Potassium chlorate

sc-203350

Section 1 - CHEMICAL PRODUCT AND COMPANY IDENTIFICATION

PRODUCT NAME
Potassium chlorate

STATEMENT OF HAZARDOUS NATURE

SUPPLIER
Company: Beijing Hengrunxin Import & Export Trading Co., Ltd.
Address: Room 1503, Hengrun Center, 32 West Beisanhuan Avenue, Haidian District, Beijing, China
Telephone: 86-10-62158015/8016/8018/8019
Fax: 86-10-62158012

PRODUCT USE
Explosives; fireworks; matches; printing and dyeing cotton and wool black; manufacturing aniline black and other dyes; chemical analyses; as a source of oxygen. Formerly used as an antiseptic for skin and mucous membranes. Potassium chlorate is a mild astrigent and a sialogue and has been employed in stomatitis, tonsillitis and other inflammatory conditions of the mouth and pharynx usually as a mouth-wash or gargle.

SYNONYMS

Section 2 - HAZARDS IDENTIFICATION

CANADIAN WHMIS SYMBOLS

EMERGENCY OVERVIEW RISK
Explosive when mixed with combustible material. Irritating to eyes. Harmful by inhalation and if swallowed. Toxic to aquatic organisms, may cause long-term adverse effects in the aquatic environment.
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.

*Nausea and vomiting are almost always apparent after chlorate poisonings usually with upper stomach pain. Diarrhea may also occur. Chlorates are poisonous to the kidney and this can cause death. Healing can be slow and kidney symptoms last weeks. Often there is severe blood cell damage.

EYE

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

SKIN

*There is some evidence to suggest that this material can cause inflammation of the skin on contact in some persons.

*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

*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.

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. Chronic and/or sub-lethal exposure to inorganic chlorate may have deleterious effects on human health, such as redness of the eyes and skin (including dermatitis), sore throat, abdominal pain, blue lips or skin, diarrhea, nausea, vomiting, shortness of breath, and unconsciousness. Sodium chlorate may damage the liver, kidneys, and blood cells of humans. Subchronic chlorate exposure was associated with smaller body and organ weights, blood abnormalities and pituitary and thyroid abnormalities in one study using Sprague-Dawley rats. Chlorate is a thyroid toxicant producing thyroid gland follicular cell hypertrophy in rats and mice following chronic exposures, and may produce follicular cell tumors in rats. The lack of mutagenicity indicates that the thyroid tumors are induced by a non-mutagenic mechanism and are therefore not likely to be carcinogenic. The effects may be attributed to changes in levels of thyroid hormones seen after administration of high doses of sodium chlorate. In female mice there was equivocal and marginal evidence of increased pancreatic islet carcinoma. Sodium chlorate was negative in most bacterial gene mutation assays and in several cytogenetics tests, including a hypoxanthineguanine phosphoribosyl-transferase (HGPRT) assay in Chinese hamster ovaries and a micronucleus assay. Intramuscular administration of potassium chlorate to pregnant rats resulted in a prolonged gestation period in most cases, and reduced neonatal weight relative to the controls. According to the author, newborn rats also showed a "marked" increase of haematopoietic residue and lipid deposit over controls, and occasionally, exposure resulted in the appearance of hyaline droplets and casts in newborn kidneys. The number of animals per treatment group/number affected, duration of exposure, and information on dose levels was not available. African green monkeys (five males and seven females) were used to study the thyroid effects of sodium chlorate when administered for 30-60 days as chlorate at concentrations of 4, 7.5, 15, 30 or 58.4 mg/kg bw per day. Chlorate did not induce thyroid depression. Chlorate did not induce a dose-dependent oxidative stress, as was observed in the case of chlorite. Female rats were exposed to 1 or 10 mg chlorate/L in their drinking water for ten weeks. Fetuses were taken on the 20th day of gestation and examined for external, visceral and skeletal malformations. No significant adverse findings were reported. No chromosomal abnormalities were seen in either the micronucleus test or a cytogenetic assay in mouse bone marrow cells following gavage dosing with chlorate.

