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Produktinformation



Forschungsprodukte & Biochemikalien



Zellkultur & Verbrauchsmaterial



Diagnostik & molekulare Diagnostik



Laborgeräte & Service

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See the following pages for more information!



Lieferung & Zahlungsart

siehe unsere [Liefer- und Versandbedingungen](#)

Zuschläge

- Mindermengenzuschlag
- Trockeneiszuschlag
- Gefahrgutzuschlag
- Expressversand

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Strontium nitrate

sc-212960

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

Strontium nitrate

STATEMENT OF HAZARDOUS NATURE

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 pyrotechnics (red fire), signal lights, marine signals, railway flares and matches.

SYNONYMS

Sr-N2-O6, Sr(NO3)2, "nitric acid, strontium salt"

Section 2 - HAZARDS IDENTIFICATION

CANADIAN WHMIS SYMBOLS



EMERGENCY OVERVIEW

RISK

Contact with combustible material may cause fire.

Irritating to eyes, respiratory system and skin.

Harmful to aquatic organisms.

POTENTIAL HEALTH EFFECTS

ACUTE HEALTH EFFECTS

SWALLOWED

■ Accidental ingestion of the material may be damaging to the health of the individual.

■ Strontium salts induce vomiting and diarrhea when swallowed in large quantity. Absorbed strontium may produce painful contractions of the limbs and may be involved in abnormalities of the heart.

■ The substance and/or its metabolites may bind to hemoglobin inhibiting normal uptake of oxygen. This condition, known as "methemoglobinemia", is a form of oxygen starvation (anoxia). Symptoms include cyanosis (a bluish discoloration skin and mucous membranes) and breathing difficulties. Symptoms may not be evident until several hours after exposure. At about 15% concentration of blood methemoglobin there is observable cyanosis of the lips, nose and earlobes. Symptoms may be absent although euphoria, flushed face and headache are commonly experienced. At 25-40%, cyanosis is marked but little disability occurs other than that produced on physical exertion. At 40-60%, symptoms include weakness, dizziness, lightheadedness, increasingly severe headache, ataxia, rapid shallow respiration, drowsiness, nausea, vomiting, confusion, lethargy and stupor. Above 60% symptoms include dyspnea, respiratory depression, tachycardia or bradycardia, and convulsions. Levels exceeding 70% may be fatal.

EYE

■ This material can cause eye irritation and damage in some persons.

SKIN

■ This material can cause inflammation of the skin oncontact in some persons.
 ■ The material may accentuate any pre-existing dermatitis condition.
 ■ 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.
 ■ 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

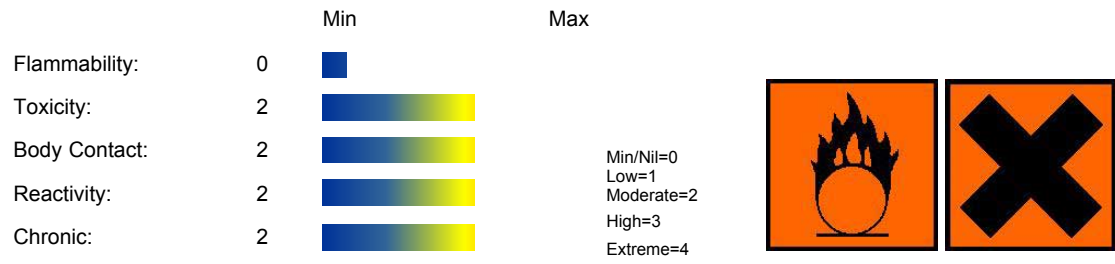
■ The material can cause respiratory irritation in some persons. The body's response to such irritation can cause further lung damage.
 ■ Persons with impaired respiratory function, airway diseases and conditions such as emphysema or chronic bronchitis, may incur further disability if excessive concentrations of particulate are inhaled.

