

Potassium hexacyanoferrate(III)

sc-203355

Material Safety Data Sheet



The Power is Question

Hazard Alert Code Key: **EXTREME** **HIGH** **MODERATE** **LOW**

Section 1 - CHEMICAL PRODUCT AND COMPANY IDENTIFICATION

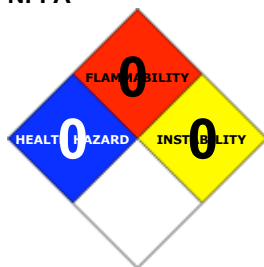
PRODUCT NAME

Potassium hexacyanoferrate(III)

STATEMENT OF HAZARDOUS NATURE

Not considered a hazardous substance according to OSHA 29 CFR 1910.1200.

NFPA



SUPPLIER

Company: Santa Cruz Biotechnology, Inc.

Address:

2145 Delaware Ave

Santa Cruz, CA 95060

Telephone: 800.457.3801 or 831.457.3800

Emergency Tel: CHEMWATCH: From within the US and Canada:
877-715-9305

Emergency Tel: From outside the US and Canada: +800 2436 2255
(1-800-CHEMCALL) or call +613 9573 3112

PRODUCT USE

Used in blueprints, woodstains, tempering iron and steel, electroplating, mild oxidising agent in organic synthesis, analytical chemistry, etching liquor (Mercuric liquor), photography.

SYNONYMS

C₆-Fe-N₆.K₃, K₃-Fe(CN)₆, "potassium hexacyanoferrate (III)", "potassium hexacyanoferrate (III)", "tripotassium hexakis(cyano-C)ferrate(3-)", "red prussiate of potash", "potassium ferricyanate"

Section 2 - HAZARDS IDENTIFICATION

CANADIAN WHMIS SYMBOLS

None

EMERGENCY OVERVIEW

RISK

Toxic to aquatic organisms.

POTENTIAL HEALTH EFFECTS

ACUTE HEALTH EFFECTS

SWALLOWED

■ Although ingestion is not thought to produce harmful effects, the material may still be damaging to the health of the individual following ingestion, especially where pre-existing organ (e.g. liver, kidney) damage is evident. Present definitions of harmful or toxic substances are

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generally based on doses producing mortality (death) rather than those producing morbidity (disease, ill-health). Gastrointestinal tract discomfort may produce nausea and vomiting. In an occupational setting however, ingestion of insignificant quantities is not thought to be cause for concern.

■ A number of materials such as cyanamide, calcium cyanamide, cyanates, isocyanates, isonitrile, thiocyanates, ferricyanide and ferrocyanide, and cyanoacetates do not exhibit the same toxic effects as cyanides and nitriles.

■ Complex cyanides are compounds in which the cyanide anion is incorporated into a complex or complexes; these compounds are different in chemical and toxicologic properties from simple cyanides. In solution, the stability of the cyanide complex varies with the type of cation and the complex that it forms. Some of these are dissociable in weak acids to give free cyanide and a cation, while other complexes require much stronger acidic conditions for dissociation. The least-stable complex metalocyanides include $[Zn(CN)_4]^{2-}$, $Cd(CN)_3^-$, and $[Cd(CN)_4]^{2-}$; moderately stable complexes include $Cu(CN)_2^-$, $[Cu(CN)_3]^{2-}$, $[Ni(CN)_4]^{2-}$, and $Ag(CN)_2^-$; and the most stable complexes include $[Fe(CN)_6]^{4-}$ and $[Co(CN)_6]^{4-}$. The toxicity of complex cyanides is usually related to their ability to release cyanide ions in solution, which then enter into an equilibrium with HCN; relatively small fluctuations in pH significantly affect their biocidal properties.

EYE

■ Although the material is not thought to be an irritant, direct contact with the eye may cause transient discomfort characterized by tearing or conjunctival redness (as with windburn). Slight abrasive damage may also result. The material may produce foreign body irritation in certain individuals.

SKIN

■ The material is not thought to produce adverse health effects or skin irritation following contact (as classified using animal models). Nevertheless, good hygiene practice requires that exposure be kept to a minimum and that suitable gloves be used in an occupational setting.

INHALED

■ The material is not thought to produce adverse health effects or irritation of the respiratory tract (as classified using animal models). Nevertheless, good hygiene practice requires that exposure be kept to a minimum and that suitable control measures be used in an occupational setting.

