ionz

SAFETY DATA SHEET

Updated on 26/09/2024

1. Material Identification

Product Name : Potassium cyanide
Catalog Number : io-2893
CAS Number : 151-50-8
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

>> H290 (24.7%): May be corrosive to metals [Warning Corrosive to Metals]

>> H300+H310+H330 (32.8%): Fatal if swallowed, in contact with skin or if inhaled [Danger Acute toxicity, oral; acute toxicity, dermal; acute toxicity, inhalation]

>> H300 (99.8%): Fatal if swallowed [Danger Acute toxicity, oral]

>> H310 (99.8%): Fatal in contact with skin [Danger Acute toxicity, dermal]

>> H315 (11.5%): Causes skin irritation [Warning Skin corrosion/irritation]

>> H318 (10.8%): Causes serious eye damage [Danger Serious eye damage/eye irritation]

>> H330 (99.8%): Fatal if inhaled [Danger Acute toxicity, inhalation]

>> H370 (18.6%): Causes damage to organs [Danger Specific target organ toxicity, single exposure]

>> H372 (56.1%): Causes damage to organs through prolonged or repeated exposure [Danger Specific target organ toxicity, repeated exposure]

>> H400 (99.8%): Very toxic to aquatic life [Warning Hazardous to the aquatic environment, acute hazard]

>> H410 (99.5%): Very toxic to aquatic life with long lasting effects [Warning Hazardous to the aquatic environment, long-term hazard]

Precautionary Statement Codes

>> P234, P260, P262, P264, P264+P265, P270, P271, P273, P280, P284, P301+P316, P302+P352, P304+P340, P305+P354+P338, P308+P316, P316, P317, P319, P320, P321, P330, P332+P317, P361+P364, P362+P364, P390, P391, P403+P233, P405, P406, and P501

Health Hazards:

>> It is classified as super toxic. Probable oral lethal dose in humans is less than 5 mg/kg or less than a taste (7 drops) for a 150 lb. person. It is an eye and skin irritant. Poisonous in very small quantities; a taste is lethal. (EPA, 1998)

ERG 2024, Guide 157 (Potassium cyanide, solid; Potassium cyanide, solution)

>> TOXIC and/or CORROSIVE; inhalation, ingestion or contact (skin, eyes) with vapors, dusts or substance may cause severe injury, burns or death.

>> Reaction with water or moist air may release toxic, corrosive or flammable gases.

>> Reaction with water may generate much heat that will increase the concentration of fumes in the air.

>> Fire will 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 157 (Potassium cyanide, solution; Potassium cyanide, solid)

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

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

>> Contact with acid releases highly flammable hydrogen cyanide gas. Moisture may cause this material to volatilize as hydrogen cyanide. When heated to decomposition, it emits very toxic fumes of cyanide and nitrogen oxides. Reacts with acids to produce hydrogen cyanide gas. Reacts with strong oxidizers such as nitrates and chlorates, nitrogen trichloride; perchloryl fluoride; sodium nitrate; acids; alkaloids; chloral hydrate; iodine. Avoid contact with acids. (EPA, 1998)

ERG 2024, Guide 157 (Potassium cyanide, solid; Potassium cyanide, solution)

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

>> UN1802, UN2032, UN3084, UN3093, UN1796 (above 50%), UN1826 (above 50%), and UN2031 (above 65%) may act as oxidizers. Also consult GUIDE 140.

>> Vapors may accumulate in confined areas (basement, tanks, hopper/tank cars, etc.).

>> Substance may react with water (some violently), releasing corrosive and/or toxic gases and runoff.

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

>> Containers may explode when heated or if contaminated with water.

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>> Substance may react with water (some violently), releasing corrosive and/or toxic gases and runoff.

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

>> Containers may explode when heated or if contaminated with water.

>> Not combustible but forms flammable gas on contact with water or damp air. Gives off irritating or toxic fumes (or gases) in a fire.

Hazards Identification

ERG Hazard Classes

>> Water-reactive material (WR)

3. Composition/Information On Ingredients

Chemical name : Potassium cyanide
CAS Number : 151-50-8
Molecular Formula : CKN
Molecular Weight : 65.1160 g/mol

4. First Aid Measures

First Aid:

>> Warning: Effects may be delayed. Caution is advised. Vital signs should be monitored closely. Heart palpitation may occur within minutes after exposure.

