

Molecular Weight:

>> 27.025

Exact Mass:

>> 27.010899036

Physical Description:

>> Hydrocyanic acid, aqueous solution, with not more than 20% hydrogen cyanide is a clear colorless aqueous solution of a gas. Has a faint odor of almonds. Can evolve hydrogen cyanide gas, which is (barely) lighter than air. Flame can flash back to the source of a gas leak very easily. Lethal doses of gas may be inhaled. Lethal doses of cyanide can be absorbed from the solution through the skin.

>> COLOURLESS GAS OR LIQUID WITH CHARACTERISTIC ODOUR.

Color/Form:

>> Colorless gas or liquid

Odor:

>> Bitter almond odor

Taste:

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

>> Bitter, burning taste

Boiling Point:

>> 78 °F at 760 mmHg (96%) (NIOSH, 2024)

>> 26 °C

Melting Point:

>> 7 °F (96%) (NIOSH, 2024)

>> -13 °C

Flash Point:

>> 0 °F (96%) (NIOSH, 2024)

>> -18 °C c.c.

Solubility:

>> Miscible (NIOSH, 2024)

>> Solubility in water: miscible

Density:

>> 0.69 (NIOSH, 2024) - Less dense than water; will float

>> Relative density (water = 1): 0.69 (liquid)

Vapor Density:

>> 0.901 (EPA, 1998) - Lighter than air; will rise (Relative to Air)

>> Relative vapor density (air = 1): 0.94

Vapor Pressure:

>> 630 mmHg (NIOSH, 2024)

>> Vapor pressure, kPa at 20 °C: 82.6

LogP:

>> log Kow = -0.25

>> -0.25

Stability/Shelf Life:

>> Soln sensitive to light.

Autoignition Temperature:

>> 1004 °F (USCG, 1999)

>> 538 °C

Corrosivity:

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

>> Although HCN is a weak acid and normally not considered corrosive, it has a corrosive effect under two special conditions: (1) water solutions of HCN cause transcrystalline stress-cracking of carbon steels under stress even at room temperature and in dilute solution; (2) water solutions of HCN containing sulfuric acid as a stabilizer severely corrode steel above 40 °C and stainless steels above 80 °C.

Heat of Combustion:

>> 642 kJ/mol

Heat of Vaporization:

>> 25.2 kJ/mol

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.

>> Very weak acid (does not redden litmus)

Ionization Potential:

>> 13.60 eV

Polymerization:

Polymerization is a process of reacting monomer molecules together in a chemical reaction to form polymer chains or three-dimensional networks.

>> When not absolutely pure or stabilized, hydrogen cyanide polymerizes spontaneously with explosive violence.

Odor Threshold:

>> Odor Threshold Low: 2.0 [mmHg]

>> Odor Threshold High: 10.0 [mmHg]

Refractive Index:

>> Index of refraction: 1.2614 at 20 °C/D

Dissociation Constants:

>> pKa = 9.2

10. Stability And Reactivity

>> No rapid reaction with air. No rapid reaction with water.

>> Polymerizable

11. Toxicological Information

Toxicity Summary:

