Chromium(III) perchlorate hexahydrate

sc-234356

Material Safety Data Sheet

Hazard Alert Code Key: EXTREME HIGH MODERATE LOW

Section 1 - CHEMICAL PRODUCT AND COMPANY IDENTIFICATION

PRODUCT NAME

Chromium(III) perchlorate hexahydrate

STATEMENT OF HAZARDOUS NATURE

CONSIDERED A HAZARDOUS SUBSTANCE ACCORDING TO OSHA 29 CFR 1910.1200.

NFPA

SUPPLIER

Santa Cruz Biotechnology, Inc.
2145 Delaware Avenue
Santa Cruz, California 95060
800.457.3801 or 831.457.3800

EMERGENCY

ChemWatch
Within the US & Canada: 877–715–9305
Outside the US & Canada: +800 2436 2255
(1–800-CHEMCALL) or call +613 9573 3112

SYNONYMS

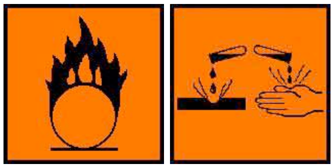
Cl3-Cr-O12, Cr(ClO4)3.6H2O, "perchloric acid, chromium (III) salt", "chromium (III) perchlorate hydrate", "chromium (III) perchlorate hexahydrate"

Section 2 - HAZARDS IDENTIFICATION

CHEMWATCH HAZARD RATINGS

		Min	Max
Flammability:	0		
Toxicity:	2		
Body Contact:	3		
Reactivity:	2		
Chronic:	2		

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



CANADIAN WHMIS SYMBOLS

EMERGENCY OVERVIEW

RISK

Causes burns.
Risk of serious damage to eyes.
Limited evidence of a carcinogenic effect.
Possible risk of impaired fertility.
Harmful to aquatic organisms.

POTENTIAL HEALTH EFFECTS

ACUTE HEALTH EFFECTS

SWALLOWED

■ The material can produce chemical burns within the oral cavity and gastrointestinal tract following ingestion.
■ Accidental ingestion of the material may be damaging to the health of the individual.
■ Symptoms of exposure to perchlorates include shortness of breath, difficulty breathing and a bluish discoloration of the skin.
The effects may be delayed for several hours following exposure.
■ Nausea and vomiting are almost always apparent after chlorate poisonings usually with upper stomach pain.
Diarrhea may also occur.
■ Chromate salts are corrosive and produce cellular damage to tissue.
Ingestion may produce inflammation of the digestive tract, nausea, vomiting and abdominal pain.

EYE

■ The material can produce chemical burns to the eye following direct contact.
Vapors or mists may be extremely irritating.
■ If applied to the eyes, this material causes severe eye damage.

SKIN

■ The material can produce chemical burns following direct contactwith the skin.
■ Skin contact is not thought to have harmful health effects, however the material may still produce health damage following entry through wounds, lesions or abrasions.
■ Skin contact may result in severe irritation particularly to broken skin.
Ulceration known as "chrome ulcers" may develop.
■ 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.
■ There is some evidence to suggest that this material can cause inflammation of the skin on contact in some persons.

INHALED

■ Inhalation may result in chrome ulcers or sores of nasal mucosa and lung damage.
■ 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.
■ There is some evidence to suggest that the material can cause respiratory irritation in some persons.
The body's response to such irritation can cause further lung damage.