■ Persons with impaired respiratory function, airway diseases and conditions such as emphysema or chronic bronchitis, may incur further disability if excessive concentrations of particulate are inhaled.

CHRONIC HEALTH EFFECTS

■ Long-term exposure to the product is not thought to produce chronic effects adverse to the health (as classified using animal models); nevertheless exposure by all routes should be minimized as a matter of course.

Long term exposure to high dust concentrations may cause changes in lung function i.e. pneumoconiosis; caused by particles less than 0.5 micron penetrating and remaining in the lung. Prime symptom is breathlessness; lung shadows show on X-ray.

This material is considered to be only slightly toxic. A serious health hazard exists if this material is used where the potentially lethal hydrogen cyanide gas may be generated by thermal or chemical decomposition. Heating of material and / or mixing / contamination with acid are conditions which are to be carefully avoided.

Section 3 - COMPOSITION / INFORMATION ON INGREDIENTS

HAZARD RATINGS

	Min	Max
Flammability:	0	■
Toxicity:	0	■
Body Contact:	0	■ Min/Nil=0 Low=1 Moderate=2
Reactivity:	0	■ High=3
Chronic:	0	■ Extreme=4

NAME	CAS RN	%
potassium ferricyanide(III)	13746-66-2	>99

Section 4 - FIRST AID MEASURES

SWALLOWED

-
- Immediately give a glass of water.

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- First aid is not generally required. If in doubt, contact a Poisons Information Center or a doctor.

EYE

- If this product comes in contact with eyes:
 - Wash out immediately with water.
 - If irritation continues, seek medical attention.
 - Removal of contact lenses after an eye injury should only be undertaken by skilled personnel.

SKIN

- If skin or hair contact occurs:
 - Flush skin and hair with running water (and soap if available).
 - Seek medical attention in event of irritation.

INHALED

- - If fumes or combustion products are inhaled remove from contaminated area.
 - Other measures are usually unnecessary.

NOTES TO PHYSICIAN

- Treat symptomatically.

Section 5 - FIRE FIGHTING MEASURES

Vapour Pressure (mmHG):	Negligible
Upper Explosive Limit (%):	Not Applicable
Specific Gravity (water=1):	1.85
Lower Explosive Limit (%):	Not Applicable

EXTINGUISHING MEDIA

- - There is no restriction on the type of extinguisher which may be used.
- Use extinguishing media suitable for surrounding area.

FIRE FIGHTING

- - Alert Emergency Responders and tell them location and nature of hazard.
 - Wear breathing apparatus plus protective gloves for fire only.
 - Prevent, by any means available, spillage from entering drains or water course.
 - Use fire fighting procedures suitable for surrounding area.
 - Do not approach containers suspected to be hot.
 - Cool fire exposed containers with water spray from a protected location.
 - If safe to do so, remove containers from path of fire.
 - Equipment should be thoroughly decontaminated after use.

GENERAL FIRE HAZARDS/HAZARDOUS COMBUSTIBLE PRODUCTS

- - Non combustible.
 - Not considered to be a significant fire risk, however containers may burn.
- Decomposition may produce toxic fumes of: nitrogen oxides (NO_x), metal oxides.

FIRE INCOMPATIBILITY

- None known.

PERSONAL PROTECTION

Glasses:
Chemical goggles.
Gloves:
Respirator:
Particulate

Section 6 - ACCIDENTAL RELEASE MEASURES

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MINOR SPILLS



- Clean up all spills immediately.
- Avoid contact with skin and eyes.
- Wear impervious gloves and safety glasses.
- Use dry clean up procedures and avoid generating dust.
- Sweep up or vacuum up (consider explosion-proof machines designed to be grounded during storage and use).
- Place spilled material in clean, dry, sealable, labeled container.

MAJOR SPILLS



- Clear area of personnel and move upwind.
- Alert Emergency Responders and tell them location and nature of hazard.
- Control personal contact by using protective equipment and dust respirator.
- Prevent spillage from entering drains, sewers or water courses.
- Avoid generating dust.
- Sweep, shovel up.
- Recover product wherever possible.
- Put residues in labeled plastic bags or other containers for disposal.
- If contamination of drains or waterways occurs, advise emergency services.

ACUTE EXPOSURE GUIDELINE LEVELS (AEGLE) (in ppm)

AEGLE 1: The airborne concentration of a substance above which it is predicted that the general population, including susceptible individuals, could experience notable discomfort, irritation, or certain asymptomatic nonsensory effects. However, the effects are not disabling and are transient and reversible upon cessation of exposure.