>> IDENTIFICATION AND USE: Hydrogen cyanide is a colorless or pale blue liquid or gas with a faint bitter almond like odor. Hydrogen cyanide is used primarily in the production of substances such as adiponitrile, methyl methacrylate, chelating agents, cyanuric chloride, methionine and its hydroxylated analogues, and sodium and potassium cyanide. Hydrogen cyanide is also used as a fumigant in ships, railroad cars, large buildings, grain silos, and flour mills, as well as in the fumigation of peas and seeds in vacuum chambers. Hydrogen cyanide is formed during the incomplete combustion of nitrogen-containing polymers, such as certain plastics, polyurethanes, and wool. Hydrogen cyanide is also present in cigarette smoke. HUMAN STUDIES: The primary targets of cyanide toxicity in humans are the cardiovascular, respiratory, and central nervous systems. The endocrine system is also a potential target for long term toxicity, as a function of continued exposure to thiocyanate, which prevents the uptake of iodine in the thyroid and acts as a goitrogenic agent. Sequelae after severe acute intoxications may include neuropsychiatric manifestations and Parkinson type disease. Cyanide from tobacco smoke has been implicated as a contributing factor in tobacco alcohol amblyopia. Long term exposure to lower concentrations of cyanide in occupational settings can result in a variety of symptoms related to central nervous system effects. Cyanides are weakly irritating to the skin and eye. ANIMAL STUDIES: The principal features of the toxicity profile for cyanide are its high acute toxicity by all routes of administration, with a very steep and rate-dependent dose effect curve, and chronic toxicity, probably mediated through the main metabolite and detoxification product, thiocyanate. The toxic effects of cyanide ion in humans and animals are generally similar and are believed to result from inactivation of cytochrome oxidase and inhibition of cellular respiration and consequent histotoxic anoxia. The primary targets of cyanide toxicity in animals are the cardiovascular, respiratory, and central nervous systems. The endocrine system is also a potential target for long-term toxicity, as a function of continued exposure to thiocyanate, which prevents the uptake of iodine in the thyroid and acts as a goitrogenic agent. In a 13 week repeated-dose toxicity study in which cyanide was administered in drinking-water, there were no clinical signs associated with central nervous system effects or histopathological effects in the brain or thyroid of rats or mice. There were slight changes in the reproductive tract in male rats. The examination of neurotoxicity in this study was limited to clinical observation and optical microscopy in autopsy. The few available studies specifically intended to investigate neurotoxicity, while reporting adverse effects at exposure levels of 1.2 mg cyanide/kg body weight per day in rats and 0.48 mg cyanide/kg body weight per day in goats, suffer from weaknesses that preclude their quantitative assessment. In relation to characterization of concentration-response for repeated-dose toxicity for inhalation (relevant principally to the occupational environment), in three separate studies in rats, there were no adverse systemic effects in rats exposed to acetone cyanohydrin, which is rapidly hydrolyzed to hydrogen cyanide at physiological pH, at concentrations up to 211 mg/cu m (corresponding to a concentration of 67 mg hydrogen cyanide/cu m). The steepness of the dose effect curve is illustrated by the observation of 30% mortality among rats exposed part of the day to 225 mg acetone cyanohydrin/cu m (71 mg hydrogen cyanide/cu m). ECOTOXICITY STUDIES: Adverse effects of exposure to the low concentrations of cyanide that are generally present in the general environment (<1 ug/cu m in ambient air; <10 ug/L in water) are unlikely.

EPA Human Health Benchmarks for Pesticides:

This section provides the EPA human health benchmarks non-enforceable drinking water levels related to adverse health effects from drinking water exposure to contaminants that have no drinking water standards or health advisories.

Chemical Substance

>> Hydrogen cyanide

Acute or One Day PAD (RfD) [mg/kg/day]

>> 0.004

Acute or One Day HHBPs [ppb]

>> 30

Acute HHBP Sensitive Lifestage/Population

>> Children

Reference (PDF)

>> Human Health Benchmarks for Pesticides - 2021 Update

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).

>> No indication of carcinogenicity to humans (not listed by IARC).

Health Effects:

>> Exposure to high levels of cyanide for a short time harms the brain and heart and can even cause coma, seizures, apnea, cardiac arrest and death. Chronic inhalation of cyanide causes breathing difficulties, chest pain, vomiting, blood changes, headaches, and enlargement of the thyroid gland. Skin contact with cyanide salts can irritate and produce sores. (L96, L97)

Exposure Routes:

>> The substance can be absorbed into the body by inhalation, through the skin and by ingestion.

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

Inhalation Exposure

>> Confusion. Drowsiness. Headache. Nausea. Shortness of breath. Convulsions. Unconsciousness. Respiratory and cardiac arrest.

Skin Exposure

>> MAY BE ABSORBED! Further see Inhalation.

Eye Exposure

>> MAY BE ABSORBED! Redness. Pain. See Inhalation.

Ingestion Exposure

>> Burning sensation. Further see Inhalation.

>> asphyxia; lassitude (weakness, exhaustion), headache, confusion; nausea, vomiting; increased rate and depth of respiration or respiration slow and gasping; thyroid, blood changes

Target Organs:

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

>> central nervous system, cardiovascular system, thyroid, blood

Adverse Effects:

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

>> Other Poison - Chemical Asphyxiant

Toxicity Data:

>> LC50 (rat) = 160 ppm/30 min

Treatment:

Treatment when exposed to toxin

>> Antidotes to cyanide poisoning include hydroxocobalamin and sodium nitrite, which release the cyanide from the cytochrome system, and rhodanase, which is an enzyme occurring naturally in mammals that combines serum cyanide with thiosulfate, producing comparatively harmless thiocyanate. Oxygen therapy can also be administered. (L97)

Interactions:

>> Co-exposure of rats to hydrogen cyanide (LC50=110 ppm) and carbon monoxide (LC50=4,600 ppm) resulted in lethal effects of these two gases that were additive. In contrast, coexposure to hydrogen cyanide and 5% carbon dioxide (not lethal by itself) resulted in an increase in lethality of hydrogen cyanide, reflected as a decrease of the hydrogen cyanide LC50 value to 75 ppm.

