Ammonium hexacyanoferrate(II) hydrate

sc-239232

Material Safety Data Sheet

Hazard Alert Code Key:	EXTREME	HIGH	MODERATE	LOW

Section 1 - CHEMICAL PRODUCT AND COMPANY IDENTIFICATION

PRODUCT NAME
Ammonium hexacyanoferrate(II) hydrate

STATEMENT OF HAZARDOUS NATURE
CONSIDERED A HAZARDOUS SUBSTANCE ACCORDING TO OSHA 29 CFR 1910.1200.

NFPA


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EMERGENCY
ChemWatch
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SYNONYMS
C6-H16-Fe-N10, (NH4)4Fe(CN)6.xH2O, "triammonium hexakis(cyano-C)ferrate(4-)", "ammonium hexacyanoferrate (II)"

Section 2 - HAZARDS IDENTIFICATION

CHEMWATCH HAZARD RATINGS

	Min	Max
Flammability:	0	
Toxicity:	2	
Body Contact:	0	
Reactivity:	0	
Chronic:	2	

Min/Nil=0
Low=1
Moderate=2
High=3
Extreme=4

CANADIAN WHMIS SYMBOLS


EMERGENCY OVERVIEW

RISK
Toxic to aquatic organisms.

POTENTIAL HEALTH EFFECTS

ACUTE HEALTH EFFECTS

SWALLOWED
■ Accidental ingestion of the material may be damaging to the health of the individual.
■ 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.
■ Large doses of ammonia or injected ammonium salts may produce diarrhea and may be sufficiently absorbed to produce increased production of urine and systemic poisoning.
Symptoms include weakening of facial muscle, tremor, anxiety, reduced muscle and limb control.

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.

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.
■ Solution of material in moisture on the skin, or perspiration, mayincrease irritant effects.
■ Open cuts, abraded or irritated skin should not be exposed to this material.
■ Entry into the blood-stream, through, for example, cuts, abrasions or lesions, may produce systemic injury with harmful effects.
Examine the skin prior to the use of the material and ensure that any external damage is suitably protected.

INHALED
■ The material is not thought to produce either adverse health effects or irritation of the respiratory tract following inhalation (as classified using animal models).
Nevertheless, adverse effects have been produced following exposure of animals by at least one other route and 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.
■ Not normally a hazard due to non-volatile nature of product.

CHRONIC HEALTH EFFECTS
■ Limited evidence suggests that repeated or long-term occupational exposure may produce cumulative health effects involving organs or biochemical systems.
Overexposure to respirable dust may cause coughing, wheezing, difficulty in breathing and impaired lung function. Chronic symptoms may include decreased vital lung capacity, chest infections
Repeated exposures, in an occupational setting, to high levels of fine- divided dusts may produce a condition known as pneumoconiosis which is the lodgement of any inhaled dusts in the lung irrespective of the effect. This is particularly true when a significant number of particles less than 0.5 microns (1/50,000 inch), are present. Lung shadows are seen in the X-ray. Symptoms of pneumoconiosis may include a progressive dry cough, shortness of breath on exertion (exertional dyspnea), increased chest expansion, weakness and weight loss. As the disease progresses the cough produces a stringy mucous, vital capacity decreases further and shortness of breath becomes more severe. Other signs or symptoms include altered breath sounds, diminished lung capacity, diminished oxygen uptake during exercise, emphysema and pneumothorax (air in lung cavity) as a rare complication.
Removing workers from possibility of further exposure to dust generally leads to halting the progress of the lung abnormalities. Where worker-exposure potential is high, periodic examinations with emphasis on lung dysfunctions should be undertaken
Dust inhalation over an extended number of years may produce pneumoconiosis.. Pneumoconiosis is the accumulation of dusts in the lungs and the tissue reaction in its presence. It is further classified as being of noncollagenous or collagenous types. Noncollagenous pneumoconiosis, the benign form, is identified by minimal stromal reaction, consists mainly of reticulin fibres, an intact alveolar architecture and is potentially reversible.
Chronic excessive intake of iron have been associated with damage to the liver and pancreas. People with a genetic disposition to poor control over iron are at an increased risk.