Section 3 - COMPOSITION / INFORMATION ON INGREDIENTS
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

- For severe intoxication: Empty the stomach by lavage and aspiration or by emesis, give demulcents or sweetened drinks and maintain respiration. Pethidine may be given if required. A 1% solution of sodium thiosulfate may be used for lavage and may also be given by intravenous infusion. Hemodialysis, peritoneal dialysis or exchange perfusions may be of value in removing chlorate from the blood. Forced diuresis should not be attempted if there is inadequate urine input. MARTINDALE: The Extra Pharmacopoeia, 27th Edition Treatment regime for bromates may also act as a guide for chlorate poisonings.
  - Syrup of ipecac or gastric lavage with tap water or perhaps a 1% solution of sodium thiosulfate
  - Administer a demulcent and an analgesic like meperidine (Demerol). Avoid morphine.
  - If readily available, the prompt use of hemodialysis or peritoneal lavage may serve to remove absorbed but unreacted chlorate in significant amounts.
  - Administer oxygen. If methemoglobinemia becomes severe a replacement transfusion with whole blood may become necessary.
  - DO NOT attempt to correct methemoglobinemia with methylene blue as the dye may enhance the toxicity.
  - Sodium thiosulfate solution (100 to 500 ml of 1%) by intravenous drip has been recommended by some authors.
  - Correct dehydration by infusing intravenously a glucose solution (5% in water). Avoid electrolytes (except as above) unless acid-base imbalance or shock becomes severe.
  - Supportive treatment of acute renal failure. [GOSSELIN et al, Clinical Toxicology of Commercial Products, Fifth Edition]

Section 5 - FIRE FIGHTING MEASURES

Vapour Pressure (mmHG): Not applicable Not applicable 2.32 Not applicable
Upper Explosive Limit (%): Not applicable
Specific Gravity (water=1): Not applicable
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 breathing apparatus plus protective gloves. Prevent, by any means available, spillage from entering drains or water course. Consider evacuation. 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: hydrogen chloride, metal oxides.

**FIRE INCOMPATIBILITY**
- Avoid storage with reducing agents.
- Avoid any contamination of this material as it is very reactive and any contamination is potentially hazardous

**PERSONAL PROTECTION**
Glasses: Full face-shield. Gloves: Respirator: Particulate

**Section 6 - ACCIDENTAL RELEASE MEASURES**

**MINOR SPILLS**
- Clean up all spills immediately.
  - No smoking, naked lights, ignition sources.
  - 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.

**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 breathing apparatus plus protective gloves.

- Prevent, by any means available, spillage from entering drains or water courses.
  - 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 or cloth.
  - Use spark-free and explosion-proof equipment.
  - Collect any recoverable product into labeled containers for possible recycling.
  - Avoid contamination with organic matter to prevent subsequent fire and explosion.
  - 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

- DO NOT use aluminum or galvanized containers.
  - 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**

![Chemical symbols]

**Section 8 -EXPOSURE CONTROLS / PERSONAL PROTECTION**

**EXPOSURE CONTROLS**

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<th>Source</th>
<th>Material</th>
<th>TWA ppm</th>
<th>TWA mg/m³</th>
<th>STEL ppm</th>
<th>STEL mg/m³</th>
<th>Peak ppm</th>
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**MATERIAL DATA**

**POTASSIUM CHLORATE:**

- 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 an 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

Airline* -50 x PEL Air-line** P2 PAPR-P2 100x PEL -P3 -
Airline* -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 certain organic gases and vapors.
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.

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 velocity" 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 conveyor 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, conveyor loading, crusher dusts, gas discharge (active 1-2.5 m/s (200-500 f/min.) generation into zone of rapid air motion)
      - grinding, abrasive blasting, tumbling, high speed wheel generated dusts (released at high initial velocity into zone of 2.5-10 m/s (500-2000 f/min.) very high rapid air motion).

  - Within each range the appropriate value depends on:
    - Lower end of the range 1: Room air currents minimal or favorable to capture
    - Upper end of the range 1: Disturbing room air currents
    - 2: Contaminants of low toxicity or of nuisance value only.
    - 3: 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.

