Site: CHEMCO IND
ID #: KS0001118850
Break: 2.0
Other:
07WK 11/13/06
LV

# Uranyl acetate

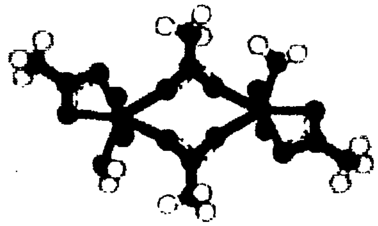
From Wikipedia, the free encyclopedia

**Uranyl acetate** ($UO_2(CH_3COO)_2{\cdot}2H_2O$) is a yellow free-flowing crystalline solid of yellow rhombic crystals with a slight acetic odor.

It is used as a negative stain in electron microscopy. In fact, most procedures in electron microscopy for biology require the use of uranyl acetate. 1% and 2% uranyl acetate solutions are used as an indicator, and a titrant in stronger concentrations in analytical chemistry, as it forms an insoluble salt with sodium. Uranyl acetate solutions show evidence of being sensitive to light, especially UV and will precipitate if exposed.

Commercial preparations of uranyl acetate are made from depleted uranium and have a typical radioactivity of 0.37 - 0.51 µCi/g. This mild radioactivity level is not sufficient to be harmful while the material remains external to the body. However it is very toxic by ingestion and if inhaled as dust or by skin contact if skin is cut or abraded and there is a danger of cumulative effects from long term exposure.

**Uranyl acetate**



| | |
|---|---|
| Systematic name | Uranium bis(acetato)-O)dioxo-dihydrate |
| Other names | Uranium acetate |
| Molecular formula | ($UO_2(CH_3COO)_2{\cdot}2H_2O$) |
| Molar mass | 424.15 |
| CAS number | [541-09-3] |
| Density | 2.893g/L |
| Solubility (water) | 7.694g/100$g_{H_2O}$ |
| Melting point | Not available |
| Boiling point | Not available |

Disclaimer and references

## External links

- Uranium Facts (http://chemistry.allinfoabout.com/periodic/u.html)
- M.S.D.S uranyl acetate (http://www.laddresearch.com/wsmsds/23620.htm)

## External links

- Link page to external chemical sources.

Retrieved from "http://en.wikipedia.org/wiki/Uranyl_acetate"

Categories: Uranium compounds | Nuclear materials | Acetates | Inorganic compound stubs

- This page was last modified 22:29, 15 July 2006.
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# Uranyl nitrate

From Wikipedia, the free encyclopedia

**Uranyl nitrate**

| | |
|---|---|
| Systematic name | Uranyl(VI)nitrate |
| Other names | Uranium nitrate |
| Molecular formula | $UO_2(NO_3)_2$ |
| Molar mass | 394.04g/mol |
| CAS number | 10102-06-4 |
| Density | 2.807g/cm$^3$ |
| Solubility (water) | ~66g/100 $g_{H_2O}$ |
| Melting point | 60C |
| Boiling point | 118C (decomposes) |

Disclaimer and references

**Uranyl nitrate** ($UO_2(NO_3)_2$) is a water soluble yellow uranium salt. Its molecular weight is 394.04 (anhydrous) or 502.13 (hexahydrate). and its CAS number is [10102-06-4] [1] (http://webbook.nist.gov/cgi/cbook.cgi?ID=10102-06-4&Units=SI) or [36478-76-9] [2] (http://webbook.nist.gov/cgi/cbook.cgi?ID=36478-76-9&Units=SI) (anhydrous) or [13520-83-7] [3] (http://webbook.nist.gov/cgi/cbook.cgi?ID=13520-83-7&Units=SI) (hexahydrate). Crystals of uranium nitrate are triboluminescent.

Uranyl nitrate can be prepared by reaction of uranium salts with nitric acid. It is soluble in water, ethanol, acetone, and ether, but not in benzene, toluene, and chloroform.

## Uses

During the first half of the 19th century, many photosensitive metal salts had been identified as candidates for photographic processes, among them uranyl nitrate. The prints thus produced were alternately referred to as uranium prints, urbanities, or more commonly uranotypes. The first uranium printing processes were invented by a Scotsman, J. Charles Burnett, between 1855 and 1857, and used this compound as the sensitive salt. Burnett, authored an 1858 article comparing "Printing by the Salts of the Uranic and Ferric Oxides" The basis for the process lies in the ability of the uranyl ion to pick up two electrons and reduce to the lower oxidation state of uranium(IV) under ultraviolet light. Uranotypes can vary from print to print from a more neutral, brown russet to strong Bartolozzi red, with a very long tone grade. Surviving prints are slightly radioactive, a property which serves as a means of non-destructively identifying them. Several other more elaborate photographic processes employing the compound sprung up and vanished throughout the second half of the century with names like Wothlytype, Mercuro-Uranotype and the Auro-Uranium process. Uranium papers were manufactured commercially at least until the end of the 19th century, vanishing in the face of the superior sensitivity and practical advantages of the silver halides. Nevertheless between the 1930's through the 1950's Kodak Books still described a uranium toner (Kodak T-9) using uranium nitrate hexahydrate. Some alternative process photographers including artists Blake Ferris and Robert Schramm continue to make uranotype prints today.

Along with uranyl acetate it is used as a negative stain for viruses in electron microscopy; in tissue samples it stabilizes nucleic acids and cell membranes.

Uranyl nitrate was used to fuel Aqueous Homogeneous Reactors in the 1950's. However it proved too corrosive in this application, and the experiments were abandoned.

Uranyl nitrate is important for nuclear reprocessing; it is the compound of uranium that results from dissolving the decladded spent nuclear fuel rods or yellowcake in nitric acid, for further separation and preparation of uranium hexafluoride for isotope separation for preparing of enriched uranium.