CHRONIC HEALTH EFFECTS

■ Long-term exposure to respiratory irritants may result in disease of the airways involving difficult breathing and related systemic problems. Limited evidence suggests that repeated or long-term occupational exposure may produce cumulative health effects involving organs or biochemical systems. 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. Strontium accumulates in teeth and bone, especially in the growth plates of rapidly growing bone. A chronic diet high in strontium and low in calcium produces severe bone deformities, inco-ordination, weakness and paralysis. Most health concerns related to strontium arise from radioisotopes of strontium which occur in "fall-out" following testing of nuclear weapons.

Section 3 - COMPOSITION / INFORMATION ON INGREDIENTS

HAZARD RATINGS



NAME	CAS RN	%
strontium nitrate	10042-76-9	> 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.
- Observe the patient carefully.
- Never give liquid to a person showing signs of being sleepy or with reduced awareness; i.e. becoming unconscious.
- Give water to rinse out mouth, then provide liquid slowly and as much as casualty can comfortably drink.
- Seek medical advice.

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.
 - If pain persists or recurs seek medical attention.
 - Removal of contact lenses after an eye injury should only be undertaken by skilled personnel.

SKIN

- If skin contact occurs:
 - Immediately remove all contaminated clothing, including footwear
 - 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.
- Lay patient down. Keep warm and rested.
- Prosthesis such as false teeth, which may block airway, should be removed, where possible, prior to initiating first aid procedures.
- Apply artificial respiration if not breathing, preferably with a demand valve resuscitator, bag-valve mask device, or pocket mask as trained. Perform CPR if necessary.
- Transport to hospital, or doctor, without delay.

NOTES TO PHYSICIAN

- The toxicity of nitrates and nitrites result from their vasodilating properties and their propensity to form methemoglobin.
- Most produce a peak effect within 30 minutes.
- Clinical signs of cyanosis appear before other symptoms because of the dark pigmentation of methemoglobin.
- Initial attention should be directed towards improving oxygen delivery, with assisted ventilation, if necessary. Hyperbaric oxygen has not demonstrated conclusive benefits.
- Institute cardiac monitoring, especially in patients with coronary artery or pulmonary disease.
- Hypotension should respond to Trendelenburg's position and intravenous fluids; otherwise dopamine may be needed.
- Naloxone, glucose and thiamine should be given if a multiple ingestion is suspected.
- Decontaminate using Ipecac Syrup for alert patients or lavage for obtunded patients who present within 2-4 hours of ingestion.
- Symptomatic patients with methemoglobin levels over 30% should receive methylene blue. (Cyanosis alone, is not an indication for treatment). The usual dose is 1-2 mg/kg of a 1% solution (10 mg/ml) IV over 5 minutes; repeat, using the same dose if symptoms of hypoxia fail to subside within 1 hour.

[Ellenhorn and Barceloux: Medical Toxicology] BIOLOGICAL EXPOSURE INDEX - BEI

These represent the determinants observed in specimens collected from a healthy worker who has been exposed at the Exposure Standard (ES or TLV):

Determinant	Index	Sampling Time	Comments
1. Methemoglobin in blood	1.5% of hemoglobin	During or end of shift	B,NS,SQ

B: Background levels occur in specimens collected from subjects NOT exposed

NS: Non-specific determinant; also observed after exposure to other materials

SQ: Semi-quantitative determinant - Interpretation may be ambiguous; should be used as a screening test or confirmatory test.

Section 5 - FIRE FIGHTING MEASURES

Vapour Pressure (mmHG):	Negligible
Upper Explosive Limit (%):	Not applicable
Specific Gravity (water=1):	2.99
Lower Explosive Limit (%):	Not applicable

EXTINGUISHING MEDIA

- FOR SMALL FIRE:
 - USE FLOODING QUANTITIES OF WATER.
 - DO NOT use dry chemicals, CO₂ or foam.
- FOR LARGE FIRE:
- Flood fire area with water from a protected position.

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.
- Fight fire from a safe distance, with adequate cover.
- Extinguishers should be used only by trained personnel.
- Use water delivered as a fine spray to control fire and cool adjacent area.
- Avoid spraying water onto liquid pools.
- 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.
- If fire gets out of control withdraw personnel and warn against entry.
- Equipment should be thoroughly decontaminated after use.