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<thead>
<tr>
<th>State</th>
<th>Divided solid</th>
<th>Molecular Weight</th>
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<td>Boiling Range</td>
<td>752 decomposes</td>
<td>Solubility in water (g/L)</td>
<td>Miscible</td>
</tr>
<tr>
<td>Flash Point</td>
<td>Not Applicable</td>
<td>pH (% solution)</td>
<td>Not available.</td>
</tr>
<tr>
<td>Decomposition Temp</td>
<td>Not Available</td>
<td>pH (as supplied)</td>
<td>Not applicable</td>
</tr>
<tr>
<td>Autoignition Temp</td>
<td>Not applicable</td>
<td>Vapour Pressure (mmHG)</td>
<td>Not applicable</td>
</tr>
<tr>
<td>Upper Explosive Limit (%)</td>
<td>Not applicable</td>
<td>Specific Gravity (water=1)</td>
<td>2.32</td>
</tr>
<tr>
<td>Lower Explosive Limit (%)</td>
<td>Not applicable</td>
<td>Relative Vapor Density (air=1)</td>
<td>Not applicable</td>
</tr>
<tr>
<td>Volatile Component (%vol)</td>
<td>Not applicable</td>
<td>Evaporation Rate</td>
<td>Not applicable</td>
</tr>
</tbody>
</table>

APPEARANCE

Section 10 - CHEMICAL STABILITY

Colourless, lustrous crystals or white granules or powder. Saline taste. Oxidising agent. 1g is soluble in 16ml of water at 20 C and 1.8ml of boiling water. Almost insoluble in alcohol and is slightly soluble in glycerol and liquid ammonia.

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.
- Presence of elevated temperatures.
- Presence of incompatible materials.

STORAGE INCOMPATIBILITY

- Contact with acids produces toxic fumes. 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.
- Avoid any contamination of this material as it is very reactive and any contamination is potentially hazardous.
- Segregate chlorates from organic matter, acids, poisonous gases, flammables, corrosives, aluminium and ammonium salts and any other combustible material.
- Mixtures of chlorates with fibrous and absorbent organic materials such as wood, paper, leather, flour, sawdust, sugar, shellac, may be ignited or caused to explode by static sparks, friction or shock.
- The extreme hazardous nature of mixtures of metal chlorates with phosphorus or sulfur, apart from being powerful explosives, are dangerously sensitive to friction or shock; spontaneous ignition occasionally occurs.
Mixtures with sucrose, lactose, chromium, sulfur dioxide, sodium amide, zirconium, germanium and titanium explode on heating.

Forms incompatible sometimes explosive mixtures with thorium dicarbide, strontium hydride, hydrogen iodide, fluorine, cyanoguanidine, cyanides, dinickel trioxide, powdered carbon, aqua regia and ruthenium, nitric acid, manganese dioxide and potassium hydroxide or boron.

Chlorates should not be allowed to come into contact with ammonium salts, aluminium and other powdered metals, phosphorous, silicon, sulfur, sulfides, sulfuric acid, nitrobenzene, iodonides and tartaric acid.

Mixtures with hydrocarbons, metal phosphides (Zn, Ag, Al, Cu, Hg, Mg, etc), metal thiocyanates, metal sulfides, arsenic, carbon, phosphorous, sulfur, ammonium salts, powdered metals, arsenic trioxide, phosphorous, silicon, sulfur, sulfides, sulfites and hyposulfites are easily ignited (by friction impact or heat) and are potentially explosive.

Metal chlorates in contact with strong acids liberate explosive chlorine dioxide gas. With concentrated sulfuric acid a violent explosion can occur unless effective cooling is used. Mixing potassium chlorate and concentrated sulfuric acid results in an explosion with optimum temperature range being 120-130. Heating a moist mixture of metal chloride and dibasic organic acid (tartaric or citric acid) liberates chlorine dioxide diluted with carbon dioxide.

Fusion of chlorates with metal cyanides may lead to an explosion.

Chlorates containing 1-2% bromate or sulfur are liable to spontaneous explosion.

Chlorates releases oxygen, chlorine and chlorine dioxide when heated above 300 deg. C.

In presence of moisture may release oxygen and ozone.

Intimate mixtures of chlorates, bromates or iodates of barium, cadmium, calcium, magnesium, potassium, sodium or zinc, with finely divided aluminum, arsenic, copper, carbon, phosphorus, sulfur, hydrides of alkali-and alkaline earth-metals; sulfides of antimony, arsenic, copper or tin; metal cyanides, thiocyanates; or impure manganese dioxide may react explosively or violently, either spontaneously (especially in the presence of moisture) or on initiation by heat, impact or friction, sparks or addition of sulfuric acid.