## Health and environmental issues

Uranyl nitrate is an oxidizing and highly toxic compound and should not be ingested; it causes severe renal insufficiency and acute tubular necrosis and is a lymphocyte mitogen. Target organs include the kidneys, liver,

# Hydrogen Fluoride (HF)
## CAS 7664-39-3; UN 1052 (anhydrous), UN 1790 (solution)

Synonyms include hydrogen fluoride, fluoric acid, hydrofluoride, hydrofluoric acid, and fluorine monohydride.

**Victims exposed only to hydrogen fluoride vapor do not pose substantial risks of secondary contamination; however, victims whose clothing or skin is contaminated with hydrogen fluoride liquid or solution can secondarily contaminate response personnel by direct contact or through off-gassing vapor.**

**Hydrofluoric acid is a serious systemic poison. It is highly corrosive. Its severe and sometimes delayed health effects are due to deep tissue penetration by the fluoride ion. The surface area of the burn is not predictive of its effects.**

**Most hydrogen fluoride exposures occur by inhalation of the gas and dermal contact with hydrofluoric acid.**

### Description

Hydrogen fluoride is a colorless, fuming liquid or gas with a strong, irritating odor. It is usually shipped in steel cylinders as a compressed gas. Hydrogen fluoride readily dissolves in water to form colorless hydrofluoric acid solutions; dilute solutions are visibly indistinguishable from water. It is present in a variety of over-the-counter products at concentrations of 6% to 12%.

Although hydrofluoric acid is weak compared with most other mineral acids, it can produce serious health effects by any route of exposure. These effects are due to the fluoride ion's aggressive, destructive penetration of tissues.

### Routes of Exposure

*Inhalation*

Inhalation hazards result not only from exposure to hydrogen fluoride gas, but also from fumes arising from concentrated hydrogen fluoride liquid. Hydrogen fluoride gas is lighter than air. Even fairly low airborne concentrations of hydrogen fluoride produce rapid onset of eye, nose, and throat irritation. Hydrogen fluoride has a strong irritating odor that is discernable at concentrations of about 0.04 ppm, which is considerably less than the OSHA PEL of 3 ppm. Therefore, odor generally provides adequate warning of hazardous concentrations.

Children exposed to the same levels of hydrogen fluoride as adults may receive larger doses because they have greater lung surface area:body weight ratios and increased minute volumes:weight ratios. Children may also be more vulnerable to corrosive agents than adults because of the relatively smaller diameter of their airways.

*Skin/Eye Contact*

Most hydrogen fluoride exposures occur by cutaneous contact with the aqueous solution. The fluoride ion, which penetrates tissues deeply, can cause both local cellular destruction and systemic toxicity and is readily absorbed through both intact and damaged skin. Hydrogen fluoride is irritating to the skin, eyes, and mucous membranes.

Children are more vulnerable to toxicants absorbed through the skin because of their relatively larger surface area:body weight ratio.

*Ingestion*

Ingestion of even a small amount of hydrofluoric acid is likely to produce systemic effects and may be fatal.

## Sources/Uses

Hydrogen fluoride is primarily an industrial raw material. It is produced commercially by action of sulfuric acid on the mineral fluorspar. Hydrogen fluoride is used in separating uranium isotopes, as a cracking catalyst in oil refineries, and for etching glass and enamel, removing rust, and cleaning brass and crystal. It also is used in manufacturing silicon semiconductor chips and as a laboratory reagent. Some consumer products that may contain hydrogen fluoride include automotive cleaning products (e.g., for aluminum and chrome), rust inhibitors, rust removers (e.g., for ceramic tubs, sinks, and fabrics), and water-spot removers.

## Standards and Guidelines

OSHA PEL (permissible exposure limit) = 3 ppm (averaged over an 8 hour work shift)

NIOSH IDLH (immediately dangerous to life or health) = 30 ppm

AIHA ERPG-2 (emergency response planning guideline) (maximum airborne concentration below which it is believed that nearly all individuals could be exposed for up to 1 hour without experiencing or developing irreversible or other serious health effects or symptoms which could impair an individual's ability to take protective action) = 20 ppm

## Physical Properties

*Description:* Colorless gas or fuming liquid; weak solutions have the appearance of water.

*Warning properties*: Disagreeable, pungent odor at 0.04 ppm; irritation of eyes and throat at 3 ppm.

*Molecular weight:* 20.0 daltons

*Boiling point* (760 mm Hg): 68 ° (20 °C)

*Freezing point:* -118 ° (-83 °)

*Specific gravity*: 1 for liquid at 67 °F (20 °C) (water = 1)

*Vapor pressure* (68 °F): 783 mm Hg

*Gas density*: 0.7 (air = 1)

*Water solubility*: Miscible with water with release of heat

*Flammability*: Nonflammable

### Incompatibilities

Hydrogen fluoride reacts with metals and water or steam. It will attack glass and concrete.

# Health Effects

**Hydrogen fluoride is irritating to the skin, eyes, and mucous membranes, and inhalation may cause respiratory irritation or hemorrhage. Systemic effects can occur from all routes of exposure and may include nausea, vomiting, gastric pain, or cardiac arrhythmia. Symptoms may be delayed for several days, especially in the case of exposure to dilute solutions of hydrogen fluoride (less than 20%).**

- **Hydrofluoric acid is corrosive and also causes destruction of deep tissues when fluoride ions penetrate the skin. Absorption of substantial amounts of hydrogen fluoride by any route may be fatal.**

**The systemic effects of hydrogen fluoride are due to increased fluoride concentrations in the body which can change the levels of calcium, magnesium, and potassium in the blood.**

- **Hypocalcemia can cause tetany, decreased myocardial contractility, and possible cardiovascular collapse while hyperkalemia has been suggested to cause ventricular fibrillation leading to death.**

## Acute Exposure

The toxic effects of hydrogen fluoride are due primarily to the fluoride ion, which is able to penetrate tissues and bind intracellular calcium and magnesium. This results in cell destruction and local bone demineralization. Systemic deficiency of calcium and magnesium and excess of potassium can occur. Hypocalcemia can cause tetany, decreased myocardial contractility, and possible cardiovascular collapse, while hyperkalemia has been suggested to cause ventricular fibrillation leading to death. The adverse action of the fluoride ion may progress for several days before symptoms appear.