CHRONIC HEALTH EFFECTS

■ There has been concern that this material can cause cancer or mutations, but there is not enough data to make an assessment.
Repeated or prolonged exposure to corrosives may result in the erosion of teeth, inflammatory and ulcerative changes in the mouth and necrosis (rarely) of the jaw. Bronchial irritation, with cough, and frequent attacks of bronchial pneumonia may ensue.
Ample evidence from experiments exists that there is a suspicionthis material directly reduces fertility.
Limited evidence suggests that repeated or long-term occupational exposure may produce cumulative health effects involving organs or biochemical systems.
There is limited evidence that, skin contact with this product is more likely to cause a sensitization reaction in some persons compared to the general population.
Exposure to the material may cause concerns for humans owing to possible developmental toxic effects, on the basis that similar materials tested in appropriate animal studies provide some suspicion of developmental toxicity in the absence of signs of marked maternal toxicity, or at around the same dose levels as other toxic effects but which are not a secondary non-specific consequence of other toxic effects.
Chronic and/or sub-lethal exposure to inorganic chlorate may have deleterious effects on human health, such as redness of the eyes and skin (including dermatitis), sore throat, abdominal pain, blue lips or skin, diarrhea, nausea, vomiting, shortness of breath, and unconsciousness. Sodium chlorate may damage the liver, kidneys, and blood cells of humans.
Subchronic chlorate exposure was associated with smaller body and organ weights, blood abnormalities and pituitary and thyroid abnormalities in one study using Sprague-Dawley rats.
Chlorate is a thyroid toxicant producing thyroid gland follicular cell hypertrophy in rats and mice following chronic exposures, and may produce follicular cell tumors in rats. The lack of mutagenicity indicates that the thyroid tumors are induced by a non-mutagenic mechanism and are therefore not likely to be carcinogenic. The effects may be attributed to changes in levels of thyroid hormones seen after administration of high doses of sodium chlorate. In female mice there was equivocal and marginal evidence of increased pancreatic islet carcinoma. Sodium chlorate was negative in most bacterial gene mutation assays and in several cytogenetics tests, including a hypoxanthineguanine phosphoribosyl-transferase (HGPRT) assay in Chinese hamster ovaries and a micronucleus assay.
Intramuscular administration of potassium chlorate to pregnant rats resulted in a prolonged gestation period in most cases, and reduced neonatal weight relative to the controls. According to the author, newborn rats also showed a "marked" increase of haematopoietic residue and lipid deposit over controls, and occasionally, exposure resulted in the appearance of hyaline droplets and casts in newborn kidneys .
The number of animals per treatment group/number affected, duration of exposure, and information on dose levels was not available.
African green monkeys (five males and seven females) were used to study the thyroid effects of sodium chlorate when administered for 30-60 days as chlorate at concentrations of 4, 7.5, 15, 30 or 58.4 mg/kg bw per day. Chlorate did not induce thyroid depression. Chlorate did not induce a dose-dependent oxidative stress, as was observed in the case of chlorite.
Female rats were exposed to 1 or 10 mg chlorate/L in their drinking water for ten weeks. Fetuses were taken on the 20th day of gestation and examined for external, visceral and skeletal malformations. No significant adverse findings were reported.

No chromosomal abnormalities were seen in either the micronucleus test or a cytogenetic assay in mouse bone marrow cells following gavage dosing with chlorate.
Perchlorates may affect the use of iodine by the thyroid gland and chronic exposures may result in symptoms of thyroid dysfunction such as goiter.
Chromium(III) is an essential trace mineral. Chronic exposure to chromium(III) irritates the airways, malnourishes the liver and kidneys, causes fluid in the lungs, and adverse effects on white blood cells, and also increases the risk of developing lung cancer.

Section 3 - COMPOSITION / INFORMATION ON INGREDIENTS

NAME	CAS RN	%
chromic perchlorate	55147-94-9	> 97

Section 4 - FIRST AID MEASURES

SWALLOWED

· For advice, contact a Poisons Information Center or a doctor at once. · Urgent hospital treatment is likely to be needed.

EYE

■ If this product comes in contact with the eyes: · Immediately hold eyelids apart and flush the eye continuously with 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: · Immediately flush body and clothes with large amounts of water, using safety shower if available. · Quickly remove all contaminated clothing, including footwear.

INHALED

· If fumes or combustion products are inhaled remove from contaminated area. · Lay patient down. Keep warm and rested.

NOTES TO PHYSICIAN

■ Antithyroid effects produced by the perchlorates may be reversed with iodine. Patients should be warned to report the development of sore throat, fever or rashes since the are indicative of blood abnormalities.
For chlorates:
For severe intoxication: Empty the stomach by lavage and aspiration or by emesis, give demulcents or sweetened drinks and maintain respiration. Pethidine may be given if required. A 1% solution of sodium thiosulfate may be used for lavage and may also be given by intravenous infusion. Haemodialysis, peritoneal dialysis or exchange perfusions may be of value in removing chlorate from the blood. Forced diuresis should not be attempted if there is inadequate urine input.
MARTINDALE: The Extra Pharmacopoeia, 27th Edition
The high sensitivity of glucose-6-phosphate dehydrogenase to denaturation by chlorate explains the inefficacy of methylene blue to reduce methaemoglobin formed, as the antidotal effect of methylene blue depends on NADPH formed mainly by the oxidation of glucose-6-phosphate. The observed changes occur only in the presence of methaemoglobin which forms a destabilising complex with chlorate. Methaemoglobin thus autocatalytically increases methaemoglobin formation and destruction of the erythrocyte.

