

Barium nitrate

sc-202972

Material Safety Data Sheet



The Power to Question

Hazard Alert Code
Key:

EXTREME

HIGH

MODERATE

LOW

Section 1 - CHEMICAL PRODUCT AND COMPANY IDENTIFICATION

PRODUCT NAME

Barium 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

Manufacture of barium peroxide; pyrotechnics for green fire; green signal lights; in the vacuum-tube industry.

SYNONYMS

Ba-N2-O6, Ba(NO3)2, "barium dinitrate", "nitric acid, barium salt"

Section 2 - HAZARDS IDENTIFICATION

CANADIAN WHMIS SYMBOLS



EMERGENCY OVERVIEW

RISK

Irritating to eyes.

Harmful by inhalation and if swallowed.

Harmful to aquatic organisms.

POTENTIAL HEALTH EFFECTS

ACUTE HEALTH EFFECTS

SWALLOWED

- Accidental ingestion of the material may be harmful; animal experiments indicate that ingestion of less than 150 gram may be fatal or may produce serious damage to the health of the individual.
- 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.

■ Ingestion of soluble barium compounds may result in ulceration of the mucous membranes of the gastrointestinal tract, tightness in the muscles of the face and neck, gastroenteritis, vomiting, diarrhea, muscular tremors and paralysis, anxiety, weakness, labored breathing, cardiac irregularity due to contractions of smooth striated and cardiac muscles (often violent and painful), slow irregular pulse, hypertension, convulsions and respiratory failure.

EYE

■ This material may produce eye irritation in some persons and produce eye damage 24 hours or more after instillation. Moderate inflammation may be expected with redness; conjunctivitis may occur with prolonged exposure.

SKIN

■ There is some evidence to suggest that the material may cause mild but significant inflammation of the skin either following direct contact or after a delay of some time. Repeated exposure can cause contact dermatitis which is characterized by redness, swelling and blistering.

■ Open cuts, abraded or irritated skin should not be exposed to this material.

■ Solution of material in moisture on the skin, or perspiration, may increase irritant effects.

■ 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

■ Inhalation of dusts, generated by the material, during the course of normal handling, may be harmful.

■ 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.

■ 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.

■ Barium fumes are respiratory irritants. Over-exposure to barium dusts and fume may result in rhinitis, frontal headache, wheezing, laryngeal spasm, salivation and anorexia. Long term effects include nervous disorders and adverse effects on the heart, circulatory system and musculature. Heavy exposures may result in a benign pneumoconiosis.

CHRONIC HEALTH EFFECTS








■ 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.

Barium compounds may cause high blood pressure, airway irritation and damage the liver, spleen and bone marrow. Prolonged exposure may cause a lung inflammation and scarring. Symptoms of this include a worsening dry cough, shortness of breath on exertion, increased chest expansion and weakness. Stringy phlegm in the cough appears later, with more difficulty in breathing and a further loss of lung capacity. Barium sulfate does not cause permanent scarring of the lungs.

Section 3 - COMPOSITION / INFORMATION ON INGREDIENTS

HAZARD RATINGS

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

NAME	CAS RN	%
barium nitrate	10022-31-8	> 97

Section 4 - FIRST AID MEASURES

SWALLOWED

-
- IF SWALLOWED, REFER FOR MEDICAL ATTENTION, WHERE POSSIBLE, WITHOUT DELAY.
- Where Medical attention is not immediately available or where the patient is more than 15 minutes from a hospital or unless instructed otherwise:
- For advice, contact a Poisons Information Center or a doctor.
- Urgent hospital treatment is likely to be needed.
- If conscious, give water to drink.
- INDUCE vomiting with fingers down the back of the throat, ONLY IF CONSCIOUS. Lean patient forward or place on left side (head-down position, if possible) to maintain open airway and prevent aspiration.

NOTE: Wear a protective glove when inducing vomiting by mechanical means.

- In the mean time, qualified first-aid personnel should treat the patient following observation and employing supportive measures as indicated by the patient's condition.
- If the services of a medical officer or medical doctor are readily available, the patient should be placed in his/her care and a copy of the MSDS should be provided. Further action will be the responsibility of the medical specialist.