>> Signs and Symptoms of Acute Potassium Cyanide Exposure: Signs and symptoms of acute exposure to potassium cyanide may include hypertension (high blood pressure) and tachycardia (rapid heart rate), followed by hypotension (low blood pressure) and bradycardia (slow heart rate). Cardiac arrhythmias and other cardiac abnormalities are common. Cyanosis (blue tint to the skin and mucous membranes), and cherry-red or bloody mucous membranes may appear. Tachypnea (rapid respiratory rate) may be followed by respiratory depression. Lung hemorrhage and pulmonary edema may occur. Headache, vertigo (dizziness), agitation, and giddiness may precede combative behavior, convulsions, paralysis, protruding eyeballs, dilated and unreactive pupils, and coma. Potassium cyanide is irritating to the skin, eyes, and mucous membranes. Lacrimation (tearing) and a burning sensation of the mouth and throat are common. Salivation, nausea, and vomiting may also occur.

>> Emergency Life-Support Procedures: Acute exposure to potassium cyanide may require decontamination and life support for the victims. All exposed persons should be transported to a health care facility as quickly as possible. Emergency personnel should wear protective clothing appropriate to the type and degree of contamination. Air-purifying or supplied-air respiratory equipment should also be worn, as necessary. Rescue vehicles should carry supplies such as plastic sheeting and disposable plastic bags to assist in preventing spread of contamination.

>> Inhalation Exposure:

>> 1. Move victims to fresh air. Emergency personnel should avoid self-exposure to potassium cyanide.

>> 2. Evaluate vital signs including pulse and respiratory rate, and note any trauma. If no pulse is detected, provide CPR. If not breathing, provide artificial respiration. IMMEDIATELY begin administering 100% oxygen to all victims. Monitor victims for respiratory distress.Warning: To prevent self-poisoning, avoid mouth-to-mouth breathing; use a forced-oxygen mask. Direct oral contact with potassium cyanide- contaminated persons or their gastric contents can result in self-poisoning.

>> 3. RUSH to a health care facility!

>> 4. Obtain authorization and/or further instructions from the local hospital for administration of an antidote or performance of other invasive procedures.

>> Dermal/Eye Exposure:

>> 1. Remove victims from exposure. Emergency personnel should avoid self- exposure to potassium cyanide.

>> 4. Remove contaminated clothing as soon as possible.

>> 5. If eye exposure has occurred, eyes must be flushed with lukewarm water for at least 15 minutes.

>> 6. Wash exposed skin areas twice with soap and water.

>> 7. Obtain authorization and/or further instructions from the local hospital for administration of an antidote or performance of other invasive procedures.

>> Ingestion Exposure:

>> 1. Evaluate vital signs including pulse and respiratory rate, and note any trauma. If no pulse is detected, provide CPR. If not breathing, provide artificial respiration. IMMEDIATELY begin administering 100% oxygen to all victims. Monitor victims for respiratory distress.Warning: To prevent self-poisoning, avoid mouth-to-mouth breathing; use a forced-oxygen mask. Direct oral contact with potassium cyanide- contaminated persons or their gastric contents can result in self-poisoning.

>> 2. RUSH to a health care facility!

>> 3. DO NOT induce vomiting. Ipecac is not recommended for ingestion of potassium cyanide.

>> 5. Activated charcoal may be administered if victims are conscious and alert. Use 15 to 30 g (1/2 to 1 oz) for children, 50 to 100 g (1-3/4 to 3-1/2 oz) for adults, with 125 to 250 mL (1/2 to 1 cup) of water.

>> 6. Promote excretion by administering a saline cathartic or sorbitol to conscious and alert victims. Children require 15 to 30 g (1/2 to 1 oz) of cathartic; 50 to 100 g (1-3/4 to 3-1/2 oz) is recommended for adults. (EPA, 1998)

ERG 2024, Guide 157 (Potassium cyanide, solid; Potassium cyanide, solution)

>> 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 case of skin contact with Hydrofluoric acid (UN1790), if calcium gluconate gel is available, rinse 5 minutes, then apply gel. Otherwise, continue rinsing until medical treatment is available.