AEGLE 2: The airborne concentration of a substance above which it is predicted that the general population, including susceptible individuals, could experience irreversible or other serious, long-lasting adverse health effects or an impaired ability to escape.

AEGLE 3: The airborne concentration of a substance above which it is predicted that the general population, including susceptible individuals, could experience life-threatening health effects or death.

Section 7 - HANDLING AND STORAGE

PROCEDURE FOR HANDLING



- Limit all unnecessary personal contact.
- Wear protective clothing when risk of exposure occurs.
- Use in a well-ventilated area.
- Avoid contact with incompatible materials.
- When handling, DO NOT eat, drink or smoke.
- Keep containers securely sealed when not in use.
- Avoid physical damage to containers.
- Always wash hands with soap and water after handling.
- Work clothes should be laundered separately.
- Use good occupational work practice.
- Observe manufacturer's storing and handling recommendations.
- Atmosphere should be regularly checked against established exposure standards to ensure safe working conditions are maintained.

RECOMMENDED STORAGE METHODS



- Lined metal can, Lined metal pail/drum
- Plastic pail
- Polyliner drum
- Packing as recommended by manufacturer.

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- Check all containers are clearly labeled and free from leaks.

STORAGE REQUIREMENTS

- Store in original containers.
- Keep containers securely sealed.
- Store in a cool, dry, well-ventilated area.
- Store away from incompatible materials and foodstuff containers.
- Protect containers against physical damage and check regularly for leaks.
- Observe manufacturer's storing and handling recommendations.

SAFE STORAGE WITH OTHER CLASSIFIED CHEMICALS



X: Must not be stored together
 O: May be stored together with specific preventions
 +: May be stored together

Section 8 - EXPOSURE CONTROLS / PERSONAL PROTECTION

EXPOSURE CONTROLS

Source	Material	TWA ppm	TWA mg/m ³	STEL ppm	STEL mg/m ³	Peak ppm	Peak mg/m ³	TWA F/CC	Notes
US - Idaho - Limits for Air Contaminants	potassium ferricyanide(III) (Cyanides (as CN))		5						
US - California Permissible Exposure Limits for Chemical Contaminants	potassium ferricyanide(III) (Cyanide, as CN)		5						
US - Minnesota Permissible Exposure Limits (PELs)	potassium ferricyanide(III) (Cyanides (as CN))			5					
US - Vermont Permissible Exposure Limits Table Z-1-A Final Rule Limits for Air Contaminants	potassium ferricyanide(III) (Cyanides (as CN))		5						
US - Vermont Permissible Exposure Limits Table Z-1-A Transitional Limits for Air Contaminants	potassium ferricyanide(III) (Cyanides (as CN))		5						
US - Tennessee Occupational Exposure Limits - Limits For Air Contaminants	potassium ferricyanide(III) (Cyanides (as CN))		5						
US OSHA Permissible Exposure Levels (PELs) - Table Z1	potassium ferricyanide(III) (Cyanides (as CN))		5						
US - Alaska Limits for Air Contaminants	potassium ferricyanide(III) (Cyanides (as CN))		5						
US - Hawaii Air Contaminant Limits	potassium ferricyanide(III) (Cyanides (as CN))		5						(CAS (Varies with compound))