- If medical attention is not available on the worksite or surroundings send the patient to a hospital together with a copy of the MSDS.

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.
 - Prostheses 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.

NOTES TO PHYSICIAN

- - After ingestion of barium acid salts, severe gastro-intestinal irritation followed by muscle twitching, progressive flaccid paralysis and severe hypokalemia and hypertension, occurs.
 - Respiratory failure, renal failure and occasional cardiac dysrhythmias may result from an acute ingestion.
 - Use sodium sulfate as a cathartic. Add 5-10 gm of sodium sulfate to lavage solution or as fluid supplement to Ipecac syrup (the sulfate salt is not absorbed)
 - Monitor cardiac rhythm and serum potassium closely to establish the trend over the first 24 hours. Large doses of potassium may be needed to correct the hypokalemia.
 - Administer generous amounts of fluid replacement but monitor the urine and serum for evidence of renal failure. [Ellenhorn and Barceloux: Medical Toxicology]

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):	Not applicable
Upper Explosive Limit (%):	Not applicable
Specific Gravity (water=1):	3.24
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.
 - 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.

- 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 (NOx), metal oxides.

Decomposes at high temperatures to produce barium oxide. Barium oxide is strongly alkaline and, upon contact with water, is exothermic. When barium oxide reacts with oxygen to give a peroxide, there is a fire and explosion risk.

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:

Safety Glasses.

Full face- shield.

Gloves:

Respirator:

Particulate

Section 6 - ACCIDENTAL RELEASE MEASURES

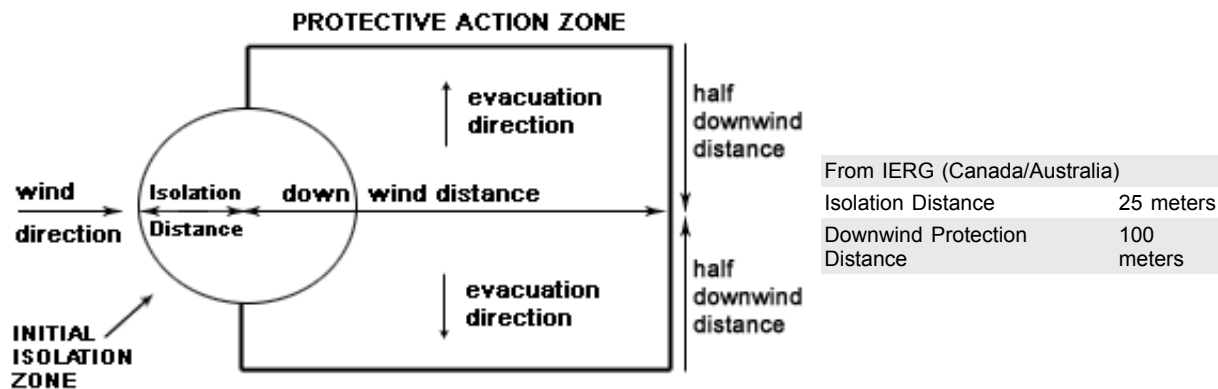
MINOR SPILLS

-
- 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 141 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

-
- 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 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.