Section 3 - COMPOSITION / INFORMATION ON INGREDIENTS

NAME	CAS RN	%
ammonium ferrocyanide	14481-29-9	>99

Section 4 - FIRST AID MEASURES

SWALLOWED
· If swallowed do NOT induce vomiting. · If vomiting occurs, lean patient forward or place on left side (head-down position, if possible) to maintain open airway and prevent aspiration.

EYE

■ If this product comes in contact with the eyes: · Wash out immediately with fresh running water. · Ensure complete irrigation of the eye by keeping eyelids apart and away from eye and moving the eyelids by occasionally lifting the upper and lower lids.

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 dust is inhaled, remove from contaminated area. · Encourage patient to blow nose to ensure clear passage of breathing. · If irritation or discomfort persists seek medical attention.

NOTES TO PHYSICIAN

■ For acute or short term repeated exposures to iron and its derivatives:
· Always treat symptoms rather than history.
· In general, however, toxic doses exceed 20mg/kg of ingested material (as elemental iron) with lethal doses exceeding 180 mg/kg.

Section 5 - FIRE FIGHTING MEASURES

Vapour Pressure (mmHG):	Negligible
Upper Explosive Limit (%):	Not applicable
Specific Gravity (water=1):	Not available
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.

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 (NOx), metal oxides.
May emit poisonous fumes.

FIRE INCOMPATIBILITY

■ None known.

PERSONAL PROTECTION

Glasses:
Chemical goggles.
Gloves:
Respirator:
Particulate

Section 6 - ACCIDENTAL RELEASE MEASURES

MINOR SPILLS
· Remove all ignition sources.
· Clean up all spills immediately.
· Avoid contact with skin and eyes.
· Control personal contact by using protective equipment.
· Use dry clean up procedures and avoid generating dust.
· Place in a suitable, labelled container for waste disposal.
MAJOR SPILLS
■ Moderate hazard.
· CAUTION: Advise personnel in area.
· Alert Emergency Responders and tell them location and nature of hazard.

Section 7 - HANDLING AND STORAGE

PROCEDURE FOR HANDLING

· Avoid all personal contact, including inhalation.
· Wear protective clothing when risk of exposure occurs.

RECOMMENDED STORAGE METHODS

· Polyethylene or polypropylene container.
· Check all containers are clearly labelled and free from leaks.

STORAGE REQUIREMENTS

■ DO NOT store near acids, or oxidizing agents.
· Store in original containers.
· Keep containers securely sealed.
Light sensitive:

Section 8 - EXPOSURE CONTROLS / PERSONAL PROTECTION

EXPOSURE CONTROLS

Source	Material	TWA ppm	TWA mg/m³	STEL ppm	STEL mg/m³	Peak ppm	Peak mg/m³	TWA F/CC	Notes
US - California Permissible Exposure Limits for Chemical Contaminants	ammonium ferrocyanide (Cyanide, as CN)		5						
US - Minnesota Permissible Exposure Limits (PELs)	ammonium ferrocyanide (Cyanides (as CN))			5					
Canada - British Columbia Occupational Exposure Limits	ammonium ferrocyanide (Cyanide salts, as CN)						5		Skin
US - Idaho - Limits for Air Contaminants	ammonium ferrocyanide (Cyanides (as CN))		5						
US - Vermont Permissible Exposure Limits Table Z-1-A Final Rule Limits for Air Contaminants	ammonium ferrocyanide (Cyanides (as CN))		5						
US - Vermont Permissible Exposure Limits Table Z-1-A Transitional Limits for Air Contaminants	ammonium ferrocyanide (Cyanides (as CN))		5						
US - Tennessee Occupational Exposure Limits - Limits For Air Contaminants	ammonium ferrocyanide (Cyanides (as CN))		5						
US - Alaska Limits for Air Contaminants	ammonium ferrocyanide (Cyanides (as CN))		5						
US - Hawaii Air Contaminant Limits	ammonium ferrocyanide (Cyanides (as CN))		5						(CAS (Varies with compound))
US - Washington Permissible exposure limits of air contaminants	ammonium ferrocyanide (Cyanide (as CN))		5		10				
US - Oregon Permissible Exposure Limits (Z-1)	ammonium ferrocyanide (Cyanides (as CN))	-	5						
US OSHA Permissible Exposure Levels (PELs) - Table Z1	ammonium ferrocyanide (Cyanides (as CN))		5						
Canada - Quebec Permissible Exposure Values for Airborne	ammonium ferrocyanide (Cyanides (as CN))					10	11		