Antidote and Emergency Treatment:

>> Management of cyanide poisoning begins with removal to fresh air. Dermal decontamination is unnecessary if exposure has been only to vapor, but wet clothing should be removed and the underlying skin should be washed with soap and water or water alone if liquid on the skin is a possibility. Attention to the basics of intensive supportive care is critical and includes mechanical ventilation as needed, circulatory support with crystalloids and vasopressors, correction of metabolic acidosis with IV sodium bicarbonate, and seizure control with benzodiazepine administration. ... Administration of 100% oxygen has been found empirically to exert a beneficial effect and should be a part of general supportive care for every cyanide-poisoned patient. /Cyanides/

Human Toxicity Excerpts:

>> /SIGNS AND SYMPTOMS/ The dose-effect curve of the acute effects in humans is steep. Whereas slight effects occur at exposure to hydrogen cyanide levels of 20 to 40 mg/cu m, 50 to 60 mg/cu m can be tolerated without immediate or late effects for 20 min to 1 hr, 120 to 150 mg/cu m is dangerous to life and may lead to death after 0.5 to 1 hr, 150 mg/cu m is likely to be fatal within 30 min, 200 mg/cu m is likely to be fatal after 10 min, and 300 mg/cu m is immediately fatal. It should be emphasized that this represents crude average exposure estimates, based on various studies.

Non-Human Toxicity Excerpts:

>> /LABORATORY ANIMALS: Acute Exposure/ Cardiovascular effects: Bradycardia, arrhythmias, and T-wave abnormalities were observed in monkeys exposed to 100 ppm hydrogen cyanide for 30 minutes.

Human Toxicity Values:

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

>> Lethal adult dose of hydrogen cyanide is 50 mg.

Non-Human Toxicity Values:

>> LC50 Rat inhalation 3778 mg/cu m (10 sec)

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.

>> Hydrocyanic acid (CAS # 74-90-8) was evaluated for subacute inhalation toxicity in Sprague-Dawley rats (5/sex/group) administered whole-body exposures to a mean analytical concentration of 67.8 +/- 7.0 ppm for 6 hours on 3 consecutive days under dynamic conditions (2060-2200 L/min). An initial exposure was associated with hypoactivity, rapid shallow breathing, anoxia/hypoxia signs, and convulsions, followed by chromorhinorrhea, convulsions and varied signs of labored breathing. Survivors of 2 exposures exhibited rapid breathing and reduced mean bodyweight with a solitary male rat exhibiting arching of the back. Signs of toxicity associated with a third exposure were limited to hypoactivity and quick shallow breathing; mean daily bodyweight gains were restored. Mortality occurred either during or following an initial exposure in 1 and 2 males, respectively. Necropsy of these study decedents revealed cyanosis of the extremities, hemorrhagic lungs, lung and tracheal edema, blanching of the liver, chromorhinorrhea, urine-filled bladder, gaseous distention of the gastro-intestinal tract, and a solitary incidence of blood engorgement of the heart and surrounding vasculature. On terminal necropsy of study survivors, females exhibited slight to moderate hemorrhage (3/5) and grey discoloration (2/5) of the lung.

Populations at Special Risk:

>> Persons with a metabolic disturbance in the conversion of cyanide to thiocyanate may be at greater risk from the toxic effect of cyanide. /Cyanide/

12. Ecological Information

Resident Soil (mg/kg)

>> 2.30e+01

Industrial Soil (mg/kg)

>> 1.50e+02

Resident Air (ug/m3)

>> 8.30e-01

Industrial Air (ug/m3)

>> 3.50e+00

Tapwater (ug/L)

>> 1.50e+00

MCL (ug/L)

>> 2.00e+02

Risk-based SSL (mg/kg)

>> 1.50e-02

Chronic Oral Reference Dose (mg/kg-day)

>> 6.00e-04

Chronic Inhalation Reference Concentration (mg/m3)

>> 8.00e-04

Volatile

>> Volatile

Mutagen

>> Mutagen

Fraction of Contaminant Absorbed in Gastrointestinal Tract

>> 1

Soil Saturation Concentration (mg/kg)

>> 1.00e+07

ICSC Environmental Data:

>> The substance is very toxic to aquatic organisms.

13. Disposal Considerations

Spillage Disposal

>> Remove all ignition sources. Evacuate danger area! Consult an expert! Personal protection: gas-tight chemical protection suit including self-contained breathing apparatus. Do NOT let this chemical enter the environment. Ventilation. Absorb remaining liquid in sand or inert absorbent. Then store and dispose of according to local regulations. NEVER direct water jet on liquid.

Disposal Methods

>> Generators of waste (equal to or greater than 100 kg/mo) containing this contaminant, EPA hazardous waste number P063 and D003, must conform with USEPA regulations in storage, transportation, treatment and disposal of waste.