Children do not always respond to chemicals in the same way that adults do. Different protocols for managing their care may be needed.

### *Respiratory*

Inhaled hydrogen fluoride mist or vapor initially affects the nose, throat, and eyes. Mild clinical effects include mucous-membrane irritation and inflammation, cough, and narrowing of the bronchi. Severe clinical effects include almost immediate narrowing and swelling of the throat, causing upper airway obstruction. Lung injury may evolve rapidly or may be delayed in onset for 12 to 36 hours. Accumulation of fluid in the lungs, constriction of the bronchi, and partial or complete lung collapse can occur. Pulmonary effects can result even from splashes on the skin.

Children may be more vulnerable to corrosive agents than adults because of the relatively smaller diameter of their airways.

Children may be more vulnerable to gas exposure because of relatively increased minute ventilation per kg and failure to evacuate an area promptly when exposed.

*Dermal*

Depending on the concentration and duration of exposure, skin contact may produce pain, redness of the skin, and deep, slow-healing burns.

Acid concentrations of more than 50% (including anhydrous hydrogen fluoride) cause immediate severe, throbbing pain and a whitish discoloration of the skin, which usually forms blisters. Hydrogen fluoride solutions from 20% to 50% may produce pain and swelling, which may be delayed up to 8 hours. Hydrogen fluoride solutions of less than 20% cause almost no immediate pain on contact but may cause delayed serious injury 12 to 24 hours later.

Because of their relatively larger surface area:body weight ratio, children are more vulnerable to toxicants absorbed through the skin.

*Ocular*

Mild effects of hydrogen fluoride exposure include rapid onset of eye irritation. More severe effects, which may result from even minor hydrofluoric acid splashes, include sloughing of the surface of the eye, swelling of various structures of the eye, and cell death due to lack of blood supply. Potentially permanent clouding of the eye surface may develop immediately or after several days.

*Gastrointestinal*

Ingestion of hydrofluoric acid may cause corrosive injury to the mouth, throat, and esophagus. Inflammation of the stomach with bleeding occurs commonly. Nausea, vomiting, diarrhea, and abdominal pain may occur. Systemic effects are likely. An acid-base imbalance can occur after acute ingestion. Pulmonary aspiration may lead to respiratory complications.

*Electrolyte*

Exposure by any route may result in systemic effects, namely, low levels of calcium and magnesium and high levels of potassium in the blood. Low blood pressure, irregular heartbeat, involuntary muscle contractions, seizures, and death may ensue.

### *Potential Sequelae*

Survivors of severe inhalation injury may suffer residual chronic lung disease. Healing of skin burns caused by concentrated hydrogen fluoride may be prolonged, and extensive scarring may result. Fingertip injuries are troublesome with persistent pain, bone loss, and nail-bed injury. After eye exposure, prolonged or permanent visual defects, blindness, or total eye destruction may occur. Hydrogen fluoride ingestion may damage the esophagus and stomach progressively for weeks. Persistent narrowing of the esophagus may result.

## Chronic Exposure

Repeated ingestion of more than 6 mg of fluoride per day may result in mottling of the teeth in developing children, accumulation of fluoride in the bone, and hardening of the bone in adults and children. Long-term hydrogen fluoride exposure has been reported to damage the kidneys and liver.

Chronic exposure may be more serious for children because of their potential longer latency period.

### *Carcinogenicity*

Hydrogen fluoride has not been classified for carcinogenic effects.

### *Reproductive and Developmental Effects*

Hydrogen fluoride is not included in *Reproductive and Developmental Toxicants,* a 1991 report published by the U.S. General Accounting Office (GAO) that lists 30 chemicals of concern because of widely acknowledged reproductive and developmental consequences. Fluoride crosses the placenta, and at low doses is thought to be essential for normal fetal development in humans. It is rarely excreted in breast milk. There have been rare cases of mottling of deciduous teeth in infants born to mothers who had high daily intakes of fluoride during pregnancy; skeletal abnormalities are considered unlikely. No reproductive effects due to hydrogen fluoride are known.

MSDS Number: **M1586** * * * * * *Effective Date: 12/19/05* * * * * * *Supercedes: 11/12/03*

**MSDS** *Material Safety Data Sheet*

*From:* **Mallinckrodt Baker, Inc.**
**222 Red School Lane**
**Phillipsburg, NJ 08865**

Mallinckrodt CHEMICALS J.T.Baker

**24 Hour Emergency Telephone: 908-859-2151**
**CHEMTREC: 1-800-424-9300**

**National Response in Canada**
**CANUTEC: 613-996-6666**

**Outside U.S. and Canada**
**Chemtrec: 703-527-3887**

**NOTE:** CHEMTREC, CANUTEC and National Response Center emergency numbers to be used only in the event of chemical emergencies involving a spill, leak, fire, exposure or accident involving chemicals.

All non-emergency questions should be directed to Customer Service (1-800-582-2537) for assistance.