Contaminants (English)					
US - Wyoming Toxic and Hazardous Substances Table Z1 Limits for Air Contaminants	ammonium ferrocyanide (Cyanides (as CN))	5			
Canada - Alberta Occupational Exposure Limits	ammonium ferrocyanide (Iron salts, soluble, as Fe)	1			
Canada - British Columbia Occupational Exposure Limits	ammonium ferrocyanide (Iron salts - soluble, as Fe)	1	2		
US NIOSH Recommended Exposure Limits (RELs)	ammonium ferrocyanide (Iron salts (soluble, as Fe))	1			
Canada - Quebec Permissible Exposure Values for Airborne Contaminants (English)	ammonium ferrocyanide (Iron salts, soluble (as Fe))	1			
US ACGIH Threshold Limit Values (TLV)	ammonium ferrocyanide (Iron salts - soluble (as Fe))	1			TLV Basis: upper respiratory tract & skin irritation
US - Vermont Permissible Exposure Limits Table Z-1-A Final Rule Limits for Air Contaminants	ammonium ferrocyanide (Iron salts (soluble) (as Fe))	1			
US - Tennessee Occupational Exposure Limits - Limits For Air Contaminants	ammonium ferrocyanide (Iron salts (soluble) (as Fe))	1			
US - Minnesota Permissible Exposure Limits (PELs)	ammonium ferrocyanide (Iron salts (soluble)(as Fe))	1			
US - California Permissible Exposure Limits for Chemical Contaminants	ammonium ferrocyanide (Iron salts, soluble, as Fe)	1			
US - Hawaii Air Contaminant Limits	ammonium ferrocyanide (Iron salts (soluble) (as Fe))	1	2		(CAS (Varies with compound))
US - Alaska Limits for Air Contaminants	ammonium ferrocyanide (Iron salts (soluble) (as Fe))	1			
Canada - Saskatchewan Occupational Health and Safety Regulations - Contamination	ammonium ferrocyanide (Iron salts, soluble, (as Fe))	1	3		

Limits							
Canada - Yukon Permissible Concentrations for Airborne Contaminant Substances	ammonium ferrocyanide (Iron salts, soluble (as Fe))	-	1	-	2		
US - Washington Permissible exposure limits of air contaminants	ammonium ferrocyanide (Iron salts, soluble (as Fe))		1		3		
Canada - Nova Scotia Occupational Exposure Limits	ammonium ferrocyanide (Iron salts - soluble (as Fe))		1				TLV Basis: upper respiratory tract & skin irritation
Canada - Prince Edward Island Occupational Exposure Limits	ammonium ferrocyanide (Iron salts - soluble (as Fe))		1				TLV Basis: upper respiratory tract & skin irritation
Canada - Northwest Territories Occupational Exposure Limits (English)	ammonium ferrocyanide (Iron salts, soluble (as Fe))		1		2		
US - Michigan Exposure Limits for Air Contaminants	ammonium ferrocyanide (Iron salts (soluble) (as Fe))		1				
US - Oregon Permissible Exposure Limits (Z-1)	ammonium ferrocyanide (Iron salts, soluble, as Fe)	-	1				Bold print identifies substances for which the Oregon Permissible Exposure Limits (PELs) are different than the federal Limits.

ENDOELTABLE

PERSONAL PROTECTION



RESPIRATOR

Particulate
Consult your EHS staff for recommendations

EYE

· Safety glasses with side shields
· Chemical goggles.