>> 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 157 (Potassium cyanide, solution; Potassium cyanide, solid)

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First Aid Measures

Inhalation First Aid

>> Administration of oxygen may be needed. Fresh air, rest. 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

>> Wear full protective clothing. Wear positive pressure breathing apparatus and special protective clothing. Move container from fire area if you can do it without risk. Fight fire from maximum distance. Dike fire control water for later disposal; do not scatter the material.

>> Water may be used on fire in an area containing potassium cyanide. Extinguish with dry chemical, carbon dioxide, water spray, fog, or foam. (EPA, 1998)

>> Excerpt from ERG Guide 157 [Substances - Toxic and/or Corrosive (Non-Combustible / Water-Sensitive)]:

>> Note: Some foams will react with the material and release corrosive/toxic gases.

>> SMALL FIRE: CO2 (except for Cyanides), dry chemical, dry sand, 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. Avoid aiming straight or solid streams directly onto the product. 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)

>> NO hydrous agents. NO water. NO carbon dioxide. In case of fire in the surroundings, use appropriate extinguishing media. In case of fire: keep drums, etc., cool by spraying with water.

>> Potassium cyanide is non-combustible.

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

>> Water-sensitive: Potassium cyanide releases highly flammable and toxic hydrogen cyanide gas on contact with water or damp air and in a fire.

>> Note: Most foams will react with the agent and release corrosive/toxic gases.

>> For small fires, do not use carbon dioxide; use dry chemical, dry sand, or alcohol-resistant foam.

>> For large fires, use water spray, fog, or alcohol-resistant foam. Move containers from the fire area if it is possible to do so without risk to personnel. Use water spray or fog; do not use straight streams. Dike fire control water for later disposal; do not scatter the material.

>> 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. Cool containers with flooding quantities of water until well after the fire is out. Withdraw immediately in case of rising sound from venting safety devices or discoloration of tanks. Always stay away from tanks engulfed in fire.

>> 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

Toxic-by-Inhalation (TIH) Gas:

ERG Toxic-by-Inhalation (TIH) Gas(es) Produced When Spilled in Water

>> HCN - when spill Potassium cyanide, solid into water.

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 157 [Substances - Toxic and/or Corrosive (Non-Combustible / Water-Sensitive)]:

>> 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 1680 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 157 (Potassium cyanide, solid; Potassium cyanide, solution)

>> 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.

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Isolation

>> When spilled in water

>> Small spill:

>> ISOLATE in all directions: 30 m (100 ft)

>> Large spill:

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

Protection

>> When spilled in water

>> Small spill:

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

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

>> Large 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)

Spillage Disposal:

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

>> Evacuate danger area! Consult an expert! Personal protection: complete protective clothing including self-contained breathing apparatus. Do NOT let this chemical enter the environment. Ventilation. Sweep spilled substance into covered dry, sealable, labelled containers. Cautiously neutralize remainder with sodium hypochlorite solution.

Accidental Release Measures

Public Safety: ERG 2024, Guide 157 (Potassium cyanide, solid; Potassium cyanide, solution)

>> 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 157 (Potassium cyanide, solid; Potassium cyanide, solution)

>> 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 damaged containers or spilled material unless wearing appropriate protective clothing.

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

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

>> DO NOT GET WATER INSIDE CONTAINERS.

>> Use water spray to reduce vapors or divert vapor cloud drift. Avoid allowing water runoff to contact spilled material.

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

>> Small Spill

>> Cover with DRY earth, DRY sand or other non-combustible material followed with plastic sheet to minimize spreading or contact with rain.

>> Use clean, non-sparking tools to collect material and place it into loosely covered plastic containers for later disposal.

Public Safety: ERG 2024, Guide 157 (Potassium cyanide, solution; Potassium cyanide, solid)

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>> Use clean, non-sparking tools to collect material and place it into loosely covered plastic containers for later disposal.

7. Handling And Storage

Safe Storage:

>> Separated from strong oxidants, acids, food and feedstuffs, carbon dioxide and products containing water. Dry. Well closed. Keep in a well-ventilated room. Store in an area without drain or sewer access.

Storage Conditions:

>> PROTECT FROM LIGHT.

8. Exposure Control/ Personal Protection

>> C 5 mg/m3 (4.7 ppm) [10-minute] [*Note: The REL also applies to other cyanides (as CN) except Hydrogen cyanide.]