# MERCUROUS NITRATE

## 1. Product Identification

**Synonyms:** Mercurous Nitrate, Dihydrate; Nitric acid, mercury (1+) salt, dihydrate; mercury protonitrate; Mercury (I) Nitrate, Dihydrate
**CAS No.:** 10415-75-5 (Anhydrous); 14836-60-3 (Dihydrate)
**Molecular Weight:** 561.22
**Chemical Formula:** Hg2(NO3)2 . 2H2O
**Product Codes:**
J.T. Baker: 2660
Mallinckrodt: 1434

## 2. Composition/Information on Ingredients

| Ingredient | CAS No | Percent | Hazardous |
|---|---|---|---|
| Mercurous Nitrate | 10415-75-5 | 90 - 100% | Yes |

## 3. Hazards Identification

**Emergency Overview**
------------------------

**DANGER! MAY BE FATAL IF SWALLOWED. HARMFUL IF INHALED OR ABSORBED THROUGH SKIN. CAUSES IRRITATION TO SKIN, EYES AND RESPIRATORY TRACT. MAY CAUSE ALLERGIC SKIN REACTION. STRONG OXIDIZER. CONTACT WITH OTHER MATERIAL MAY CAUSE FIRE. MERCURY COMPOUNDS AFFECT THE KIDNEYS AND CENTRAL NERVOUS SYSTEM.**

**SAF-T-DATA$^{(tm)}$** Ratings (Provided here for your convenience)

Health Rating: 3 - Severe (Poison)
Flammability Rating: 0 - None
Reactivity Rating: 3 - Severe (Oxidizer)

Contact Rating: 3 - Severe (Life)
Lab Protective Equip: GOGGLES & SHIELD; LAB COAT & APRON; VENT HOOD; PROPER GLOVES
Storage Color Code: Yellow (Reactive)

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**Potential Health Effects**

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**Inhalation:**
Causes irritation to the respiratory tract. Symptoms include sore throat, coughing, pain, tightness in chest, breathing difficulties, shortness of breath and headache. Pneumonitis may develop. Can be absorbed through inhalation with symptoms to parallel ingestion.
**Ingestion:**
Highly Toxic! Average lethal dose for inorganic mercury salts is about 1 gram. May cause burning of the mouth and pharynx, abdominal pain, vomiting, corrosive ulceration, bloody diarrhea. May be followed by a rapid and weak pulse, shallow breathing, paleness, exhaustion, central nervous system problems, tremors and collapse. Delayed death may occur from renal failure.
**Skin Contact:**
Causes irritaton. Symptoms include redness and pain. May cause burns. May cause sensitization. Can be absorbed through the skin with symptoms to parallel ingestion.
**Eye Contact:**
Causes irritation to eyes, may cause burns and eye damage.
**Chronic Exposure:**
Chronic exposure through any route can produce central nervous system damage. May cause muscle tremors, personality and behavior changes, memory loss, metallic taste, loosening of the teeth, digestive disorders, skin rashes, brain damage and kidney damage. Can cause skin allergies and accumulate in the body. Repeated skin contact can cause the skin to turn gray in color. Not a known reproductive hazard, but related mercury compounds can damage the developing fetus and decrease fertility in males and females.
**Aggravation of Pre-existing Conditions:**
Persons with nervous disorders, or impaired kidney or respiratory function, or a history of allergies or a known sensitization to mercury may be more susceptible to the effects of the substance.

## 4. First Aid Measures

**Inhalation:**
Remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Get medical attention immediately.
**Ingestion:**
Induce vomiting immediately as directed by medical personnel. Never give anything by mouth to an unconscious person. Get medical attention immediately.
**Skin Contact:**
Immediately flush skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. Get medical attention immediately. Wash clothing before reuse. Thoroughly clean shoes before reuse.
**Eye Contact:**
Immediately flush eyes with plenty of water for at least 15 minutes, lifting lower and upper eyelids occasionally. Get medical attention immediately.

## 5. Fire Fighting Measures

**Fire:**
This oxidizing material can increase the flammability of adjacent combustible materials.
**Explosion:**
Strong oxidants may explode when shocked, or if exposed to heat, flame, or friction. Also may act as initiation source for dust or vapor explosions.
**Fire Extinguishing Media:**

Use any means suitable for extinguishing surrounding fire. Do not allow water runoff to enter sewers or waterways.
**Special Information:**
In the event of a fire, wear full protective clothing and NIOSH-approved self-contained breathing apparatus with full facepiece operated in the pressure demand or other positive pressure mode. Substance may react violently with some organic compounds or reducing agents.

## 6. Accidental Release Measures

Ventilate area of leak or spill. Clean-up personnel require protective clothing and respiratory protection from dust.

Spills: Pick up and place in a suitable container for reclamation or disposal in a method that does not generate dust. Sprinkle area with sulfur or calcium polysulfide to suppress mercury.
US Regulations (CERCLA) require reporting spills and releases to soil, water and air in excess of reportable quantities. The toll free number for the US Coast Guard National Response Center is (800) 424-8802.

## 7. Handling and Storage

Keep in a tightly closed container, stored in a cool, dry, ventilated area. Protect against physical damage and moisture. Isolate from any source of heat or ignition. Avoid storage on wood floors. Separate from incompatibles, combustibles, organic or other readily oxidizable materials. Follow strict hygiene practices. Containers of this material may be hazardous when empty since they retain product residues (dust, solids); observe all warnings and precautions listed for the product.

## 8. Exposure Controls/Personal Protection

**Airborne Exposure Limits:**
- OSHA Acceptable Ceiling Concentration:
mercury and mercury compounds: 0.1 mg/m3 (TWA), skin
- ACGIH Threshold Limit Value (TLV):
inorganic and metallic mercury, as Hg: 0.025 mg/m3 (TWA) skin, A4 Not classifiable as a human carcinogen.
- ACGIH Biological Exposure Indices:
total inorganic mercury in urine (preshift): 35 ug/g creatinine;
total inorganic mercury in blood (end of shift): 15 ug/l.
**Ventilation System:**
A system of local and/or general exhaust is recommended to keep employee exposures below the Airborne Exposure Limits. Local exhaust ventilation is generally preferred because it can control the emissions of the contaminant at its source, preventing dispersion of it into the general work area. Please refer to the ACGIH document, *Industrial Ventilation, A Manual of Recommended Practices*, most recent edition, for details.
**Personal Respirators (NIOSH Approved):**
If the exposure limit is exceeded and engineering controls are not feasible, a half facepiece particulate respirator (NIOSH type N95 or better filters) may be worn for up to ten times the exposure limit or the maximum use concentration specified by the appropriate regulatory agency or respirator supplier, whichever is lowest.. A full-face piece particulate respirator (NIOSH type N100 filters) may be worn up to 50 times the exposure limit, or the maximum use concentration specified by the appropriate regulatory agency, or respirator supplier, whichever is lowest. If oil particles (e.g. lubricants, cutting fluids, glycerine, etc.) are present, use a NIOSH type R or P filter. For emergencies or instances where the exposure levels are not known, use a full-facepiece positive-pressure, air-supplied respirator. WARNING: Air-purifying respirators do not protect workers in oxygen-deficient atmospheres.
**Skin Protection:**