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/m³	STEL ppm	STEL mg/m³	Peak ppm	Peak mg/m³	TWA F/CC	Notes
Canada - Ontario Occupational Exposure Limits	barium nitrate (Barium carbonate, chloride, nitrate, or oxide (as barium))		0.5						
US NIOSH Recommended Exposure Limits (RELs)	barium nitrate (Barium nitrate (as Ba))		0.5						
Canada - British Columbia Occupational Exposure Limits	barium nitrate (Barium and soluble compounds, as Ba)		0.5						
US - Minnesota Permissible Exposure Limits (PELs)	barium nitrate (Barium, soluble compounds (as Ba))		0.5						
Canada - Alberta Occupational Exposure Limits	barium nitrate (Barium and soluble compounds, as Ba)		0.5						
US OSHA Permissible Exposure Levels (PELs) - Table Z1	barium nitrate (Barium, soluble compounds (as Ba))		0.5						
US ACGIH Threshold Limit Values (TLV)	barium nitrate (Barium - Soluble compounds (as Ba))		0.5						TLV Basis: eye, skin & gastrointestinal irritation; muscular stimulation
US - Vermont Permissible Exposure Limits Table Z-1-A Transitional Limits for Air Contaminants	barium nitrate (Barium, soluble compounds (as Ba))		0.5						
US - Vermont Permissible Exposure Limits Table Z-1-A Final Rule Limits for Air Contaminants	barium nitrate (Barium, soluble compounds (as Ba))		0.5						
US - Tennessee Occupational Exposure Limits - Limits For Air Contaminants	barium nitrate (Barium, soluble compounds (as Ba))		0.5						
US - California Permissible Exposure Limits for Chemical Contaminants	barium nitrate (Barium, soluble compounds, as Ba)		0.5						
US - Idaho - Limits for Air Contaminants	barium nitrate (Barium, soluble compounds (as Ba))		0.5						
US - Hawaii Air Contaminant Limits	barium nitrate (Barium, soluble compounds (as Ba))		0.5						
US - Alaska Limits for Air Contaminants	barium nitrate (Barium, soluble compounds (as Ba))		0.5						

Contaminants	Ba))			
Canada - Saskatchewan Occupational Health and Safety Regulations - Contamination Limits	barium nitrate (Barium and soluble compounds, (as Ba))	0.5	1.5	
Canada - Yukon Permissible Concentrations for Airborne Contaminant Substances	barium nitrate (Barium (soluble compounds) (as - Ba))	0.5	-	0.5
US - Washington Permissible exposure limits of air contaminants	barium nitrate (Barium, soluble compounds (as Ba))	0.5	1.5	
Canada - Nova Scotia Occupational Exposure Limits	barium nitrate (Barium - Soluble compounds (as Ba))	0.5		TLV Basis: eye, skin & gastrointestinal irritation; muscular stimulation
Canada - Prince Edward Island Occupational Exposure Limits	barium nitrate (Barium - Soluble compounds (as Ba))	0.5		TLV Basis: eye, skin & gastrointestinal irritation; muscular stimulation
Canada - Northwest Territories Occupational Exposure Limits (English)	barium nitrate (Barium (soluble compounds) (as Ba))	0.5	1.5	
US - Michigan Exposure Limits for Air Contaminants	barium nitrate (Barium, soluble compounds (as Ba))	0.5		
US - Oregon Permissible Exposure Limits (Z1)	barium nitrate (Barium (soluble compounds))	0.5		
Canada - Quebec Permissible Exposure Values for Airborne Contaminants (English)	barium nitrate (Barium, soluble compounds (as Ba))	0.5		
US - Wyoming Toxic and Hazardous Substances Table Z1 Limits for Air Contaminants	barium nitrate (Barium, soluble compounds (as Ba))	0.5		

EMERGENCY EXPOSURE LIMITS

Material	Revised IDLH Value (mg/m3)	Revised IDLH Value (ppm)
barium nitrate	50	

MATERIAL DATA

BARIUM NITRATE:

■ The recommended TLV-TWA is based on satisfactory results achieved while employing an internal limit for barium nitrate at a national laboratory. It is not known what degree of added safety this limit incorporates.

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	261.36
Melting Range (°F)	1097.6	Viscosity	Not Applicable
Boiling Range (°F)	Decomposes >1097.6	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)	Not applicable
Upper Explosive Limit (%)	Not applicable	Specific Gravity (water=1)	3.24
Lower Explosive Limit (%)	Not applicable	Relative Vapor Density (air=1)	Not applicable
Volatile Component (%vol)	Nil.	Evaporation Rate	Not applicable

APPEARANCE

Odourless, white crystals. Freely soluble in water.

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

Barium nitrate:

- is a strong oxidiser
- is incompatible strong acids and other oxidisers
- mixtures with sulfur, finely divided metals (specifically aluminium and magnesium alloys) can form shock- and friction-sensitive compounds
- contact with ammonium nitrate may cause spontaneous fire or explosion

Avoid storage with reducing agents.