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

■ FOR SMALL FIRE:
· USE FLOODING QUANTITIES OF WATER.
· DO NOT use dry chemicals, CO2 or foam.

FIRE FIGHTING

· Alert Emergency Responders and tell them location and nature of hazard.
· May be violently or explosive reactive.
When any large container (including road and rail tankers) is involved in a fire,
consider evacuation by 800 metres in all directions.

GENERAL FIRE HAZARDS/HAZARDOUS COMBUSTIBLE PRODUCTS

· Will not burn but increases intensity of fire.
· Heating may cause expansion or decomposition leading to violent rupture of containers.
Decomposition may produce toxic fumes of: hydrogen chloride, metal oxides.

FIRE INCOMPATIBILITY

■ Avoid storage with reducing agents.
· Avoid any contamination of this material as it is very reactive and any contamination is potentially hazardous.

PERSONAL PROTECTION

Glasses:
Full face- shield.

Gloves:
Respirator:
Particulate

Section 6 - ACCIDENTAL RELEASE MEASURES

MINOR SPILLS
· Clean up all spills immediately.
· No smoking, naked lights, ignition sources.
MAJOR SPILLS
· Clear area of personnel and move upwind.
· Alert Emergency Responders and tell them location and nature of hazard.

Section 7 - HANDLING AND STORAGE

PROCEDURE FOR HANDLING

· Avoid personal contact and inhalation of dust, mist or vapors.
· Provide adequate ventilation.

RECOMMENDED STORAGE METHODS

■ Glass container.
· DO NOT repack. Use containers supplied by manufacturer only.
For low viscosity materials
· Drums and jerricans must be of the non-removable head type.
· Where a can is to be used as an inner package, the can must have a screwed enclosure.

STORAGE REQUIREMENTS

■ In addition, Goods of Class 5.1, packing group II should be:
· stored in piles so that
· the height of the pile does not exceed 1 metre
· the maximum quantity in a pile or building does not exceed 1000 tonnes unless the area is provided with automatic fire extinguishers
· the maximum height of a pile does not exceed 3 metres where the room is provided with automatic fire extinguishers or 2 meters if not.
· the minimum distance between piles is not less than 2 metres where the room is provided with automatic fire extinguishers or 3 meters if not.
· the minimum distance to walls is not less than 1 metre.

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
Canada - Northwest Territories Occupational Exposure Limits (English)	chromic perchlorate (Chromium, Sol. chromic, chromous salts (as Cr))		0.5		0.15				
Canada - Northwest Territories Occupational Exposure Limits (English)	chromic perchlorate (Chromite ore processing (chromate (as Cr)))		0.05		0.15				

ENDOELTABLE

PERSONAL PROTECTION

RESPIRATOR

Particulate

EYE

· Chemical goggles.
· Full face shield.

HANDS/FEET

■ Wear chemical protective gloves, eg. PVC.

NOTE: The material may produce skin sensitization in predisposed individuals. Care must be taken, when removing gloves and other protective equipment, to avoid all possible skin contact.

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.
· DO NOT wear cotton or cotton-backed gloves.
· DO NOT wear leather gloves.
· Promptly hose all spills off leather shoes or boots or ensure that such footwear is protected with PVC over-shoes.

OTHER

· Overalls.
· PVC Apron.
· Some plastic personal protective equipment (PPE) (e.g. gloves, aprons, overshoes) are not recommended as they may produce static electricity.
· For large scale or continuous use wear tight-weave non-static clothing (no metallic fasteners, cuffs or pockets), non sparking safety footwear.

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	458.44 (6H2O)
Melting Range (°F)	Not available	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 Applicable	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 available

APPEARANCE

Powder; mixes with water.

Section 10 - CHEMICAL STABILITY

CONDITIONS CONTRIBUTING TO INSTABILITY

· Presence of incompatible materials.
· Product is considered stable under normal handling conditions.

STORAGE INCOMPATIBILITY

· Inorganic oxidising agents can react with reducing agents to generate heat and products that may be gaseous (causing pressurization of closed containers). The products may themselves be capable of further reactions (such as combustion in the air).
· Organic compounds in general have some reducing power and can in principle react with compounds in this class. Actual reactivity varies greatly with the identity of the organic compound.
· Inorganic oxidising agents can react violently with active metals, cyanides, esters, and thiocyanates.
· Inorganic reducing agents react with oxidizing agents to generate heat and products that may be flammable, combustible, or otherwise reactive. Their reactions with oxidizing agents may be violent.