Wear impervious protective clothing, including boots, gloves, lab coat, apron or coveralls, as appropriate, to prevent skin contact.

**Eye Protection:**

Use chemical safety goggles and/or full face shield where dusting or splashing of solutions is possible. Maintain eye wash fountain and quick-drench facilities in work area.

## 9. Physical and Chemical Properties

**Appearance:**
Colorless crystals.
**Odor:**
Odorless or slight nitric acid odor.
**Solubility:**
Soluble in water.
**Density:**
4.78 (Dihydrate)
**pH:**
No information found.
**% Volatiles by volume @ 21C (70F):**
0
**Boiling Point:**
Decomposes.
**Melting Point:**
70C (158F) (Dihydrate).
**Vapor Density (Air=1):**
1.9
**Vapor Pressure (mm Hg):**
No information found.
**Evaporation Rate (BuAc=1):**
No information found.

## 10. Stability and Reactivity

**Stability:**
Stable under ordinary conditions of use and storage.
**Hazardous Decomposition Products:**
Emits volatile mercury or mercury compounds and nitrous oxides when heated to decomposition.
**Hazardous Polymerization:**
Will not occur.
**Incompatibilities:**
Phosphorus, ammonia, most common metals, combustible materials, strong reducing agents. Solution may corrode metals.
**Conditions to Avoid:**
Heat, flames, ignition sources and incompatibles.

## 11. Toxicological Information

**Toxicological Data:**
Oral rat LD50: 170 mg/kg, anhydrous.
**Reproductive Toxicity:**
All forms of mercury can cross the placenta to the fetus, but most of what is known has been learned from experimental animals. See Chronic Health Hazards.

--------\Cancer Lists\--------------------------------------------------

| Ingredient | ---NTP Carcinogen--- Known | ---NTP Carcinogen--- Anticipated | IARC Category |
|---|---|---|---|
| Mercurous Nitrate (10415-75-5) | No | No | 3 |

## 12. Ecological Information

**Environmental Fate:**
For mercury: This material has an experimentally-determined bioconcentration factor (BCF) of greater than 100. This material is expected to significantly bioaccumulate.
**Environmental Toxicity:**
For mercury: This material is expected to be toxic to aquatic life. The LC50/96-hour values for fish are less than 1 mg/l.

## 13. Disposal Considerations

Whatever cannot be saved for recovery or recycling should be handled as hazardous waste and sent to a RCRA approved waste facility. Processing, use or contamination of this product may change the waste management options. State and local disposal regulations may differ from federal disposal regulations. Dispose of container and unused contents in accordance with federal, state and local requirements.

## 14. Transport Information

**Domestic (Land, D.O.T.)**
**-----------------------**
**Proper Shipping Name:** MERCUROUS NITRATE
**Hazard Class:** 6.1
**UN/NA:** UN1627
Packing Group: II
**Information reported for product/size:** 2.5KG

**International (Water, I.M.O.)**
**-----------------------------**
**Proper Shipping Name:** MERCUROUS NITRATE
**Hazard Class:** 6.1
**UN/NA:** UN1627
Packing Group: II
**Information reported for product/size:** 2.5KG

## 15. Regulatory Information

--------\Chemical Inventory Status - Part 1\----------------------------------

| Ingredient | TSCA | EC | Japan | Australia |
|---|---|---|---|---|
| Mercurous Nitrate (10415-75-5) | Yes | Yes | Yes | Yes |

--------\Chemical Inventory Status - Part 2\----------------------------------

| Ingredient | Korea | --Canada-- DSL | --Canada-- NDSL | Phil. |
|---|---|---|---|---|
| Mercurous Nitrate (10415-75-5) | Yes | Yes | No | No |

--------\Federal, State & International Regulations - Part 1\----------------

| Ingredient | -SARA 302- RQ | -SARA 302- TPQ | ------SARA 313------ List | ------SARA 313------ Chemical Catg. |
|---|---|---|---|---|

| | | | | |
|---|---|---|---|---|
| Mercurous Nitrate (10415-75-5) | No | No | No | Mercury cmpd |

--------\Federal, State & International Regulations - Part 2\----------------

| Ingredient | CERCLA | -RCRA-<br>261.33 | -TSCA-<br>8(d) |
|---|---|---|---|
| Mercurous Nitrate (10415-75-5) | 10 | No | No |

Chemical Weapons Convention: No TSCA 12(b): No CDTA: No
SARA 311/312: Acute: Yes Chronic: Yes Fire: No Pressure: No
Reactivity: Yes (Pure / Solid)

**WARNING:**
THIS PRODUCT CONTAINS A CHEMICAL(S) KNOWN TO THE STATE OF CALIFORNIA TO CAUSE BIRTH DEFECTS OR OTHER REPRODUCTIVE HARM.

**Australian Hazchem Code:** 2X
**Poison Schedule:** S7
**WHMIS:**
This MSDS has been prepared according to the hazard criteria of the Controlled Products Regulations (CPR) and the MSDS contains all of the information required by the CPR.