Inorganic oxidising agents can react with reducing agents to generate heat and products that may be gaseous (causing pressurization of closed containers). The products may themselves be capable of further reactions (such as combustion in the air).

Organic compounds in general have some reducing power and can in principle react with compounds in this class. Actual reactivity varies greatly with the identity of the organic compound.

Inorganic oxidising agents can react violently with active metals, cyanides, esters, and thiocyanates.

Inorganic reducing agents react with oxidizing agents to generate heat and products that may be flammable, combustible, or otherwise reactive. Their reactions with oxidizing agents may be violent.

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

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

Section 11 -TOXICOLOGICAL INFORMATION

potassium chlorate

TOXICITY AND IRRITATION

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

TOXICITY IRRITATION Oral (rat) LD50: 1870 mg/kg Nil Reported

Section 12 -ECOLOGICAL INFORMATION

Refer to data for ingredients, which follows: POTASSIUM

CHLORATE:

Toxic to aquatic organisms, may cause long-term adverse effects in the aquatic environment.

Do NOT allow product to come in contact with surface waters or to intertidal areas below the mean high water mark. Do not contaminate water when cleaning equipment or disposing of equipment wash-waters. Wastes resulting from use of the product must be disposed of on site or at approved waste sites.

- Chlorate is highly soluble in water (95.7 g/100 ml at 20 deg, C) and will therefore be uniformly distributed in groundwater or surface
toxicity < 0.1 mg/l) to certain macro brown algal species. The toxicity of chlorate is nontoxic (acute toxicity > 100 mg/l) to most of the freshwater and marine species examined. However, chlorate is considerably by a high nitrate residual activity for sodium chlorate in soil was 3. 

The redox potential of the media also effects the predominance of the reduction products. Nitrate concentration, temperature, pH, and degree of moisture (soils). For example, chlorate is generally more mobile than nitrate and other inorganic chemical species are very complex and depend on the redox conditions of the media, nature and concentration of reductants, chlorate concentration, temperature, pH, and degree of moisture (soils). For example, chlorate is generally more stable under alkaline than acidic conditions; however, when a chemical element (chlorine) can exist in two or more oxidation states (i.e., chloride and chlorate), the redox potential of the media also effects the predominance of the reduction products. Nitrate concentrations in soil and water (as well as other physical and chemical properties of soil and water) play an important role in the redox chemistry of chlorate in the environment. The duration of residual activity for sodium chlorate in soil was 3-4 months after using 1,000 liters of a 1% solution/ha. Sodium chlorate may persist in soil for 6 months to 5 years, depending on rate applied, soil type, fertility, organic matter, moisture, and weather conditions. Toxicity in soil is decreased considerably by a high nitrate content, alkaline conditions, and high soil temperatures. Decomposition of the compound occurs more readily in moist soils above 20 degrees C. Plants absorb sodium chlorate through both roots and leaves. Chlorate is carried downward through the xylem since it kills the phloem tissue. It also increases the rate of respiration, decreasing catalase activity, and depleting the plant's food reserves. Chlorate-injured plants are more susceptible to frost. Sodium chlorate is 30-50 times more toxic to plants than sodium chloride (table salt) Chlorate is nontoxic (acute toxicity > 100 mg/l) to most of the freshwater and marine species examined. However, chlorate is highly toxic (acute toxicity < 0.1 mg/l) to certain macro brown algal species. The toxicity of chlorate is coupled to its reduction to chlorite and this reduction is linked
to an active, functioning nitrate reductase system. Chlorite is toxic to the algae, which do not contain the enzyme chlorite dismutase to convert chlorite into innocuous chloride and oxygen. Sodium chlorate is considered non-toxic to fish. The possible 48-hour LC50 for various species of fish is as high as 10,000 mg/l; other reported literature values confirm low toxicities, e.g.:
- **Fish (freshwater)** LC50: 7.3-1100 mg/l; NOEC 600-1000 mg/l
- **Invertebrates (freshwater)** LC50: 2100 -4100 mg/l; NOEC 52-1000 mg/l
- **Aquatic Plants** LC50: 133-444 mg/l; NOEC 50-133 mg/l