- Incidents involving interaction of active oxidants and reducing agents, either by design or accident, are usually very energetic and examples of so-called redox reactions.
- 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.
- 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.

NOTE: May contain traces of perchloric acid or may, on contact with acids, produce an anhydrous perchloric acid an extremely reactive and explosive species. Many of the reported explosions involving perchlorate may result its ability to form unstable perchlorate esters or salts of the anhydrous acid.

WARNING:

- On the basis of experience with cobalt(III) perchlorate, attention is drawn to the possibility of stable metal perchlorates being converted by unintentional dehydration to unstable (endothermic) lower hydrates capable of explosive decomposition in the absence of impurities. Great care must be taken to avoid dehydration or desolvation of perchlorates.
- Metal perchlorates may be explosively reactive with finely divided aluminium, magnesium and zinc and other metals, calcium and strontium hydrides, glycol (on heating), sulfuric acid (with the formation of unstable perchloric acid), and trifluoromethanesulfonic acid.
- The perchlorate salts of the complexes of divalent cobalt, nickel and particularly iron ([tetramethyl[14]-N8 complexes) are potentially explosive and storage for more than 4 weeks is inadvisable.
- Avoid any contamination of this material as it is very reactive and any contamination is potentially hazardous.
- Segregate chlorates from organic matter, acids, poisonous gases, flammables, corrosives, aluminium and ammonium salts and any other combustible material.
- Mixtures of chlorates with fibrous and absorbent organic materials such as wood, paper, leather, flour, sawdust, sugar, shellac, may be ignited or caused to explode by static sparks, friction or shock.
- The extreme hazardous nature of mixtures of metal chlorates with phosphorus or sulfur, apart from being powerful explosives, are dangerously sensitive to friction or shock; spontaneous ignition occasionally occurs.
- Mixtures with sucrose, lactose, chromium, sulfur dioxide, sodium amide, zirconium, germanium and titanium explode on heating.
- Forms incompatible sometimes explosive mixtures with thorium dicarbide, strontium hydride, hydrogen iodide, fluorine, cyanoguanidine, cyanides, dinickel trioxide, powdered carbon, aqua regia and ruthenium, nitric acid, manganese dioxide and potassium hydroxide or boron.
- Chlorates should not be allowed to come into contact with ammonium salts, aluminium and other powdered metals, phosphorous, silicon, sulfur, sulfides, sulfuric acid, nitrobenzene, iodides and tartaric acid
- Mixtures with hydrocarbons, metal phosphides (Zn, Ag, Al, Cu, Hg, Mg, etc), metal thiocyanates, metal sulfides, arsenic, carbon, phosphorous, sulfur, ammonium salts, powdered metals, arsenic trioxide, phosphorous, silicon, sulfur, sulfides, sulfites and hyposulfites are easily ignited (by friction impact or heat) and are potentially explosive.
- Metal chlorates in contact with strong acids liberate explosive chlorine dioxide gas. With concentrated sulfuric acid a violent explosion can occur unless effective cooling is used. Mixing potassium chlorate and concentrated sulfuric acid results in an explosion with optimum temperature range being 120-130. Heating a moist mixture of metal chlorate and a dibasic organic acid (tartaric or citric acid) liberates chlorine dioxide diluted with carbon dioxide.
- Fusion of chlorates with metal cyanides may lead to an explosion.
- Chlorates containing 1-2% bromate or sulfur are liable to spontaneous explosion.
- Chlorates releases oxygen, chlorine and chlorine dioxide when heated above 300 deg. C..
- In presence of moisture may release oxygen and ozone.
- Intimate mixtures of chlorates, bromates or iodates of barium, cadmium, calcium, magnesium, potassium, sodium or zinc, with finely divided aluminium, arsenic, copper, carbon, phosphorus, sulfur, hydrides of alkali- and alkaline earth-metals; sulfides of antimony, arsenic, copper or tin; metal cyanides, thiocyanates; or impure manganese dioxide may react explosively or violently, either spontaneously (especially in the presence of moisture) or on initiation by heat, impact or friction, sparks or addition of sulfuric acid.