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
· fluorocaoutchouc
· polyvinyl chloride
Gloves should be examined for wear and/ or degradation constantly.

OTHER

· Overalls.
· P.V.C. apron.
· Barrier cream.
· Skin cleansing cream.
· Eye wash unit.

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.

Section 9 - PHYSICAL AND CHEMICAL PROPERTIES

PHYSICAL PROPERTIES

Solid.
Mixes with water.

State	Divided solid	Molecular Weight	284.12
Melting Range (°F)	Not available	Viscosity	Not Applicable
Boiling Range (°F)	Not applicable	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)	Not available
Lower Explosive Limit (%)	Not applicable	Relative Vapor Density (air=1)	Not applicable
Volatile Component (%vol)	Negligible	Evaporation Rate	Not applicable

APPEARANCE

Yellow-green powder; mixes with watre.

Section 10 - CHEMICAL STABILITY

CONDITIONS CONTRIBUTING TO INSTABILITY

· Presence of incompatible materials.
· Product is considered stable.

STORAGE INCOMPATIBILITY

■ Avoid reaction with.
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.
· Contact with acids produces toxic fumes.
· Metals and their oxides or salts may react violently with chlorine trifluoride and bromine trifluoride.
· These trifluorides are hypergolic oxidisers. They ignites on contact (without external source of heat or ignition) with recognised 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.
· WARNING: Avoid or control reaction with peroxides. All transition metal peroxides should be considered as potentially explosive. For example transition metal complexes of alkyl hydroperoxides may decompose explosively.
· The pi-complexes formed between chromium(0), vanadium(0) and other transition metals (haloarene-metal complexes) and mono-or poly-fluorobenzene show extreme sensitivity to heat and are explosive.
· Avoid reaction with borohydrides or cyanoborohydrides.
WARNING:
May decompose violently or explosively on contact with other substances.
· This substance is one of the relatively few compounds which are described as "endothermic" i.e. heat is absorbed into the compound,

rather than released from it, during its formation.
· The majority of endothermic compounds are thermodynamically unstable and may decompose explosively under various circumstances of initiation.
· Many but not all endothermic compounds have been involved in decompositions, reactions and explosions and, in general, compounds with significantly positive values of standard heats of formation, may be considered suspect on stability grounds.
BRETHERICK L.: Handbook of Reactive Chemical Hazards.

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

Section 11 - TOXICOLOGICAL INFORMATION

ammonium ferrocyanide

TOXICITY AND IRRITATION
AMMONIUM FERROCYANIDE:
■ No significant acute toxicological data identified in literature search.

CARCINOGEN

	US - Rhode Island Hazardous Substance List	IARC	
SKIN			
ammonium ferrocyanide	US - Washington Permissible exposure limits of air contaminants - Skin	Skin	X
ammonium ferrocyanide	US - Hawaii Air Contaminant Limits - Skin Designation	Skin Designation	X
ammonium ferrocyanide	US OSHA Permissible Exposure Levels (PELs) - Skin	Skin Designation	X

Section 12 - ECOLOGICAL INFORMATION

Toxic to aquatic organisms.

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 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.
For small quantities:
· Treat a dilute basic solution (pH10-11) of the material with a50% excess of commercial laundry bleach.
· Recycle wherever possible or consult manufacturer for recycling options.
· Consult Waste Management Authority for disposal.

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
Cargo Only
Packing Instructions: Not Restricted
Maximum Qty/Pack: Not Restricted Passenger and Cargo
Passenger and Cargo Packing Instructions: Not Restricted
Maximum Qty/Pack: Not Restricted Passenger and Cargo Limited Quantity
Passenger and Cargo Limited Quantity Packing Instructions: Not Restricted
Maximum Qty/Pack: Not Restricted
Shipping Name: FERROCYANIDES
NOT REGULATED FOR TRANSPORT OF DANGEROUS GOODS: DOT, IMDG

Section 15 - REGULATORY INFORMATION

ammonium ferrocyanide (CAS: 14481-29-9) is found on the following regulatory lists;
"Canada Non-Domestic Substances List (NDSL)","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 preparation 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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