>> 5.0 [mg/m3], as CN

TLV-Ceiling

>> 5.0 [mg/m3], as CN

>> Ceiling limit: 5 mg/cu m, skin /Cyanide salts, as CN/

>> (ceiling value): 5 mg/m

EU-OEL

>> 1 mg/m

Emergency Response: ERG 2024, Guide 157 (Potassium cyanide, solid; Potassium cyanide, solution)

>> Note: Some foams will react with the material and release corrosive/toxic gases.

>> Small Fire

>> CO2 (except for Cyanides), dry chemical, dry sand, 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.

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

>> 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.

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>> 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.

Inhalation Risk:

>> A harmful concentration of airborne particles can be reached quickly when dispersed.

Effects of Short Term Exposure:

>> The substance is severely irritating to the eyes, skin and respiratory tract. 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 has not been classified for cancer-causing (carcinogenic) effects, and no carcinogenic effects have been reported for hydrogen cyanide. No reproductive or developmental effects of hydrogen cyanide have been reported in experimental animals or 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 exposed to cyanide solutions on a daily basis, 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.

Exposure Prevention

>> AVOID ALL CONTACT! FIRST AID: USE PERSONAL PROTECTION.

Inhalation Prevention

>> Use 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 157 (Potassium cyanide, solid; Potassium cyanide, solution)

>> 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 157 (Potassium cyanide, solution; Potassium cyanide, solid)

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

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>> 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)

>> 5.0 [mg/m3], as CN, inhalable fraction[German Research Foundation (DFG)]

9. Physical And Chemical Properties

Molecular Weight:

>> 65.116

Exact Mass:

>> 64.96678049

Physical Description:

>> Potassium cyanide appears as white amorphous lumps or a crystalline mass with a faint odor of bitter almonds. Density 1.52 g / cm3 Toxic by skin absorption through open wounds, by ingestion. Heating to decomposition produces toxic fumes. Used for gold and silver extraction, in chemical analysis, to make other chemicals, and as an insecticide.

>> HYGROSCOPIC CRYSTALS OR SOLID IN VARIOUS FORMS WITH CHARACTERISTIC ODOUR. ODOURLESS WHEN DRY.

Color/Form:

>> White, granular powder or fused pieces

Odor:

>> Faint odor of bitter almonds

Boiling Point:

>> Very high (USCG, 1999)

>> 1625 °C

Melting Point:

>> 1173 °F (EPA, 1998)

>> 634 °C

Flash Point:

>> Not flammable (EPA, 1998)

Solubility:

>> 72 % at 77 °F (NIOSH, 2024)

>> Solubility in water, g/l at 25 °C: 716 (freely soluble)

Density:

>> 1.52 at 60.8 °F (EPA, 1998) - Denser than water; will sink

>> 1.52 g/cm³

Vapor Pressure:

>> 0 mmHg (approx) (NIOSH, 2024)

Stability/Shelf Life:

>> In air, it is gradually decomp on exposure to carbon dioxide and moisture.

Autoignition Temperature:

>> Not flammable (USCG, 1999)

Decomposition:

>> Potassium ... cyanide solutions give off hydrogen cyanide when heated above 176 °F. /Potassium cyanide soln/

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.

>> 11.0 (0.1 N aq soln)

Refractive Index:

>> INDEX OF REFRACTION: 1.410

10. Stability And Reactivity

>> Deliquescent. Soluble in water. Dissolution releases some poisonous hydrogen cyanide gas. The amount is not hazardous except in an enclosed space. If the water is acidic, dangerous amounts of hydrogen cyanide form at once.

>> Based on a scenario where the chemical is spilled into an excess of water (at least 5 fold excess of water), half of the maximum theoretical yield of Hydrogen Cyanide gas will be created in 12 minutes. Experimental details are in the following: "Development of the Table of Initial Isolation and Protective Distances for the 2008 Emergency Response Guidebook", ANL/DIS-09-2, D.F. Brown, H.M. Hartmann, W.A. Freeman, and W.D. Haney, Argonne National Laboratory, Argonne, Illinois, June 2009.