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.
- Heat affected containers remain hazardous.
- Contact with combustibles such as wood, paper, oil or finely divided metal may cause ignition, combustion or violent decomposition.
- May emit irritating, poisonous or corrosive fumes.

Decomposition may produce toxic fumes of: nitrogen oxides (NO_x), 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

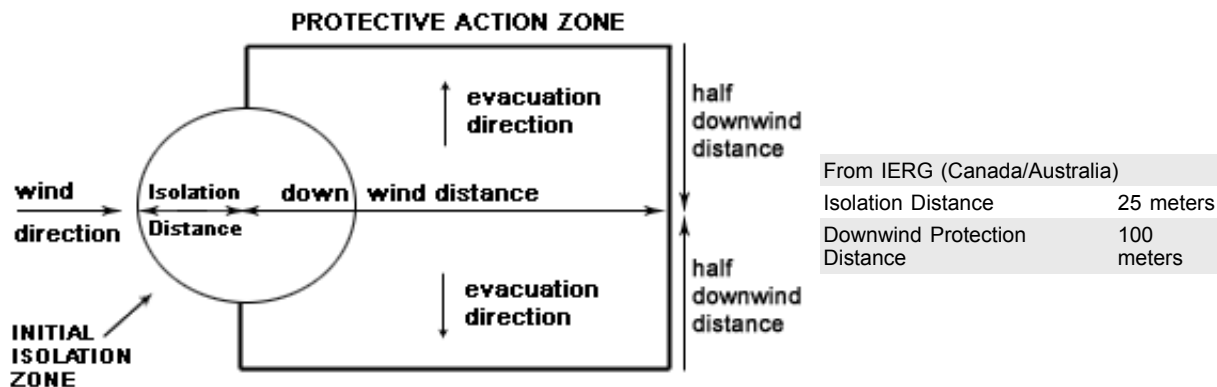
MINOR SPILLS

- Clean up all spills immediately.
- No smoking, naked lights, ignition sources.
- Avoid all contact with any organic matter including fuel, solvents, sawdust, paper or cloth and other incompatible materials; as ignition may result.
- Avoid breathing dust or vapors and all contact with skin and eyes.
- Control personal contact by using protective equipment.
- Contain and absorb spill with dry sand, earth, inert material or vermiculite
- DO NOT use sawdust as fire may result.
- Scoop up solid residues and seal in labeled drums for disposal.
- Neutralize/decontaminate area.

MAJOR SPILLS

- Clear area of personnel and move upwind.
- Alert Emergency Responders and tell them location and nature of hazard.
- May be violently or explosively reactive.
- Wear full body protective clothing with breathing apparatus.
- Prevent, by any means available, spillage from entering drains or water course.
- Consider evacuation.
- No smoking, flames or ignition sources.
- Increase ventilation.
- Contain spill with sand, earth or other clean, inert materials.
- NEVER use organic absorbents such as sawdust, paper, cloth; as fire may result.
- Avoid any contamination by organic matter.
- Use spark-free and explosion-proof equipment.
- Collect any recoverable product into labeled containers for possible recycling.
- DO NOT mix fresh with recovered material.
- Collect residues and seal in labeled drums for disposal.
- Wash area and prevent runoff into drains.
- Decontaminate equipment and launder all protective clothing before storage and re-use.
- If contamination of drains or waterways occurs advise emergency services.

PROTECTIVE ACTIONS FOR SPILL



FOOTNOTES

1 PROTECTIVE ACTION ZONE is defined as the area in which people are at risk of harmful exposure. This zone assumes that random changes in wind direction confines the vapour plume to an area within 30 degrees on either side of the predominant wind direction, resulting in a crosswind protective action distance equal to the downwind protective action distance.

2 PROTECTIVE ACTIONS should be initiated to the extent possible, beginning with those closest to the spill and working away from the site in the downwind direction. Within the protective action zone a level of vapour concentration may exist resulting in nearly all unprotected persons becoming incapacitated and unable to take protective action and/or incurring serious or irreversible health effects.