BRETHERICKS HANDBOOK OF REACTIVE CHEMICAL HAZARDS, 4th Edition.
Avoid storage with reducing agents.

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

Section 11 - TOXICOLOGICAL INFORMATION

chromic perchlorate

TOXICITY AND IRRITATION
CHROMIC PERCHLORATE:

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

■ For chrome(III) and other valence states (except hexavalent):

For inhalation exposure, all trivalent and other chromium compounds are treated as particulates, not gases.

The mechanisms of chromium toxicity are very complex, and although many studies on chromium are available, there is a great deal of uncertainty about how chromium exerts its toxic influence. Much more is known about the mechanisms of hexavalent chromium toxicity than trivalent chromium toxicity. There is an abundance of information available on the carcinogenic potential of chromium compounds and on the genotoxicity and mutagenicity of chromium compounds in experimental systems. The consensus from various reviews and agencies is that evidence of carcinogenicity of elemental, divalent, or trivalent chromium compounds is lacking. Epidemiological studies of workers in a number of industries (chromate production, chromate pigment production and use, and chrome plating) conclude that while occupational exposure to hexavalent chromium compounds is associated with an increased risk of respiratory system cancers (primarily bronchogenic and nasal), results from occupational exposure studies to mixtures that were mainly elemental and trivalent (ferrochromium alloy worker) were inconclusive. Studies in leather tanners, who were exposed to trivalent chromium were consistently negative. In addition to the lack of direct evidence of carcinogenicity of trivalent or elemental chromium and its compounds, the genotoxic evidence is overwhelmingly negative.

The lesser potency of trivalent chromium relative to hexavalent chromium is likely related to the higher redox potential of hexavalent chromium and its greater ability to enter cells. enter cells

The general inability of trivalent chromium to traverse membranes and thus be absorbed or reach peripheral tissue in significant amounts is generally accepted as a probable explanation for the overall absence of systemic trivalent chromium toxicity. Elemental and divalent forms of chromium are not able to traverse membranes readily either. This is not to say that elemental, divalent, or trivalent chromium compounds cannot traverse membranes and reach peripheral tissue, the mechanism of absorption is simply less efficient in comparison to absorption of hexavalent chromium compounds. Hexavalent chromium compounds exist as tetrahedral chromate anions, resembling the forms of other natural anions like sulfate and phosphate which are permeable across nonselective membranes. Trivalent chromium forms octahedral complexes which cannot easily enter though these channels, instead being absorbed via passive diffusion and phagocytosis. Although trivalent chromium is less well absorbed than hexavalent chromium, workers exposed to trivalent compounds have had detectable levels of chromium in the urine at the end of a workday. Absorbed chromium is widely distributed throughout the body via the bloodstream, and can reach the foetus. Although there is ample in vivo evidence that hexavalent chromium is efficiently reduced to trivalent chromium in the gastrointestinal tract and can be reduced to the trivalent form by ascorbate and glutathione in the lungs, there is no evidence that trivalent chromium is converted to hexavalent chromium in biological systems. In general, trivalent chromium compounds are cleared rapidly from the blood and more slowly from the tissues. Although not fully characterized, the biologically active trivalent chromium molecule appears to be chromodulin, also referred to as (GTF). Chromodulin is an oligopeptide complex containing four chromic ions. Chromodulin may facilitate interactions of insulin with its receptor site, influencing protein, glucose, and lipid metabolism. Inorganic trivalent chromium compounds, which do not appear to have insulin-potentiating properties, are capable of being converted into biologically active forms by humans and animals

Chromium can be a potent sensitiser in a small minority of humans, both from dermal and inhalation exposures.

The most sensitive endpoint identified in animal studies of acute exposure to trivalent chromium appears to involve the respiratory system. Specifically, acute exposure to trivalent chromium is associated with impaired lung function and lung damage.

Based on what is known about absorption of chromium in the human body, its potential mechanism of action in cells, and occupational data indicating that valence states other than hexavalent exhibit a relative lack of toxicity the toxicity of elemental and divalent chromium compounds is expected to be similar to or less than common trivalent forms.