>> SRP: Wastewater from contaminant suppression, cleaning of protective clothing/equipment, or contaminated sites should be contained and evaluated for subject chemical or decomposition product concentrations. Concentrations shall be lower than applicable environmental discharge or disposal criteria. Alternatively, pretreatment and/or discharge to a permitted wastewater treatment facility is acceptable only after review by the governing authority and assurance that "pass through" violations will not occur. Due consideration shall be given to remediation worker exposure (inhalation, dermal and ingestion) as well as fate during treatment, transfer and disposal. If it is not practicable to manage the chemical in this fashion, it must be evaluated in accordance with EPA 40 CFR Part 261, specifically Subpart B, in order to determine the appropriate local, state and federal requirements for disposal.

>> Principles and methods for destruction of chemical weapons: ... "Destruction of chemical weapons" means a process by which chemicals are converted in an essentially irreversible way to a form unsuitable for production of chemical weapons, and which in an irreversible manner renders munitions and other devices unusable as such. ... Each /nation/ shall determine how it shall destroy chemical weapons, except that the following processes may not be used: dumping in any body of water, land burial or open-pit burning. It shall destroy chemical weapons only at specifically designated and appropriately designed and equipped facilities. ... Each /nation/ shall ensure that its chemical weapons destruction

facilities are constructed and operated in a manner to ensure the destruction of the chemical weapons; and that the destruction process can be verified under the provisions of this Convention.

>> Rotary kiln, heat recovery boiler, reduction furnace and quench chambers are appropriate technologies for incineration of gaseous hydrogen cyanide and hydrogen gas.

>> Potential candidate for rotary kiln incineration, with a temperature range of 820 to 1,600 °C and a residence time of seconds. Also, a potential candidate for fluidized bed incineration, with a temperature range of 450 to 980 °C and a residence time of seconds. Also, a potential candidate for liquid injection incineration, with a temperature range of 650 to 1,600 °C and a residence time of 0.1 to 2 seconds.

14. Transport Information

DOT

Hydrogen cyanide
6.1
UN Pack Group: I
Reportable Quantity of 10 lb or 4

IATA

Hydrogen cyanide
6.1, 3
UN Pack Group: I

15. Regulatory Information

DHS Chemicals of Interest (COI):

This section provides the Department of Homeland Security (DHS) Chemicals of Interest (COI) and related information (Ref: 6 eCFR part 27 - https://www.ecfr.gov/current/title-6/chapter-I/part-27).

Chemicals of Interest(COI)

>> Hydrocyanic acid

Release: Minimum Concentration (%)

>> 1

Release: Screening Threshold Quantities (in pounds)

>> 2500

Security Issue: Release - Toxic

>> Toxic chemical that can be released at a facility.

Theft: Minimum Concentration (%)

>> 4.67

Theft: Screening Threshold Quantities (in pounds unless otherwise noted)

>> 15

Security Issue: Theft - WME

>> Weapons of Mass Effect chemical material that, if stolen or diverted, can be converted into weapons using simple chemistry, equipment, or techniques.

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.

>> Hydrogen cyanide is designated as a hazardous substance under section 311(b)(2)(A) of the Federal Water Pollution Control Act and further regulated by the Clean Water Act Amendments of 1977 and 1978. These regulations apply to

discharges of this substance. This designation includes any isomers and hydrates, as well as any solutions and mixtures containing this substance.

Regulatory Information

The Australian Inventory of Industrial Chemicals

>> Chemical: Hydrocyanic acid

REACH Registered Substance

>> Status: Active Update: 26-03-2019 https://echa.europa.eu/registration-dossier/-/registered-dossier/14996

New Zealand EPA Inventory of Chemical Status

>> Hydrogen cyanide: Does not have an individual approval but may be used as a component in a product covered by a group standard. It is not approved for use as a chemical in its own right.

16. Other Information

Toxic Combustion Products:

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

>> Extremely toxic vapors /unspecified/ are generated even at ordinary temperatures.

Other Safety Information

Chemical Assessment

>> IMAP assessments - Hydrocyanic acid: Human health tier I assessment

Methods of Dissemination

>> Indoor Air: Hydrogen cyanide (AC) can be released into indoor air as a liquid spray (aerosol) or as a gas.

>> Water: Hydrogen cyanide (AC) can be used to contaminate water.

>> Food: Hydrogen cyanide (AC) can be used to contaminate food.

>> Outdoor Air: Hydrogen cyanide (AC) can be released into outdoor air as a liquid spray (aerosol) or as a gas.

>> Agricultural: If hydrogen cyanide (AC) is released into the air as a liquid spray (aerosol), it has the potential to contaminate agricultural products. If hydrogen cyanide (AC) is released as a gas, it is highly unlikely to contaminate agricultural products.

"The information provided is believed to be accurate but is not comprehensive and should be used as a reference. It reflects our current knowledge and is intended for safety guidance related to the product. This document does not constitute a warranty of the product's properties. Ionz is not responsible for any damages resulting from handling or contact with the product incorrectly."