3 INITIAL ISOLATION ZONE is determined as an area, including upwind of the incident, within which a high probability of localised wind reversal may expose nearly all persons without appropriate protection to life-threatening concentrations of the material.

4 SMALL SPILLS involve a leaking package of 200 litres (55 US gallons) or less, such as a drum (jerrican or box with inner containers). Larger packages leaking less than 200 litres and compressed gas leaking from a small cylinder are also considered "small spills". LARGE SPILLS involve many small leaking packages or a leaking package of greater than 200 litres, such as a cargo tank, portable tank or a "one-tonne" compressed gas cylinder.

5 Guide 140 is taken from the US DOT emergency response guide book.

6 IERG information is derived from CANUTEC - Transport Canada.

ACUTE EXPOSURE GUIDELINE LEVELS (AEGL) (in ppm)

AEGL 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.

AEGL 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.

AEGL 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

-
- Avoid personal contact and inhalation of dust, mist or vapors.
- Provide adequate ventilation.
- Always wear protective equipment and wash off any spillage from clothing.
- Keep material away from light, heat, flammables or combustibles.
- Keep cool, dry and away from incompatible materials.
- Avoid physical damage to containers.
- DO NOT repack or return unused portions to original containers.
- Withdraw only sufficient amounts for immediate use.
- Contamination can lead to decomposition leading to possible intense heat and fire.
- When handling NEVER smoke, eat or drink.
- Always wash hands with soap and water after handling.
- Use only good occupational work practice.
- Observe manufacturer's storing and handling directions.

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.

For materials with a viscosity of at least 2680 cSt. (23 deg. C) and solids:

- Removable head packaging and
- cans with friction closures may be used.

- Where combination packages are used, and the inner packages are of glass, there must be sufficient inert cushioning material in contact with inner and outer packages * . - In addition, where inner packagings are glass and contain liquids of packing group I and II there must be sufficient inert absorbent to absorb any spillage *. - * unless the outer packaging is a close fitting molded plastic box and the substances are not incompatible with the plastic.

STORAGE REQUIREMENTS

- In addition, Goods of Class 5.1, packing group III should be stored in packages and be separated from buildings, tanks, and compounds containing other dangerous goods in tanks, and from property boundaries by a distance of at least 5 metres.

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 - Oregon Permissible Exposure Limits (Z3)	strontium nitrate (Inert or Nuisance Dust: (d) Total dust)		10						*
US OSHA Permissible Exposure Levels (PELs) - Table Z3	strontium nitrate (Inert or Nuisance Dust: (d) Respirable fraction)		5						
US OSHA Permissible Exposure Levels (PELs) - Table Z3	strontium nitrate (Inert or Nuisance Dust: (d) Total dust)		15						
US - Hawaii Air Contaminant Limits	strontium nitrate (Particulates not other wise regulated - Total dust)		10						
US - Hawaii Air Contaminant Limits	strontium nitrate (Particulates not other wise regulated - Respirable fraction)		5						
US - Oregon Permissible Exposure Limits (Z3)	strontium nitrate (Inert or Nuisance Dust: (d) Respirable fraction)		5						*

US - Tennessee Occupational Exposure Limits - Limits For Air Contaminants	strontium nitrate (Particulates not otherwise regulated Respirable fraction)	5
US - Wyoming Toxic and Hazardous Substances Table Z1 Limits for Air Contaminants	strontium nitrate (Particulates not otherwise regulated (PNOR)(f)-Respirable fraction)	5
US - Michigan Exposure Limits for Air Contaminants	strontium nitrate (Particulates not otherwise regulated, Respirable dust)	5

MATERIAL DATA

STRONTIUM NITRATE:

■ 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.