## 16. Other Information

**NFPA Ratings:** Health: **3** Flammability: **1** Reactivity: **1** Other: **Oxidizer**
**Label Hazard Warning:**
DANGER! MAY BE FATAL IF SWALLOWED. HARMFUL IF INHALED OR ABSORBED THROUGH SKIN. CAUSES IRRITATION TO SKIN, EYES AND RESPIRATORY TRACT. MAY CAUSE ALLERGIC SKIN REACTION. STRONG OXIDIZER. CONTACT WITH OTHER MATERIAL MAY CAUSE FIRE. MERCURY COMPOUNDS AFFECT THE KIDNEYS AND CENTRAL NERVOUS SYSTEM.
**Label Precautions:**
Do not breathe dust.
Keep container closed.
Use only with adequate ventilation.
Do not get in eyes, on skin, or on clothing.
Wash thoroughly after handling.
Keep from contact with clothing and other combustible materials.
Store in a tightly closed container.
Do not store near combustible materials.
**Label First Aid:**
If swallowed, induce vomiting immediately as directed by medical personnel. Never give anything by mouth to an unconscious person. If inhaled, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. In case of contact, immediately flush eyes or skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. Wash clothing before reuse. In all cases get medical attention immediately.
**Product Use:**
Laboratory Reagent.
**Revision Information:**
MSDS Section(s) changed since last revision of document include: 3, 11.
**Disclaimer:**
****************************************************************************************************

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******************************************************************************************

**Prepared by:** Environmental Health & Safety
Phone Number: (314) 654-1600 (U.S.A.)

MSDS Number: **M0234** * * * * * *Effective Date: 08/01/05* * * * * * *Supercedes: 08/10/04*

**MSDS** *Material Safety Data Sheet*

24 Hour Emergency Telephone: 908-859-2151
CHEMTREC: 1-800-424-9300

National Response in Canada
CANUTEC: 613-996-6666

Outside U.S. and Canada
Chemtrec: 703-527-3887

NOTE: CHEMTREC, CANUTEC and National Response Center emergency numbers to be used only in the event of chemical emergencies involving a spill, leak, fire, exposure or accident involving chemicals.

*From:* Mallinckrodt Baker, Inc.
222 Red School Lane
Phillipsburg, NJ 08865

Mallinckrodt CHEMICALS J.T.Baker

All non-emergency questions should be directed to Customer Service (1-800-582-2537) for assistance.

# MAGNESIUM SULFATE

## 1. Product Identification

**Synonyms:** Magnesium sulfate (1:1) heptahydrate; Epsom salts; sulfuric acid, magnesium salt (1:1), heptahydrate; Magnesium sulfate, 7- hydrate
**CAS No.:** 7487-88-9 (Anhydrous) 10034-99-8 (heptahydrate)
**Molecular Weight:** 246.47
**Chemical Formula:** $MgSO4.7H2O$
**Product Codes:**
J.T. Baker: 2500, 2504, 2505
Mallinckrodt: 4200, 5099, 5691, 6046, 6066, 7778

## 2. Composition/Information on Ingredients

| Ingredient | CAS No | Percent | Hazardous |
|---|---|---|---|
| Magnesium Sulfate Anhydrous | 7487-88-9 | 99 - 100% | Yes |

## 3. Hazards Identification

**Emergency Overview**

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**CAUTION! MAY BE HARMFUL IF SWALLOWED.**

**SAF-T-DATA**$^{(tm)}$ Ratings (Provided here for your convenience)

-----------------------------------------------------------------------------------------------------------

Health Rating: 1 - Slight
Flammability Rating: 0 - None
Reactivity Rating: 1 - Slight
Contact Rating: 1 - Slight
Lab Protective Equip: GOGGLES; LAB COAT; VENT HOOD; PROPER GLOVES
Storage Color Code: Green (General Storage)

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**Potential Health Effects**

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**Inhalation:**
Dust may be slightly irritating. Sore throat or coughing may occur.
**Ingestion:**
Since magnesium salts are slowly absorbed, abdominal pain, vomiting and diarrhea may be the only symptoms. However, if elimination is blocked by bowel blockage or other reasons, CNS depression, lack of reflexes, hypocalcemia (deficiency of calcium in the blood) may occur.
**Skin Contact:**
No adverse effects expected but may cause minor skin irritation.
**Eye Contact:**
No adverse effects expected but dust may cause mechanical irritation.
**Chronic Exposure:**
No information found.
**Aggravation of Pre-existing Conditions:**
No information found.

## 4. First Aid Measures

**Inhalation:**
Remove to fresh air. Get medical attention for any breathing difficulty.
**Ingestion:**
Give several glasses of water to drink to dilute. If large amounts were swallowed, get medical advice.
**Skin Contact:**
Remove any contaminated clothing. Wash skin with soap and water for at least 15 minutes. Get medical attention if irritation develops or persists.
**Eye Contact:**
Wash thoroughly with running water. Get medical advice if irritation develops.

**Note to Physician:**
IV administration of calcium gluconate will partially reverse the effects of acute magnesium toxicity. Ventricular support with calcium chloride infusion and mannitol forced diuresis has also been successful.

## 5. Fire Fighting Measures

**Fire:**
Not considered to be a fire hazard.
**Explosion:**
Not considered to be an explosion hazard.
**Fire Extinguishing Media:**
Use any means suitable for extinguishing surrounding fire.
**Special Information:**
Use protective clothing and breathing equipment appropriate for the surrounding fire.

## 6. Accidental Release Measures

Ventilate area of leak or spill. Wear appropriate personal protective equipment as specified in Section 8. Spills: Sweep up and containerize for reclamation or disposal. Vacuuming or wet sweeping may be used to avoid dust dispersal.