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

Section 11 - TOXICOLOGICAL INFORMATION

barium nitrate

TOXICITY AND IRRITATION

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

TOXICITY	IRRITATION
Oral (rat) LD50: 355 mg/kg	Skin (rabbit): 500 mg/24h - Mild
	Eye (rabbit): 100 mg/24h - Moderate

■ The material may produce moderate eye irritation leading to inflammation. Repeated or prolonged exposure to irritants may produce conjunctivitis.

The material may cause skin irritation after prolonged or repeated exposure and may produce on contact skin redness, swelling, the production of vesicles, scaling and thickening of the skin.

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
Barium and Compounds	US EPA Carcinogens Listing	Carcinogenicity	D
Barium and Compounds (Inhalation Route)*	US EPA Carcinogens Listing	Carcinogenicity	CBD
Barium and Compounds (Oral Route)*	US EPA Carcinogens Listing	Carcinogenicity	NL
Barium and Compounds	US ACGIH Threshold Limit Values (TLV) - Carcinogens	Carcinogen Category	D
Barium and Compounds (Inhalation Route)*	US ACGIH Threshold Limit Values (TLV) - Carcinogens	Carcinogen Category	CBD
Barium and Compounds (Oral Route)*	US ACGIH Threshold Limit Values (TLV) - Carcinogens	Carcinogen Category	NL
Barium - Soluble compounds (as Ba)	US ACGIH Threshold Limit Values (TLV) - Carcinogens	Carcinogen Category	A4

Section 12 - ECOLOGICAL INFORMATION

Refer to data for ingredients, which follows:

BARIUM 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 barium and its compounds:

Environmental fate:

Under natural conditions, barium is stable in the +2 valence state and is found primarily in the form of inorganic complexes. Conditions such as pH, Eh (oxidation-reduction potential), cation exchange capacity, and the presence of sulfate, carbonate, and metal oxides (e.g., oxides of aluminum, manganese, silicon, and titanium) will affect the partitioning of barium and its compounds in the environment. The major features of the biogeochemical cycle of barium include wet and dry deposition to land and surface water, leaching from geological formations to groundwater, adsorption to soil and sediment particulates, and biomagnification in terrestrial and aquatic food chains.

Barium is a highly reactive metal that occurs naturally only in a combined state. The element is released to environmental media by both natural processes and anthropogenic sources.

The general population is exposed to barium through consumption of drinking water and foods, usually at low levels. Most barium released to the environment from industrial sources is in forms that do not become widely dispersed. In the atmosphere, barium is likely to be present in particulate form. Although chemical reactions may cause changes in speciation of barium in air, the main mechanisms for the removal of barium compounds from the atmosphere are likely to be wet and dry deposition.

In aquatic media, barium is likely to precipitate out of solution as an insoluble salt (i.e., as BaSO₄ or BaCO₃). Waterborne barium may also adsorb to suspended particulate matter through the formation of ion pairs with natural anions such as bicarbonate or sulfate in the matter.

Precipitation of barium sulfate salts is accelerated when rivers enter the ocean because of the high sulfate content (905 mg/L) in the ocean. It is estimated that only 0.006% of the total barium input into oceans from freshwater sources remains in solution. Sedimentation of suspended solids removes a large portion of the barium content from surface waters. There is evidence to suggest that the precipitation of barium from the surface of fresh and marine waters occurs, in part, as the result of the barite crystal formation in microorganisms.

Barium in sediments is found largely in the form of barium sulfate (barite). Coarse silt sediment in a turbulent environment will often grind and cleave the barium sulfate from the sediment particles leaving a buildup of dense barites. Estimated soil:water distribution coefficients (K_d) (i.e., the ratio of the quantity of barium sorbed per gram of sorbent to the concentration of barium

remaining in solution at equilibrium) range from 200 to 2,800 for sediments and sandy loam soils. The uptake of barium by fish and marine organisms is also an important removal mechanism. Barium levels in sea water range from 2 to 63 µg/L with a mean concentration of about 13 µg/L. Barium was found to bioconcentrate in marine plants by a factor of 400-4,000 times the level present in the water. Bioconcentration factors in marine animals, plankton, and brown algae of 100, 120, and 260, respectively, have been reported. In freshwater, a bioconcentration factor of 129 was estimated in fish where the barium in water was 0.07 mg/L.