Sensory irritants are chemicals that produce temporary and undesirable side-effects on the eyes, nose or throat. Historically occupational exposure standards for these irritants have been based on observation of workers' responses to various airborne concentrations. Present day expectations require that nearly every individual should be protected against even minor sensory irritation and exposure standards are established using uncertainty factors or safety factors of 5 to 10 or more. On occasion animal no-observable-effect-levels (NOEL) are used to determine these limits where human results are unavailable. An additional approach, typically used by the TLV committee (USA) in determining respiratory standards for this group of chemicals, has been to assign ceiling values (TLV C) to rapidly acting irritants and to assign short-term exposure limits (TLV STELs) when the weight of evidence from irritation, bioaccumulation and other endpoints combine to warrant such a limit. In contrast the MAK Commission (Germany) uses a five-category system based on intensive odour, local irritation, and elimination half-life. However this system is being replaced to be consistent with the European Union (EU) Scientific Committee for Occupational Exposure Limits (SCOEL); this is more closely allied to that of the USA.

OSHA (USA) concluded that exposure to sensory irritants can:

- cause inflammation
- cause increased susceptibility to other irritants and infectious agents
- lead to permanent injury or dysfunction
- permit greater absorption of hazardous substances and
- acclimate the worker to the irritant warning properties of these substances thus increasing the risk of overexposure.

PERSONAL PROTECTION



Consult your EHS staff for recommendations

EYE

-
- Chemical goggles.
- Full face shield.
- Contact lenses pose a special hazard; soft lenses may absorb irritants and all lenses concentrate them.

HANDS/FEET

■ Wear chemical protective gloves, eg. PVC.

Wear safety footwear or safety gumboots, eg. Rubber.

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.
- PVC protective suit may be required if exposure severe.
- Eyewash unit.
- Ensure there is ready access to a safety shower.
- 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.
-
- 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

Protection Factor	Half-Face Respirator	Full-Face Respirator	Powered Air Respirator
10 x PEL	P1	-	PAPR-P1
	Air-line*	-	-
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 usually required. If risk of overexposure exists, wear an approved respirator. Correct fit is essential to obtain adequate protection an approved self contained breathing apparatus (SCBA) may be required in some situations. Provide adequate ventilation in warehouse or closed storage area.

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:
solvent, vapors, degreasing etc., evaporating from tank (in still air).	0.25-0.5 m/s (50-100 f/min.)
aerosols, fumes from pouring operations, intermittent container filling, low speed conveyer transfers, welding, spray drift, plating acid fumes, pickling (released at low velocity into zone of active generation)	0.5-1 m/s (100-200 f/min.)
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 1-2 m/s (200-400 f/min) for extraction of solvents generated in a tank 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.

Section 9 - PHYSICAL AND CHEMICAL PROPERTIES

PHYSICAL PROPERTIES

Solid.

Mixes with water.

State	Divided solid	Molecular Weight	211.65
Melting Range (°F)	1058 (decomposes)	Viscosity	Not Applicable
Boiling Range (°F)	1193	Solubility in water (g/L)	Miscible
Flash Point (°F)	Not applicable	pH (1% solution)	7
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)	2.99
Lower Explosive Limit (%)	Not applicable	Relative Vapor Density (air=1)	>1
Volatile Component (%vol)	Negligible	Evaporation Rate	Not applicable

APPEARANCE

Odourless white powder or granules. Soluble in water (47%); slightly soluble in absolute alcohol and acetone. Strong oxidising agent. At low temperatures strontium nitrate crystallises with 4H₂O (25.4%).

Section 10 - CHEMICAL STABILITY

CONDITIONS CONTRIBUTING TO INSTABILITY

-
- Presence of incompatible materials.
- Product is considered stable under normal handling conditions.
- Prolonged exposure to heat.
- Hazardous polymerization will not occur.