>> Water-Reactive

11. Toxicological Information

Toxicity Summary:

>> IDENTIFICATION: Other cyanides, such as sodium and potassium cyanide, are solid or crystalline hygroscopic salts widely used in ore extracting processes for the recovery of gold and silver, electroplating, case-hardening of steel, base metal flotation, metal degreasing, dyeing, printing, and photography. They are also widely used in the synthesis of organic and inorganic chemicals (e.g., nitriles, carboxylic acids, amides, esters, and amines; heavy metal cyanides) and in the production of chelating agents. HUMAN EXPOSURE: Cyanides are well absorbed via the gastrointestinal tract or skin and rapidly absorbed via the respiratory tract. Once absorbed, cyanide is rapidly and ubiquitously distributed throughout the body, although the highest levels are typically found in the liver, lungs, blood, and brain. There is no accumulation of cyanide in the blood or tissues following chronic or repeated exposure. Approximately 80% of absorbed cyanide is metabolized to thiocyanate in the liver by the mitochondrial sulfur transferase enzyme rhodanese and other sulfur transferases. Thiocyanate is excreted in the urine. Minor pathways for cyanide detoxification involve reaction with cystine to produce aminothiazoline- and iminothiazolidinecarboxylic acids and combination with hydroxycobalamin (vitamin B12a) to form cyanocobalamin (vitamin B12); these end-products are also excreted in the urine. 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 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. Sequele 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; alkali salts have not been identified. ANIMAL/PLANT 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, which, although they apparently would not affect fertility in 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 hydrolysed to hydrogen cyanide at physiological pH, at concentrations up to 211 mg/m3 (corresponding to a concentration of 67 mg hydrogen cyanide/m3). 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/m3 (71 mg hydrogen cyanide/m3). Adverse effects of exposure to the low concentrations of cyanide that are generally present in the general environment (<1 ug/m3 in ambient air; <10 ug/litre in water) are unlikely. /Cyanide/

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

>> Nausea. Dizziness. Drowsiness. Sore throat. Headache. Confusion. Weakness. Shortness of breath. Convulsions. Unconsciousness.

Skin Exposure

>> MAY BE ABSORBED! Redness. Pain. Further see Inhalation.

Eye Exposure

>> Redness. Pain. Further see Inhalation.

Ingestion Exposure

>> Burning sensation. Nausea. Vomiting. Diarrhoea. See Inhalation.

>> irritation eyes, skin, upper respiratory system; asphyxia; lassitude (weakness, exhaustion), headache, confusion; nausea, vomiting; increased resp rate, slow gasping respiration; thyroid, blood changes

Target Organs:

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

>> Reproductive

>> Eyes, skin, respiratory system, cardiovascular system, central nervous 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

>> Dermatotoxin - Skin burns.

Toxicity Data:

>> LD50: 5 mg/kg (Oral, Rat) (T14) LD50: 4 mg/kg (Intraperitoneal, Rat) (T14) LD50: 9 mg/kg (Subcutaneous, Rat) (T14) LD50: 2600 ug/kg (Intravenous, Mouse) (T14)

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:

>> CHLORPROMAZINE ANTAGONISM OF CYANIDE INTOXICATION WAS POTENTIATED BY SODIUM THIOSULFATE. CHLORPROMAZINE & SODIUM NITRITE DID NOT PROTECT AGAINST KCN LETHALITY BETTER THAN NITRITE ALONE.

Antidote and Emergency Treatment:

>> Due to the apparent low binding capacity of activated charcoal for potassium cyanide (KCN) in vitro, the use of oral activated charcoal therapy for oral exposure to cyanide compounds is controversial. In our study, rats were given a lethal oral dose of ground granular KCN (35 or 40 mg/kg) in a gelatin capsule followed immediately by either 4 g/kg of superactivated charcoal in a 20% suspension or a similar volume of deionized water. Signs of cyanide toxicosis occurred rapidly, with a mean time to signs of 3.3 and 2.7 min in control animals receiving 35 or 40 mg/kg KCN, respectively. All 26 of the control rats showed signs, and all but one in the 35 mg/kg group died within 19 min. Only 12 of 26 rats treated with superactivated charcoal showed signs of KCN toxicosis and eight of those animals died.