## 7. Handling and Storage

Keep in a tightly closed container, stored in a cool, dry, ventilated area. Protect against physical damage. Isolate from incompatible substances. Containers of this material may be hazardous when empty since they retain product residues (dust, solids); observe all warnings and precautions listed for the product.

## 8. Exposure Controls/Personal Protection

**Airborne Exposure Limits:**
None established.
**Ventilation System:**
A system of local and/or general exhaust is recommended to keep employee exposures as low as possible. Local exhaust ventilation is generally preferred because it can control the emissions of the contaminant at its source, preventing dispersion of it into the general work area. Please refer to the ACGIH document, *Industrial Ventilation, A Manual of Recommended Practices*, most recent edition, for details.
**Personal Respirators (NIOSH Approved):**
For conditions of use where exposure to dust or mist is apparent and engineering controls are not feasible, a particulate respirator (NIOSH type N95 or better filters) may be worn. If oil particles (e.g. lubricants, cutting fluids, glycerine, etc.) are present, use a NIOSH type R or P filter. For emergencies or instances where the exposure levels are not known, use a full-face positive-pressure, air-supplied respirator. WARNING: Air-purifying respirators do not protect workers in oxygen-deficient atmospheres.
**Skin Protection:**
Wear protective gloves and clean body-covering clothing.
**Eye Protection:**
Use chemical safety goggles. Maintain eye wash fountain and quick-drench facilities in work area.

## 9. Physical and Chemical Properties

**Appearance:**
Transparent crystals, or white powder.
**Odor:**
Odorless.
**Solubility:**
Very soluble in water.
**Density:**
1.67 g/ml @ 4C
**pH:**
Aqueous solution is neutral or slightly acid.
**% Volatiles by volume @ 21C (70F):**
0
**Boiling Point:**
Not applicable.
**Melting Point:**
1124C (2055F) Decomposes. Loses all waters of hydration @ 250C (482F)
**Vapor Density (Air=1):**
No information found.
**Vapor Pressure (mm Hg):**
No information found.
**Evaporation Rate (BuAc=1):**
No information found.

## 10. Stability and Reactivity

**Stability:**
Stable under ordinary conditions of use and storage. Loses some moisture on exposure to dry air at room temperatures.
**Hazardous Decomposition Products:**
Oxides of sulfur and the contained metal.
**Hazardous Polymerization:**
Will not occur.
**Incompatibilities:**
Ethoxy ethyl alcohols, arsenates, phosphates, tartrates, lead, barium, strontium, and calcium
**Conditions to Avoid:**
Heat, moisture, incompatibles.

## 11. Toxicological Information

No LD50/LC50 information found relating to normal routes of occupational exposure. Investigated as a mutagen, reproductive effector.

--------\Cancer Lists\------------------------------------------------------

| Ingredient | ---NTP Carcinogen---<br>Known | <br>Anticipated | IARC Category |
|---|---|---|---|
| Magnesium Sulfate Anhydrous (7487-88-9) | No | No | None |

## 12. Ecological Information

**Environmental Fate:**
No information found.
**Environmental Toxicity:**
No information found.

## 13. Disposal Considerations

Whatever cannot be saved for recovery or recycling should be managed in an appropriate and approved waste disposal facility. Processing, use or contamination of this product may change the waste management options. State and local disposal regulations may differ from federal disposal regulations. Dispose of container and unused contents in accordance with federal, state and local requirements.

## 14. Transport Information

Not regulated.

## 15. Regulatory Information

--------\Chemical Inventory Status - Part 1\---------------------------------

| Ingredient | TSCA | EC | Japan | Australia |
|---|---|---|---|---|
| Magnesium Sulfate Anhydrous (7487-88-9) | Yes | Yes | Yes | Yes |

```
 --------\Chemical Inventory Status - Part 2\---------------------------------
                                                          --Canada--
 Ingredient                                        Korea  DSL   NDSL  Phil.
 -----------------------------------------------   -----  ---   ----  -----
 Magnesium Sulfate Anhydrous (7487-88-9)            Yes   Yes   No     Yes

 --------\Federal, State & International Regulations - Part 1\----------------
                                         -SARA 302-    ------SARA 313------
 Ingredient                              RQ    TPQ     List  Chemical Catg.
 -----------------------------------------  ---   -----   ----  --------------
 Magnesium Sulfate Anhydrous (7487-88-9)  No    No      No          No

 --------\Federal, State & International Regulations - Part 2\----------------
                                                    -RCRA-    -TSCA-
 Ingredient                              CERCLA     261.33    8(d)
 -----------------------------------------  ------     ------    ------
 Magnesium Sulfate Anhydrous (7487-88-9)  No         No        No


Chemical Weapons Convention:  No     TSCA 12(b):  No     CDTA:  No
SARA 311/312:  Acute: Yes      Chronic: No    Fire: No   Pressure: No
Reactivity: No         (Pure / Solid)
```

**Australian Hazchem Code:** None allocated.
**Poison Schedule:** None allocated.
**WHMIS:**
This MSDS has been prepared according to the hazard criteria of the Controlled Products Regulations (CPR) and the MSDS contains all of the information required by the CPR.

## 16. Other Information

**NFPA Ratings:** Health: 1 Flammability: 0 Reactivity: 0
**Label Hazard Warning:**
CAUTION! MAY BE HARMFUL IF SWALLOWED.
**Label Precautions:**
Keep container closed.
Wash thoroughly after handling.
**Label First Aid:**
If swallowed, give several glasses of water to drink to dilute. If large amounts were swallowed, get medical advice.
**Product Use:**
Laboratory Reagent.
**Revision Information:**
MSDS Section(s) changed since last revision of document include: 3.
**Disclaimer:**
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Phone Number: (314) 654-1600 (U.S.A.)