STORAGE INCOMPATIBILITY

- for metal nitrates:
 - Segregate from heavy metals, phosphides, sodium acetate, lead nitrate, tartrates, trichloroethylene,
 - Avoid shock and heat.
 - Mixtures of metal nitrates with alkyl esters may explode due to the formation of unstable alkyl nitrates.
 - Mixtures of a nitrate with phosphorous, tin(II) chloride and other reducing agents may react explosively.
 - Mixtures containing nitrates and organic materials are potentially dangerous, especially if acidic materials or heavy metals are present.
 - Fibrous organic material, jute, wood and similar cellulosic material can become highly combustible by nitrate impregnation
 - Metal nitrates are incompatible with cyanides, thiocyanates, isothiocyanates and hypophosphites. Avoid reaction with the following which can cause an explosion: barium thiocyanate, boron phosphide, cyanides, sodium hypophosphite, sulfur and charcoal, powdered aluminium or aluminium oxide, sodium thiosulfate.
 - Mixtures of metal nitrates and phosphinates may explode on heating
 - A mixture of aluminium powder, water and metal nitrate may explode due to a self accelerating reaction.
 - Mixtures containing nitrates, nitrites and organic materials are potentially dangerous, especially in the presence of acidic materials and heavy metals

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.

- 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.
- Avoid any contamination of this material as it is very reactive and any contamination is potentially hazardous

Avoid storage with reducing agents.

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

Section 11 - TOXICOLOGICAL INFORMATION

strontium nitrate

TOXICITY AND IRRITATION

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

TOXICITY	IRRITATION
Oral (rat) LD50: 2750 mg/kg	Nil Reported

- 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.

CARCINOGEN

Nitrate or nitrite (ingested) under conditions that result in endogenous nitrosation

International Agency for Research on Cancer (IARC) - Agents
Reviewed by the IARC Monographs

Group 2A

Section 12 - ECOLOGICAL INFORMATION

Refer to data for ingredients, which follows:

STRONTIUM NITRATE:

■ Harmful to aquatic organisms.

■ The nitrates are of environmental concern because of their high water solubility and consequent leaching, diffusion, and environmental mobility in soil and water. Nitrate can contaminate groundwater to unacceptable levels. Nitrite is formed from nitrate or ammonium ion by micro-organisms in soil, water, sewage and the alimentary tract. The concern with nitrate in the environment is related to its conversion to nitrite.

Methemoglobinemia is caused following exposure to high levels of nitrite and produces difficulties in oxygen transport in the blood. Thousands of cases involving poisoning of infants, particularly in rural areas, have been reported as a result of drinking nitrate rich well-water.

Other concerns deriving from exposure to environmental nitrates relate to the production of nitrosamines following the reaction of food nitrites and secondary amines. Other nitroso-compounds may result following reaction with nitrites and amides, ureas, carbamates and other nitrogenous compounds. Nitrosamines produce liver damage, hemorrhagic lung lesions, convulsions and coma in rats, and teratogenic effects in experimental animals.

The N-nitroso class of compounds include potent carcinogens and mutagens: induction of tumors by single doses of N-nitroso compounds testify to this.

■ For strontium:

Environmental fate:

Strontium present in the atmosphere is in the form of wet or dry aerosols. The principal chemical species in the air is strontium oxide (SrO). Strontium oxide will react rapidly in the presence of moisture to form Sr²⁺ and SrOH⁺ ions. Strontium is dispersed by atmospheric cycling and is subsequently deposited by wet deposition on the earth's surface. In surface water and groundwater, strontium exists primarily as a hydrated ion. Strontium can form ionic complexes with other inorganic or organic substances. Strontium is relatively mobile in water. However, the formation of insoluble complexes or sorption of strontium to soils can reduce its mobility in water. Strontium sorbs to soils by ion exchange, and tends to be more mobile in soils with a high concentration of exchangeable ions or in soils with low cation exchange capacities. Strontium is taken up and retained by aquatic and terrestrial plants and is concentrated in the bony tissues of animals that eat contaminated vegetation. The concentration of radioactive ⁹⁰Sr in the atmosphere has steadily decreased since its maximum concentration in 1963, probably as a result of reduced numbers of tests involving nuclear explosives. However radioactive strontium occurs naturally in the earth's crust and partitions between various environmental compartments.

Strontium exists almost exclusively in the environment as a +2 cation, and will form different species, some of which are more soluble than others. Because the different species have different solubilities, they will have different mobilities in the environment and different exposure potentials. Strontium exists as a hydrated cation, an ionic solution complex, or an ionic salt. In the environment, typical solution species for strontium are Sr²⁺ and SrOH⁺, and some strontium compounds (SrCO₃ and SrSO₄) are practically insoluble in neutral water.