Barium added to soils (e.g., from the land farming of waste drilling muds) may either be taken up by vegetation or transported through soil with precipitation. Relative to the amount of barium found in soils, little is typically bioconcentrated by plants. For example, a bioconcentration factor of 0.4 has been estimated for plants in a Virginia floodplain with a barium soil concentration of 104.2 mg/kg. However, there are some plants, such as legumes, forage plants, Brazil nuts, and mushrooms that accumulate barium. Bioconcentration factors from 2 to 20 have been reported for tomatoes and soybeans.

Barium is not very mobile in most soil systems, due to the formation of water-insoluble salts and an inability of the barium ion to form soluble complexes with fulvic and humic acids. The rate of transportation of barium in soil is dependent on the characteristics of the soil material. Soil properties that influence the transportation of barium to groundwater are cation exchange capacity, calcium carbonate (CaCO₃) content and pH. In soil with a high cation exchange capacity (e.g., fine textured mineral soils or soils with high organic matter content), barium mobility will be limited by adsorption. High CaCO₃ content limits mobility by precipitation of the element as BaCO₃. Barium will also precipitate as barium sulfate in the presence of sulfate ions. Barium is more mobile and is more likely to be leached from soils in the presence of chloride due to the high solubility of barium chloride as compared to other chemical forms of barium. Barium may become more mobile in soils under acid conditions as barium in water-insoluble salts, such as barium sulfate and carbonate, becomes more soluble. Barium complexes with fatty acids (e.g., in acidic landfill leachate) will be much more mobile in the soil due to the lower charge of these complexes and subsequent reduction in adsorption capacity.

■ DO NOT discharge into sewer or waterways.

Ecotoxicity

Ingredient	Persistence: Water/Soil	Persistence: Air	Bioaccumulation	Mobility
barium nitrate			LOW	

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 D005 (waste code E) if this substance, in a solid waste, produces an extract containing greater than 100 mg/L of barium.

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 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:	UN1446	PG:	II
Label Codes:	5.1, 6.1	Special provisions:	IB8, IP2, IP4, T3, TP33
Packaging: Exceptions:	152	Packaging: Non-bulk:	212
Packaging: Exceptions:	152	Quantity limitations: Passenger aircraft/rail:	5 kg
Quantity Limitations: Cargo	25 kg	Vessel stowage: Location:	A

aircraft only:	2.5 kg	vessel stowage:	Location:	A
Vessel stowage: Other:	None			
Hazardous materials descriptions and proper shipping names:				
Barium nitrate				
Air Transport IATA:				
ICAO/IATA Class:	5.1 (6.1)	ICAO/IATA Subrisk:	None	
UN/ID Number:	1446	Packing Group:	II	
Special provisions:	None			
Shipping Name: BARIUM NITRATE				
Maritime Transport IMDG:				
IMDG Class:	5.1	IMDG Subrisk:	6.1	
UN Number:	1446	Packing Group:	II	
EMS Number:	F-A,S-Q	Special provisions:	None	
Limited Quantities:	1 kg			
Shipping Name: BARIUM NITRATE				

Section 15 - REGULATORY INFORMATION

barium nitrate (CAS: 10022-31-8,34053-87-7) is found on the following regulatory lists;

"Canada - Ontario Occupational Exposure Limits","Canada - Saskatchewan Industrial Hazardous Substances","Canada Domestic Substances List (DSL)","Canada Ingredient Disclosure List (SOR/88-64)","Canada Toxicological Index Service - Workplace Hazardous Materials Information System - WHMIS (English)","Canada Toxicological Index Service - Workplace Hazardous Materials Information System - WHMIS (French)","OECD Representative List of High Production Volume (HPV) Chemicals","US - Massachusetts Oil & Hazardous Material List","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 NIOSH Recommended Exposure Limits (RELs)","US Toxic Substances Control Act (TSCA) - Inventory"

Section 16 - OTHER INFORMATION

LIMITED EVIDENCE

- Contact with air may produce sufficient heat to ignite combustible materials.*.
- Cumulative effects may result following exposure*.
- May produce discomfort of the respiratory system and skin*.

* (limited evidence).

Ingredients with multiple CAS Nos

Ingredient Name	CAS
barium nitrate	10022-31-8, 34053-87-7

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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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