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US - Washington Permissible exposure limits of air contaminants	potassium ferricyanide(III) (Cyanide (as CN))		5	10	
Canada - Quebec Permissible Exposure Values for Airborne Contaminants (English)	potassium ferricyanide(III) (Cyanides (as CN))			10	11
US - Wyoming Toxic and Hazardous Substances Table Z1 Limits for Air Contaminants	potassium ferricyanide(III) (Cyanides (as CN))		5		
US - Oregon Permissible Exposure Limits (Z1)	potassium ferricyanide(III) (Cyanides (as CN))		5		
Canada - British Columbia Occupational Exposure Limits	potassium ferricyanide(III) (Iron salts - soluble, as Fe)		1	2	
Canada - Ontario Occupational Exposure Limits	potassium ferricyanide(III) (Iron salts, water-soluble (as iron))		1		
Canada - Alberta Occupational Exposure Limits	potassium ferricyanide(III) (Iron salts, soluble, as Fe)		1		
US ACGIH Threshold Limit Values (TLV)	potassium ferricyanide(III) (Iron salts - soluble (as Fe))		1		TLV Basis: upper respiratory tract & skin irritation
US NIOSH Recommended Exposure Limits (RELs)	potassium ferricyanide(III) (Iron salts (soluble, as Fe))		1		
US - Vermont Permissible Exposure Limits Table Z-1-A Final Rule Limits for Air Contaminants	potassium ferricyanide(III) (Iron salts (soluble) (as Fe))		1		
US - Tennessee Occupational Exposure Limits - Limits For Air Contaminants	potassium ferricyanide(III) (Iron salts (soluble) (as Fe))		1		
US - Minnesota Permissible Exposure Limits (PELs)	potassium ferricyanide(III) (Iron salts (soluble)(as Fe))		1		
US - California Permissible Exposure Limits for Chemical Contaminants	potassium ferricyanide(III) (Iron salts, soluble, as Fe)		1		
Canada - Quebec Permissible Exposure Values for Airborne Contaminants (English)	potassium ferricyanide(III) (Iron salts, soluble (as Fe))		1		
US - Hawaii Air Contaminant Limits	potassium ferricyanide(III) (Iron salts (soluble) (as Fe))		1	2	(CAS (Varies with compound))
US - Alaska Limits for Air Contaminants	potassium ferricyanide(III) (Iron salts (soluble) (as Fe))		1		
Canada - Saskatchewan Occupational Health and Safety Regulations - Contamination Limits	potassium ferricyanide(III) (Iron salts, soluble, (as Fe))		1	3	
Canada - Yukon Permissible Concentrations for Airborne Contaminant Substances	potassium ferricyanide(III) (Iron salts, soluble (as Fe))	-	1	-	2
US - Washington Permissible exposure limits of air contaminants	potassium ferricyanide(III) (Iron salts, soluble (as Fe))		1	3	

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Hazard Alert Code Key:		EXTREME	HIGH	MODERATE	LOW
Canada - Nova Scotia Occupational Exposure Limits	potassium ferricyanide(III) (Iron salts - soluble (as Fe))		1		TLV Basis: upper respiratory tract & skin irritation
Canada - Prince Edward Island Occupational Exposure Limits	potassium ferricyanide(III) (Iron salts - soluble (as Fe))		1		TLV Basis: upper respiratory tract & skin irritation
Canada - Northwest Territories Occupational Exposure Limits (English)	potassium ferricyanide(III) (Iron salts, soluble (as Fe))		1	2	
US - Michigan Exposure Limits for Air Contaminants	potassium ferricyanide(III) (Iron salts (soluble) (as Fe))		1		
US - Oregon Permissible Exposure Limits (Z1)	potassium ferricyanide(III) (Iron salts, soluble, as Fe)		1		*
US - Oregon Permissible Exposure Limits (Z3)	potassium ferricyanide(III) (Inert or Nuisance Dust: (d) Total dust)		10		*
US OSHA Permissible Exposure Levels (PELs) - Table Z3	potassium ferricyanide(III) (Inert or Nuisance Dust: (d) Respirable fraction)		5		
US OSHA Permissible Exposure Levels (PELs) - Table Z3	potassium ferricyanide(III) (Inert or Nuisance Dust: (d) Total dust)		15		
US - Hawaii Air Contaminant Limits	potassium ferricyanide(III) (Particulates not otherwise regulated - Total dust)		10		
US - Hawaii Air Contaminant Limits	potassium ferricyanide(III) (Particulates not otherwise regulated - Respirable fraction)		5		
US - Oregon Permissible Exposure Limits (Z3)	potassium ferricyanide(III) (Inert or Nuisance Dust: (d) Respirable fraction)		5		*
US - Tennessee Occupational Exposure Limits - Limits For Air Contaminants	potassium ferricyanide(III) (Particulates not otherwise regulated Respirable fraction)		5		
US - Wyoming Toxic and Hazardous Substances Table Z1 Limits for Air Contaminants	potassium ferricyanide(III) (Particulates not otherwise regulated (PNOR)(f)-Respirable fraction)		5		
US - Michigan Exposure Limits for Air Contaminants	potassium ferricyanide(III) (Particulates not otherwise regulated, Respirable dust)		5		

EMERGENCY EXPOSURE LIMITS

Material	Revised IDLH Value (mg/m3)	Revised IDLH Value (ppm)
potassium ferricyanide(III)	25	

MATERIAL DATA

POTASSIUM FERRICYANIDE(III):

■ It is the goal of the ACGIH (and other Agencies) to recommend TLVs (or their equivalent) for all substances for which there is evidence of health effects at airborne concentrations encountered in the workplace.