The principal abiotic processes that transform strontium in soils and sediments are mediated by sorption and desorption reactions between the soil solution and matrix (precipitation, complexation, and ion exchange), and controlled by pH, ionic strength, solution speciation, mineral composition, organic matter, biological organisms, and temperature. For many soil systems, in the short term, strontium sorption is dominated by simple ion exchange, and strontium ions are readily exchangeable. At longer time scales, however, strontium ions may be relocated into sterically hindered sites that are not readily exchangeable.

Because strontium is an element, its atoms do not degrade by environmental processes such as hydrolysis or biodegradation. However, radioactive strontium will be subject to radioactive decay and transformation to other elements. Eventually, all of the radioactive strontium will be transformed into stable zirconium by the process of radioactive decay

⁹⁰Sr (t_{1/2} = 29 years) → ⁹⁰Y (t_{1/2} = 64 hours) + β⁻ → ⁹⁰Zr (stable) + β⁻

Both radioactive and nonradioactive strontium compounds are subject to both biotic and abiotic transformation mechanisms.

Like calcium, strontium has moderate mobility in soils and sediments, and sorbs moderately to metal oxides and clays. The Sr²⁺ ion is strongly hydrated and is firmly coordinated with six or more water molecules in aqueous solution. When Sr²⁺ ions sorb on negatively charged mineral surface sites, the hydration sphere is retained. Strontium sorbs as hydrated ions on the surface of clay minerals (kaolinite), weathered minerals (amorphous silica), and iron oxides. Sorbed carbonate on iron oxides enhances the sorption of Sr²⁺ and permits the nucleation of Sr²⁺ as strontium carbonate. On calcite (calcium carbonate), Sr²⁺ sorption occurs by electrostatic attraction as hydrated ions. However, at higher concentrations, precipitation of strontianite (strontium carbonate) occurs, and strontium is likely to be less mobile.

Strontium is not necessary for growth or reproduction for most plants, but is typically absorbed to satisfy the plant's metabolic requirements for calcium. Soil to plant concentration ratios for strontium (the ratio of the concentration of strontium in wet vegetation to the concentration of strontium in dry soil) are, and indicate that strontium can be easily absorbed into plants from soil. The uptake of strontium by plants is greatest in sandy soils having low clay and organic matter content. The concentration of nutritive mineral elements in soil such as calcium lower the intake of strontium to the aboveground phytomass. The average reduction of the soil-to-plant concentration ratios for ⁹⁰Sr caused by amendment with Ca or K is around 50-60% .

Strontium may be deposited on plant surfaces from the atmosphere, remain on the plant, be washed off, or be absorbed directly into the plant through leaves. Contamination by direct deposition on foliage surfaces is predominantly a short-term mechanism with a weathering half-life of approximately 14 days. Once absorbed in the plant, strontium translocates to other parts of the plant, such as the leaves or fruit. Translocation of strontium in plants is affected by the particular species and stage of organism growth, and the most metabolically active parts (growing) will accumulate higher concentrations of strontium.

The primary routes of human exposure to strontium are from inhalation of aerosols and ingestion of food and drinking water containing strontium. The intake of strontium, therefore, depends upon the concentration of strontium in air, drinking water, and in the food items that comprise a person's diet, which may be highly variable.

External exposure to ⁹⁰Sr is not a concern because of minor emission of penetrating radiation from ⁹⁰Sr.

No estimate of the concentration of ⁹⁰Sr in air is available. However, it is assumed that ambient concentrations of ⁹⁰Sr in the atmosphere are small relative to exposures from water and diet. If the concentration of ⁹⁰Sr in average U.S. drinking water is estimated as 0.1 pCi/L (4 mBq/L) or one radiochemical event per 5?10 minutes, and the consumption rate of drinking water by a normal adult is assumed to be 2 L/day, then the exposure from drinking water would be 0.2 pCi (7 mBq) per day.