Human Toxicity Excerpts:

>> ... IT IS POSSIBLE FOR CYANIDE TO CAUSE BLINDNESS & TO DAMAGE OPTIC NERVES & RETINA. /CYANIDE/

Non-Human Toxicity Excerpts:

>> ... DAILY SC INJECTIONS OF POTASSIUM CYANIDE INCR GRADUALLY TO LETHAL LEVELS HAS CAUSED NYSTAGMUS & PERIODS OF BLINDNESS IN MONKEYS, CATS, DOGS, & RATS, WITH HISTOLOGICALLY DEMONSTRABLE DEGENERATION IN OPTIC NERVE, CHIASM, & OPTIC TRACT.

Non-Human Toxicity Values:

>> LD50 Rat oral 5 mg/kg

Populations at Special Risk:

>> WORKERS WITH CHRONIC DISEASES OF KIDNEYS, RESPIRATORY TRACT, SKIN OR THYROID ARE @ GREATER RISK OF DEVELOPING TOXIC CYANIDE EFFECTS THAN ARE HEALTHY WORKERS. /CYANIDES/

12. Ecological Information

Resident Soil (mg/kg)

>> 1.60e+02

Industrial Soil (mg/kg)

>> 2.30e+03

Resident Air (ug/m3)

>> 9.40e+00

Industrial Air (ug/m3)

>> 3.90e+01

Tapwater (ug/L)

>> 4.00e+01

MCL (ug/L)

>> 2.00e+02

Chronic Oral Reference Dose (mg/kg-day)

>> 2.00e-03

Chronic Inhalation Reference Concentration (mg/m3)

>> 9.00e-03

Volatile

>> Volatile

Mutagen

>> Mutagen

Fraction of Contaminant Absorbed in Gastrointestinal Tract

>> 1

ICSC Environmental Data:

>> The substance is very toxic to aquatic organisms.

13. Disposal Considerations

Spillage Disposal

>> Evacuate danger area! Consult an expert! Personal protection: complete protective clothing including self-contained breathing apparatus. Do NOT let this chemical enter the environment. Ventilation. Sweep spilled substance into covered dry, sealable, labelled containers. Cautiously neutralize remainder with sodium hypochlorite solution.

Disposal Methods

>> Generators of waste (equal to or greater than 100 kg/mo) containing this contaminant, EPA hazardous waste number P098; D003, must conform with USEPA regulations in storage, transportation, treatment and disposal of waste.

>> Cyanide salts should not be flushed into any drain which may contain or subsequently receive acid waste. ... Cyanide process waste solutions and flushings from spills should be passed through a cyanide waste disposal system. /Cyanide salts/

>> Potassium cyanide is a poor candidate for incineration.

14. Transport Information

DOT

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

IATA

Potassium cyanide
6.1,
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)

>> Potassium cyanide

Sabotage: Minimum Concentration (%)

>> A Commercial Grade

Sabotage: Screening Threshold Quantities

>> A Placarded Amount

Security Issue: Sabotage/Contamination

>> Chemical or material that can be mixed with readily available materials.

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 200 ug/l /Cyanide ion/

State Drinking Water Standards:

State drinking water standards (e.g. maximum containment level (MCL)) for this chemical. These standards are legally enforceable.

>> (CA) CALIFORNIA 150 ug/L /Cyanide ion/

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.

>> Potassium 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: Potassium cyanide (K(CN))

REACH Registered Substance

>> Status: Active Update: 30-11-2018 https://echa.europa.eu/registration-dossier/-/registered-dossier/13737

>> Status: Active Update: 26-03-2018 https://echa.europa.eu/registration-dossier/-/registered-dossier/23185

New Zealand EPA Inventory of Chemical Status

>> Potassium cyanide: HSNO Approval: HSR002741 Approved with controls

16. Other Information

Toxic Combustion Products:

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

>> When heated to decomp it emits very toxic fumes of cyanide & oxides of nitrogen.

Other Safety Information

Chemical Assessment

>> IMAP assessments - Sodium and potassium cyanides: Human health tier II assessment

Methods of Dissemination

>> Indoor Air: Potassium cyanide can be released into indoor air as fine droplets, liquid spray (aerosol), or fine particles.

>> Water: Potassium cyanide can be used to contaminate water.

>> Food: Potassium cyanide can be used to contaminate food.

>> Outdoor Air: Potassium cyanide can be released into indoor air as fine droplets, liquid spray (aerosol), or fine particles.

>> Agricultural: If potassium cyanide is released as fine droplets, liquid spray (aerosol), or fine particles, it has the potential to contaminate agricultural products.