At this time no TLV has been established, even though this material may produce adverse health effects (as evidenced in animal experiments or clinical experience). Airborne concentrations must be maintained as low as is practically possible and occupational exposure must be kept to a minimum.

NOTE: The ACGIH occupational exposure standard for Particles Not Otherwise Specified (P.N.O.S) does NOT apply.

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PERSONAL PROTECTION



Consult your EHS staff for recommendations

EYE

- Safety glasses with side shields
- Chemical goggles.
- Contact lenses pose a special hazard; soft lenses may absorb irritants and all lenses concentrate them.

HANDS/FEET

- Suitability and durability of glove type is dependent on usage. Important factors in the selection of gloves include: such as:
 - frequency and duration of contact,
 - chemical resistance of glove material,
 - glove thickness and
 - dexterity

Select gloves tested to a relevant standard (e.g. Europe EN 374, US F739).

- When prolonged or frequently repeated contact may occur, a glove with a protection class of 5 or higher (breakthrough time greater than 240 minutes according to EN 374) is recommended.
- When only brief contact is expected, a glove with a protection class of 3 or higher (breakthrough time greater than 60 minutes according to EN 374) is recommended.
- Contaminated gloves should be replaced.

Gloves must only be worn on clean hands. After using gloves, hands should be washed and dried thoroughly. Application of a non-perfumed moisturiser is recommended.

Experience indicates that the following polymers are suitable as glove materials for protection against undissolved, dry solids, where abrasive particles are not present.

- polychloroprene
- nitrile rubber
- butyl rubber
- fluorocautchouc
- polyvinyl chloride

Gloves should be examined for wear and/ or degradation constantly.

OTHER

- No special equipment needed when handling small quantities.

OTHERWISE:

- Overalls.
- Barrier cream.
- Eyewash unit.
- - Respirators may be necessary when engineering and administrative controls do not adequately prevent exposures.
 - The decision to use respiratory protection should be based on professional judgment that takes into account toxicity information, exposure measurement data, and frequency and likelihood of the worker's exposure - ensure users are not subject to high thermal loads which may result in heat stress or distress due to personal protective equipment (powered, positive flow, full face apparatus may be an option).
 - Published occupational exposure limits, where they exist, will assist in determining the adequacy of the selected respiratory . These may be government mandated or vendor recommended.
 - Certified respirators will be useful for protecting workers from inhalation of particulates when properly selected and fit tested as part of a complete respiratory protection program.
 - Use approved positive flow mask if significant quantities of dust becomes airborne.
 - Try to avoid creating dust conditions.

RESPIRATOR

■

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Protection Factor	Half-Face Respirator	Full-Face Respirator	Powered Air Respirator	
10 x PEL	P1 Air-line*	-	PAPR-P1 -	
50 x PEL	Air-line**	P2	PAPR-P2	
100 x PEL	-	P3 Air-line*	-	
100+ x PEL	-	Air-line**	PAPR-P3	

* - Negative pressure demand ** - Continuous flow

Explanation of Respirator Codes:

Class 1 low to medium absorption capacity filters.

Class 2 medium absorption capacity filters.

Class 3 high absorption capacity filters.

PAPR Powered Air Purifying Respirator (positive pressure) cartridge.

Type A for use against certain organic gases and vapors.

Type AX for use against low boiling point organic compounds (less than 65°C).

Type B for use against certain inorganic gases and other acid gases and vapors.

Type E for use against sulfur dioxide and other acid gases and vapors.

Type K for use against ammonia and organic ammonia derivatives

Class P1 intended for use against mechanically generated particulates of sizes most commonly encountered in industry, e.g. asbestos, silica.

Class P2 intended for use against both mechanically and thermally generated particulates, e.g. metal fume.

Class P3 intended for use against all particulates containing highly toxic materials, e.g. beryllium.

The local concentration of material, quantity and conditions of use determine the type of personal protective equipment required.