Chlorites produced as a result of the reduction of chlorates exhibit low to high environmental toxicity. Environmental conditions dictate the rate and extent of conversion. Biological uptake of chlorate by phytoplankton appears to be a potential and significant sink for effluent-derived chlorate. Since chlorate is an analogue of nitrate, chlorate will be taken up by the phytoplankton. Once chlorate is in the marine environment, it can be taken up by macroalgae using the same mechanism as nitrate. In brown algae, the uptake of nutrients is an active process and does not simply rely on the slow diffusion of seawater. Nitrate and chlorate are structurally analogous to each other and may potentially be incorporated into the same enzyme active site, as is evidenced by the fact that chlorate can be used as a substrate by various nitrate reductases. There is competition for the active sites on the enzyme system and if nitrate is abundant, it prevents too much chlorate from being reduced. If nitrate concentrations are just high enough to induce the nitrate reductase system, but not high enough to out-compete chlorate for all the active sites, then chlorate may be reduced to chlorite at a maximal rate. Chlorite toxicity to various aquatic species has been reported:
- **Fish (freshwater)** LC50: 50.6-420 mg/l; NOEC 32-216 mg/l
- **Fish (estuarine/ marine)** LC50: 75 mg/l; NOEC 13.9 mg/l
- **Invertebrates (freshwater)** EC50: 0.027-1.4 mg/l; NOEC 0.003 -0.4 mg/l
- **Invertebrates (estuarine/ marine)** EC50: 0.576 -21.4 mg/l; NOEC 14.3 mg/l
- **Aquatic Plants** EC50: 1.32 mg/l; NOEC <0.62 mg/l

The long-term toxicity of sodium chlorate to birds resulted in reduced egg production and fertility.

**DO NOT** discharge into sewer or waterways.

**Ecotoxicity**

Ingredient Persistence: Water/Soil Persistence: Air Bioaccumulation Mobility potassium chlorate HIGH LOW HIGH

**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. Puncture containers to prevent re-use and bury at an authorized landfill. Legislation addressing waste disposal requirements may differ by country, state and/ or territory. Each user must refer to laws operating in their area. In some areas, certain wastes must be tracked. A Hierarchy of Controls seems to be common. The user should investigate:

- **Reduction**
- **Reuse**
- **Recycling**

Disposal (if all else fails) This material may be recycled if unused, or if it has not been contaminated so as to make it unsuitable for its intended use. Shelf life considerations should also be applied in making decisions of this type. Note that properties of a material may change in use, and recycling or reuse may not always be appropriate. DO NOT allow wash water from cleaning equipment to enter drains. Collect all wash water for treatment before disposal. FOR DISPOSAL OF SMALL QUANTITIES:

Cautiously acidify a 3% solution or a suspension of the material to pH 2 with sulfuric acid.

Gradually add a 50% excess of aqueous sodium bisulfite with stirring at room temperature. (Other reducers such as thiosulfate or ferrous salts may substitute; do NOT use carbon, sulfur or other strong reducing agents). An increase in temperature indicates reaction is taking place. If no reaction is observed on the addition of about 10% of the sodium bisulfite solution, initiate it by cautiously adding more acid.

If manganese, chromium or molybdenum are present adjust the pH of the solution to 7 and treat with sulfide to precipitate for burial as a hazardous waste. Destroy excess sulfide, neutralize and flush the solution down the drain (subject to State and Local Regulation).

[Sigma/Aldrich].
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: UN1485 PG: II
A9, IB8, IP2, IP4, N34, T3, Label Codes: 5.1 Special provisions: TP33

Packaging: Exceptions: 152 Packaging: Non-bulk: 212

Packaging: Exceptions: 152 Quantity limitations: 5 kg

Passenger aircraft/rail:
Quantity Limitations: Cargo
25 kg Vessel stowage: Location: A
aircraft only
Vessel stowage: Other: 56, 58 Hazardous materials descriptions and proper shipping names: Potassium chlorate
Air Transport IATA:
ICAO/IATA Class: 5.1 ICAO/IATA Subrisk: None
UN/ID Number: 1485 Packing Group: II

Special provisions: None
Shipping Name: POTASSIUM CHLORATE

Maritime Transport IMDG:
IMDG Class: 5.1 IMDG Subrisk: None UN Number: 1485 Packing Group: II EMS Number: F-H,S-Q Special provisions: None Limited Quantities: 1 kg
Shipping Name: POTASSIUM CHLORATE

Section 15 - REGULATORY INFORMATION

potassium chlorate (CAS: 3811-04-9) is found on the following regulatory lists;

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*.