The distributions of ⁹⁰Sr in the body are significantly different for males and females. As expected, the highest concentrations of ⁹⁰Sr are measured in the bony tissue. Males and females averaged 10.4 and 65 pCi/kg (0.38 and 2.4 Bq/kg) wet weight, respectively. Males had a much higher concentration of ⁹⁰Sr in the muscular tissue compared to females. The heart and psoas muscles had respective concentrations of ⁹⁰Sr for men averaging 13.9 and 18.7 pCi/kg (0.51 and 0.69 Bq) wet weight versus respective concentrations of 7.4 and 1.9 pCi/kg (0.27 Bq/kg and 70 mBq/kg) wet weight for females.

Occupational exposure to strontium compounds affords the opportunity to accumulate higher levels of all forms of strontium. Children drink more fluids, eat more food, breathe more air per kilogram of body weight, and have a larger skin surface in proportion to their body volume. A child's diet often differs from that of adults. The developing human's source of nutrition changes with age: from placental nourishment to breast milk or formula to the diet of older children who eat more of certain types of foods than adults. A child's behavior and lifestyle also influence exposure. Compared to adults, the potential for radiostrontium exposure is greater for children who consume foods (e.g., milk, grains) produced in areas with elevated concentrations of radiostrontium in the soil and for children with elevated concentrations of radiostrontium in their drinking water. Children are more likely to be exposed to ⁹⁰Sr in cow's milk produced in contaminated areas..

Agency for Toxic Substances and Disease Registry (ATSDR); Toxicological Profile for Strontium.

- DO NOT discharge into sewer or waterways.

Section 13 - DISPOSAL CONSIDERATIONS

US EPA Waste Number & Descriptions

A. General Product Information

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

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 of oxidizing agent:

- Cautiously acidify a 3% solution to pH 2 with sulfuric acid.
- Gradually add a 50% excess of sodium bisulfite solution with stirring.
- Add a further 10% sodium bisulfite.
- If no further reaction occurs (as indicated by a rise in temperature) cautiously add more acid.
- 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



DOT:

Symbols:	None	Hazard class or Division:	5.1
Identification Numbers:	UN1507	PG:	III
Label Codes:	5.1	Special provisions:	A1, A29, IB8, IP3, T1, TP33
Packaging: Exceptions:	152	Packaging: Non-bulk:	213
Packaging: Exceptions:	152	Quantity limitations: Passenger aircraft/rail:	25 kg
Quantity Limitations: Cargo aircraft only:	100 kg	Vessel stowage: Location:	A
Vessel stowage: Other:	None		

Hazardous materials descriptions and proper shipping names:

Strontium nitrate

Air Transport IATA:

ICAO/IATA Class:	5.1	ICAO/IATA Subrisk:	None
UN/ID Number:	1507	Packing Group:	III
Special provisions:	None		

Shipping Name: STRONTIUM NITRATE

Maritime Transport IMDG:

IMDG Class:	5.1	IMDG Subrisk:	None
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UN Number:	1507	Packing Group:	III
EMS Number:	F-A,S-Q	Special provisions:	None
Limited Quantities:	5 kg		
Shipping Name:	STRONTIUM NITRATE		

Section 15 - REGULATORY INFORMATION

strontium nitrate (CAS: 10042-76-9,13470-05-8) is found on the following regulatory lists;

"Canada Domestic Substances List (DSL)", "OECD Representative List of High Production Volume (HPV) Chemicals", "US - New Jersey Right to Know Hazardous Substances", "US - Pennsylvania - Hazardous Substance List", "US - Rhode Island Hazardous Substance List", "US DOE Temporary Emergency Exposure Limits (TEELs)", "US Toxic Substances Control Act (TSCA) - Inventory"

Section 16 - OTHER INFORMATION

LIMITED EVIDENCE

- Ingestion may produce health damage*.
 - Cumulative effects may result following exposure*.
- *(limited evidence).

Ingredients with multiple CAS Nos

Ingredient Name	CAS
strontium nitrate	10042-76-9, 13470-05-8

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- 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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Issue Date: May-24-2009

Print Date: Apr-21-2010