Use appropriate NIOSH-certified respirator based on informed professional judgement. In conditions where no reasonable estimate of exposure can be made, assume the exposure is in a concentration IDLH and use NIOSH-certified full face pressure demand SCBA with a minimum service life of 30 minutes, or a combination full facepiece pressure demand SAR with auxiliary self-contained air supply. Respirators provided only for escape from IDLH atmospheres shall be NIOSH-certified for escape from the atmosphere in which they will be used.

ENGINEERING CONTROLS

- Local exhaust ventilation is required where solids are handled as powders or crystals; even when particulates are relatively large, a certain proportion will be powdered by mutual friction.
- If in spite of local exhaust an adverse concentration of the substance in air could occur, respiratory protection should be considered.

Such protection might consist of:

- particle dust respirators, if necessary, combined with an absorption cartridge;
- filter respirators with absorption cartridge or canister of the right type;
- fresh-air hoods or masks

Air contaminants generated in the workplace possess varying "escape" velocities which, in turn, determine the "capture velocities" of fresh circulating air required to effectively remove the contaminant.

Type of Contaminant:	Air Speed:
direct spray, spray painting in shallow booths, drum filling, conveyer loading, crusher dusts, gas discharge (active generation into zone of rapid air motion)	1-2.5 m/s (200-500 f/min.)
grinding, abrasive blasting, tumbling, high speed wheel generated dusts (released at high initial velocity into zone of very high rapid air motion).	2.5-10 m/s (500-2000 f/min.)
Within each range the appropriate value depends on:	
Lower end of the range	Upper end of the range
1: Room air currents minimal or favorable to capture	1: Disturbing room air currents
2: Contaminants of low toxicity or of nuisance value only.	2: Contaminants of high toxicity
3: Intermittent, low production.	3: High production, heavy use
4: Large hood or large air mass in motion	4: Small hood-local control only

Simple theory shows that air velocity falls rapidly with distance away from the opening of a simple extraction pipe. Velocity generally decreases with the square of distance from the extraction point (in simple cases). Therefore the air speed at the extraction point should be adjusted, accordingly, after reference to distance from the contaminating source. The air velocity at the extraction fan, for example, should be a minimum of 4-10 m/s (800-2000 f/min) for extraction of crusher dusts generated 2 meters distant from the extraction point. Other mechanical considerations, producing performance deficits within the extraction apparatus, make it essential that theoretical air velocities are multiplied by factors of 10 or more when extraction systems are installed or used.

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Section 9 - PHYSICAL AND CHEMICAL PROPERTIES

PHYSICAL PROPERTIES

Solid.
Mixes with water.

State	Divided solid	Molecular Weight	329.25
Melting Range (°F)	Decomposes	Viscosity	Not Applicable
Boiling Range (°F)	Not available.	Solubility in water (g/L)	Miscible
Flash Point (°F)	Not applicable	pH (1% solution)	Not available.
Decomposition Temp (°F)	Not available.	pH (as supplied)	Not applicable
Autoignition Temp (°F)	Not Applicable	Vapour Pressure (mmHG)	Negligible
Upper Explosive Limit (%)	Not Applicable	Specific Gravity (water=1)	1.85
Lower Explosive Limit (%)	Not Applicable	Relative Vapor Density (air=1)	Not Applicable
Volatile Component (%vol)	Negligible	Evaporation Rate	Not available

APPEARANCE

Ruby red crystals or powder. Slowly soluble in water. Slightly soluble in ethanol.

Section 10 - CHEMICAL STABILITY

CONDITIONS CONTRIBUTING TO INSTABILITY

- Product is considered stable and hazardous polymerization will not occur.

STORAGE INCOMPATIBILITY

- ferricyanide:
 - mixtures with water, acids, or alcohols may slowly decompose producing hydrocyanic acid
 - reacts explosively with strong oxidisers, ammonia chromium trioxide, chromic acid, chromic anhydride, sodium nitrite
 - reacts violently with copper(II) nitrate, trihydrate.

Metals and their oxides or salts may react violently with chlorine trifluoride. Chlorine trifluoride is a hypergolic oxidizer. It ignites on contact (without external source of heat or ignition) with recognized fuels - contact with these materials, following an ambient or slightly elevated temperature, is often violent and may produce ignition. The state of subdivision may affect the results.

For incompatible materials - refer to Section 7 - Handling and Storage.

Section 11 - TOXICOLOGICAL INFORMATION

potassium ferricyanide(III)

TOXICITY AND IRRITATION

- unless otherwise specified data extracted from RTECS - Register of Toxic Effects of Chemical Substances.