Asthma-like symptoms may continue for months or even years after exposure to the material ceases. This may be due to a non-allergenic condition known as reactive airways dysfunction syndrome (RADS) which can occur following exposure to high levels of highly irritating compound. Key criteria for the diagnosis of RADS include the absence of preceding respiratory disease, in a non-atopic individual, with abrupt onset of persistent asthma-like symptoms within minutes to hours of a documented exposure to the irritant. A reversible airflow pattern, on spirometry, with the presence of moderate to severe bronchial hyperreactivity on methacholine challenge testing and the lack of minimal lymphocytic inflammation, without eosinophilia, have also been included in the criteria for diagnosis of RADS. RADS (or asthma) following an irritating inhalation is an infrequent disorder with rates related to the concentration of and duration of exposure to the irritating substance. Industrial bronchitis, on the other hand, is a disorder that occurs as result of exposure due to high concentrations of irritating substance (often particulate in nature) and is completely reversible after exposure ceases. The disorder is characterised by dyspnea, cough and mucus production.

No significant acute toxicological data identified in literature search.

CARCINOGEN

CHROMIUM COMPOUNDS	US Environmental Defense Scorecard Suspected Carcinogens	Reference(s)	HAZMAP, P65-MC

Section 12 - ECOLOGICAL INFORMATION

Harmful to aquatic organisms.

This material and its container must be disposed of as hazardous waste.

Section 13 - DISPOSAL CONSIDERATIONS

US EPA Waste Number & Descriptions

A. General Product Information

Ignitability characteristic: use EPA hazardous waste number D001 (waste code I)

Toxicity characteristic: use EPA hazardous waste number D007 (waste code E) if this substance, in a solid waste, produces an extract containing greater than 5 mg/L of chromium.

Disposal Instructions

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

¦ Puncture containers to prevent re-use and bury at an authorized landfill.

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 DISPOSAL OF SMALL QUANTITIES:

- Cautiously acidify a 3% solution or a suspension of the material to pH 2 with sulfuric acid.
- Gradually add a 50% excess of aqueous sodium bisulfite with stirring at room temperature. (Other reducers such as thiosulfate or ferrous

salts may substitute; do NOT use carbon, sulfur or other strong reducing agents). An increase in temperature indicates reaction is taking place. If no reaction is observed on the addition of about 10% of the sodium bisulfite solution, initiate it by cautiously adding more acid.
· Recycle wherever possible or consult manufacturer for recycling options.
· Consult Waste Management Authority for disposal.

Section 14 - TRANSPORTATION INFORMATION

DOT:
Symbols: None Hazard class or Division: 5.1
Identification Numbers: UN1481 PG: II
Label Codes: 5.1 Special provisions: IB6, IP2,
T3, TP33
Packaging: Exceptions: 152 Packaging: Non- bulk: 212
Packaging: Exceptions: 152 Quantity limitations: 5 kg
Passenger aircraft/rail:
Quantity Limitations: Cargo 25 kg Vessel stowage: Location: A
aircraft only:
Vessel stowage: Other: 56, 58
Hazardous materials descriptions and proper shipping names:
Perchlorates, inorganic, n.o.s.

Air Transport IATA:
ICAO/IATA Class: 5.1 ICAO/IATA Subrisk: None
UN/ID Number: 1481 Packing Group: II
Special provisions: A3
Cargo Only
Packing Instructions: 25 kg Maximum Qty/Pack: 5 kg
Passenger and Cargo Passenger and Cargo
Packing Instructions: 562 Maximum Qty/Pack: 558
Passenger and Cargo Limited Quantity Passenger and Cargo Limited Quantity
Packing Instructions: 2.5 kg Maximum Qty/Pack: Y544
Shipping Name: PERCHLORATES, INORGANIC, N.O.S.
1481(CONTAINS CHROMIC PERCHLORATE)

Maritime Transport IMDG:
IMDG Class: 5.1 IMDG Subrisk: None
UN Number: 1481 Packing Group: II
EMS Number: F-H , S-Q Special provisions: None
Limited Quantities: 1 kg
Shipping Name: PERCHLORATES, INORGANIC, N.O.S.
(contains chromic perchlorate)

Section 15 - REGULATORY INFORMATION

chromic perchlorate (CAS: 13537-21-8,55147-94-9) is found on the following regulatory lists;
"Canada Non-Domestic Substances List (NDSL)","US DOE Temporary Emergency Exposure Limits (TEELs)","US Toxic Substances Control Act (TSCA) - Inventory"

Section 16 - OTHER INFORMATION

Ingredients with multiple CAS Nos
Ingredient Name CAS chromic perchlorate 13537-21-8, 55147-94-9

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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