TOXICITY	IRRITATION
Oral (rat) LDLo: 1600 mg/kg	Nil Reported
Oral (mouse) LD50: 2970 mg/kg	

SKIN

potassium ferricyanide(III)	US - Washington Permissible exposure limits of air contaminants - Skin	Skin	X
potassium ferricyanide(III)	US - Hawaii Air Contaminant Limits - Skin Designation	Skin Designation	X
potassium ferricyanide(III)	US OSHA Permissible Exposure Levels (PELs) - Skin	Skin Designation	X
potassium ferricyanide(III)	US - California Permissible Exposure Limits for Chemical Contaminants - Skin	Skin	X

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potassium ferricyanide(III)	US - California Permissible Exposure Limits for Chemical Contaminants - Skin		Skin	S

Section 12 - ECOLOGICAL INFORMATION

Refer to data for ingredients, which follows:

POTASSIUM FERRICYANIDE(III):

■ Toxic to aquatic organisms.

■ Do NOT allow product to come in contact with surface waters or to intertidal areas below the mean high water mark. Do not contaminate water when cleaning equipment or disposing of equipment wash-waters.

Wastes resulting from use of the product must be disposed of on site or at approved waste sites.

■ Metal-containing inorganic substances generally have negligible vapour pressure and are not expected to partition to air. Once released to surface waters and moist soils their fate depends on solubility and dissociation in water. Environmental processes (such as oxidation and the presence of acids or bases) may transform insoluble metals to more soluble ionic forms. Microbiological processes may also transform insoluble metals to more soluble forms. Such ionic species may bind to dissolved ligands or sorb to solid particles in aquatic or aqueous media. A significant proportion of dissolved/ sorbed metals will end up in sediments through the settling of suspended particles. The remaining metal ions can then be taken up by aquatic organisms.

When released to dry soil most metals will exhibit limited mobility and remain in the upper layer; some will leach locally into ground water and/ or surface water ecosystems when soaked by rain or melt ice. Environmental processes may also be important in changing solubilities.

Even though many metals show few toxic effects at physiological pHs, transformation may introduce new or magnified effects.

A metal ion is considered infinitely persistent because it cannot degrade further.

The current state of science does not allow for an unambiguous interpretation of various measures of bioaccumulation.

The counter-ion may also create health and environmental concerns once isolated from the metal. Under normal physiological conditions the counter-ion may be essentially insoluble and may not be bioavailable.

Environmental processes may enhance bioavailability.

■ for complex metalocyanides:

Metalocyanide complexes have a wide range of stabilities. Some of the metalocyanide anions are extremely stable. Cobaltocyanide is difficult to destroy with highly destructive acid distillation in a laboratory. The iron cyanides are also very stable but exhibit photodecomposition. In the presence of sunlight they dissociate to release the cyanide ion, thus affecting toxicity; at night the reaction may reverse to produce a less toxic form or state.

Zinc $[Zn(CN)_4^{-2}]$ and cadmium $[Cd(CN)_3^{-}]$ and $[Cd(CN)_4^{-2}]$ complexes dissociate rapidly and nearly completely in dilute solutions. Moderately stable complexes include copper $[Cu(CN)_2^{-}]$ and $[Cu(CN)_3^{-2}]$, nickel $[Ni(CN)_4^{-2}]$, and silver $[Ag(CN)_2^{-}]$. The most stable complexes include iron $[Fe(CN)_6^{4-}]$ and cobalt $[Co(CN)_6^{4-}]$

The weak acid dissociable cyanides (CNW) are essentially all cyanide forms excluding iron-cyanide complexes (ferrocyanides, ferricyanides). Cyanide complexes of iron dissociate very little, but they are subject to photolysis by natural light. Release of cyanide ion by photodecomposition might be important in relatively clean receiving waters

Tests carried out on metalocyanide complexes revealed that no matter how stable the complexes were, they must be regarded as a delayed source of free cyanide in natural aquatic systems which will be released under certain conditions (e.g., ultraviolet irradiation, decreased pH, increased temperature. This free cyanide is then subject to various natural removal mechanisms

Complex metalocyanide ions in solution can be dissociated or decomposed to release free cyanide ion, that, in turn, forms HCN through hydrolytic reactions in water. The concentration of HCN may change due to exposure to natural light, changes in pH or hardness, or because of increased dilution of the complex. The toxicity of these complexes seems to be due only to the free cyanide rather than the complex

The effect of pH on the toxicity of metalocyanides is much more complex because of the greater number of dissociation reactions involved, and the long time required (up to ten days) to reach the dissociation equilibrium. A simplified example of a metalocyanide dissociation is shown for cyanonickelate(II): $[Ni(CN)_4]^{2-} \leftrightarrow Ni^{2+} + 4CN^{-}$; $4CN^{-} + 4H^{+} \leftrightarrow 4HCN$

It is the undissociated hydrogen cyanide (HCN) which contributes most to the toxicity; an increase in pH from 7.4 to 7.8 reduces the toxicity of cyanonickelate by ten- to 13-fold. Because the ionisation constants for many of the metalocyanide equilibria are not known with any accuracy, and because of the long time taken to reach equilibrium, it is difficult to measure the toxicity of the products formed; the likelihood of predicting the toxicity of a complex effluent containing metalocyanides from its chemical analysis is remote.

Clearly, toxicity tests on metalocyanides alone must be carried out with very precise pH control, but it may be necessary only to test effluents containing these compounds in a limited range of 'soft acid' to 'hard alkaline' dilution waters. This would give an approximate indication of the effect of these factors on their toxicity, and discharge controls for such effluents could then be adjusted, albeit roughly, to allow for changes in the hardness and pH of the receiving water.

■ Ferrocyanide ion is toxic to fish. The US EPA recommends that ferrocyanide levels in water be maintained below 2 ppm. [OHMTADS].

Section 13 - DISPOSAL CONSIDERATIONS

Disposal Instructions

All waste must be handled in accordance with local, state and federal regulations.

! Legislation addressing waste disposal requirements may differ by country, state and/ or territory. Each user must refer to laws operating in

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their area. In some areas, certain wastes must be tracked.

A Hierarchy of Controls seems to be common - the user should investigate:

- Reduction
- Reuse
- Recycling
- Disposal (if all else fails)

This material may be recycled if unused, or if it has not been contaminated so as to make it unsuitable for its intended use. Shelf life considerations should also be applied in making decisions of this type. Note that properties of a material may change in use, and recycling or reuse may not always be appropriate.

DO NOT allow wash water from cleaning equipment to enter drains. Collect all wash water for treatment before disposal.

- Recycle wherever possible or consult manufacturer for recycling options.
- Consult Waste Management Authority for disposal.
- Bury residue in an authorized landfill.
- Recycle containers where possible, or dispose of in an authorized landfill.

Section 14 - TRANSPORTATION INFORMATION

Air Transport IATA:

ICAO/IATA Class:	None	ICAO/IATA Subrisk:	None
UN/ID Number:	None	Packing Group:	-
ERG Code:	-	Special provisions:	None

Shipping Name: FERRICYANIDES

NOT REGULATED FOR TRANSPORT OF DANGEROUS GOODS: DOT, IMDG

Section 15 - REGULATORY INFORMATION

potassium ferricyanide(III) (CAS: 13746-66-2) is found on the following regulatory lists;

"Canada Domestic Substances List (DSL)", "Canada Toxicological Index Service - Workplace Hazardous Materials Information System - WHMIS (English)", "Canada Toxicological Index Service - Workplace Hazardous Materials Information System - WHMIS (French)", "US DOE Temporary Emergency Exposure Limits (TEELs)", "US FDA Indirect Food Additives: Adhesives and Components of Coatings - Substances for Use Only as Components of Adhesives - Adhesives", "US Toxic Substances Control Act (TSCA) - Inventory"

Section 16 - OTHER INFORMATION

Reasonable care has been taken in the preparation of this information, but the author makes no warranty of merchantability or any other warranty, expressed or implied, with respect to this information. The author makes no representations and assumes no liability for any direct, incidental or consequential damages resulting from its use. For additional technical information please call our toxicology department on +800 CHEMCALL.

■ Classification of the mixture and its individual components has drawn on official and authoritative sources as well as independent review by the Chemwatch Classification committee using available literature references.

A list of reference resources used to assist the committee may be found at:
www.chemwatch.net/references.

■ The (M)SDS is a Hazard Communication tool and should be used to assist in the Risk Assessment. Many factors determine whether the reported Hazards are Risks in the workplace or other settings. Risks may be determined by reference to Exposures Scenarios. Scale of use, frequency of use and current or available engineering controls must be considered.

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