ATSDR
AGENCY FOR TOXIC SUBSTANCES AND DISEASE REGISTRY

**CONTENTS**

June 1999

# ToxFAQs™
# for
# Sulfur Trioxide and Sulfuric Acid

*(Anhídrido Sulfúrico y Ácido Sulfúrico)*

**CAS#** Sulfur Trioxide 7446-11-9
Sulfuric Acid 7664-93-9

**This fact sheet answers the most frequently asked health questions about sulfur trioxide and sulfuric acid. For more information, you may call the ATSDR Information Center at 1-888-422-8737. This fact sheet is one in a series of summaries about hazardous substances and their health effects. This information is important because this substance may harm you. The effects of exposure to any hazardous substance depend on the dose, the duration, how you are exposed, personal traits and habits, and whether other chemicals are present.**

**HIGHLIGHTS: Sulfur trioxide ($SO_3$) is formed from sulfur dioxide; $SO_3$ forms sulfuric acid when it comes in contact with water. Sulfuric acid can cause burns to the skin, eyes, lungs, and digestive tract. Severe exposure can result in death. This substance has been found in at least 47 of the 1,467 National Priorities List sites identified by the Environmental Protection Agency (EPA).**

## What are sulfur trioxide and sulfuric acid?

Sulfur trioxide ($SO_3$) is generally a colorless liquid. It can also exist as ice- or fiber-like crystals or as a gas. When $SO_3$ is exposed to air, it rapidly takes up water and gives off white fumes. It can react with water to form sulfuric acid.

$SO_3$ is also called sulfuric oxide and sulfuric anhydride. It is used in the production of sulfuric acid and other chemicals, and explosives.

Sulfuric acid is a clear, colorless, oily liquid that is very corrosive. It is also called sulphine acid, battery acid, and hydrogen sulfate. It is used in the manufacture of fertilizers, explosives, other acids, and glue; in the purifiction of petroleum; in the pickling of metal; and in lead-acid batteries (used in most vehicles).

**RELATED RESOURCES**
ToxFAQ™ 47k
ToxFAQ™ en Español 93k
Public Health Statement 232k
Public Health Statement en Español 176k
Toxicological Profile 5.3MB
**A-Z INDEX**
A B C
D E
F G H I
J K
L M N O P
Q R S
T U
V W X Y Z

**ATSDR RESOURCES**
ToxFAQs™
ToxFAQs™ en Español
Public Health Statements
Toxicological Profiles
Minimum Risk Levels
MMGs
MHMIs
Interaction Profiles
Priority List of Hazardous Substances
Division of Toxicology

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## What happens to sulfur trioxide and sulfuric acid when they enter the environment?

- Much of the sulfuric acid in the air is formed from sulfur dioxide released when coal, oil, and gas are burned.
- SO3 is formed when sulfur dioxide reacts with water in the air.
- Sulfuric acid dissolves in the water in air and can remain suspended in air for varying periods of time.
- Sulfuric acid is removed from the air in rain.
- Sulfuric acid contributes to the formation of acid rain.

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## How might I be exposed to sulfur trioxide and sulfuric acid?

- Working in the chemical or metal plating industry; producing detergents, soaps, fertilizers, or lead-acid batteries; or working in printing and publishing or photography shops.
- Breathing outdoor air where coal, oil, or gas are burned.
- Touching the material that forms on the outside of your car battery.
- Breathing air near a hazardous waste site where SO3 is disposed of.
- Coming in contact with toilet bowl cleaners mixed with water.

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## How can sulfur trioxide and sulfuric acid affect my health?

Touching sulfuric acid will burn your skin, and breathing sulfuric acid can result in tooth erosion and respiratory tract irritation. Drinking sulfuric acid can burn your mouth, throat, and stomach; it can result in death. If you get sulfuric acid in your eyes, it will cause your eyes to water and will burn.

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## How likely are sulfur trioxide and sulfuric acid to cause cancer?

People who have breathed large quantities of sulfuric acid at work have shown an increase in cancers of the larynx. However, most of the people were also smokers who were exposed to other chemcals and acids as well.

The ability of sulfuric acid to cause cancer in laboratory animals has not been studied. The International Agency for Research on Cancer (IARC) has determined that occupational exposure to strong inorganic acid mists containing sulfuric acid is carcinogenic to humans. IARC has not classified pure sulfuric acid for its carcinogenic effects.

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### How does sulfur trioxide and sulfuric acid affect children?

Children may be exposed in the same ways as adults; however, they may be more at risk due to accidental injuries and accidents in the home. Teenagers may have jobs (such as car repair) in which they have contact with sulfuric acid.

Children may have increased sensitivity to sulfuric acid in air, due to their smaller airway diameters and the fact that they breathe more air per kilogram of body weight than adults.

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### How can families reduce the risk of exposure to sulfur trioxide and sulfuric acid?

- Keep household products like drain and toilet bowl cleaners containing sulfuric acid out of the reach of children.
- Wear protective gloves when using products that contain sulfuric acid.
- Keep car batteries away from children.

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### Is there a medical test to show whether I've been exposed to sulfur trioxide and sulfuric acid?

There is no medical test to determine whether you have been exposed to sulfur trioxide or sulfuric acid. Breathing in acids, including sulfuric acid, will increase the acidity of your saliva. Measuring the acidity of saliva may determine whether you have been exposed to acid but cannot tell which acid.

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### Has the federal government made recommendations to protect human health?

EPA limits the amount of sulfur dioxide that can be released into the air. This limits the amount of sulfur trioxide and sulfuric acid that form from sulfur dioxide in the air. The Occupational Safety and Health Administration (OSHA) and the National Institute of Occupational Safety and Health (NIOSH) limit the amount of sulfuric acid in workroom air to 1 milligram per cubic meter of air (1 mg/m$^3$).

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## References

Agency for Toxic Substances and Disease Registry (ATSDR). 1998. Toxicological Profile for sulfur trioxide and sulfuric acid. Atlanta, GA: U.S. Department of Health and Human Services, Public Health Service.

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## Where can I get more information?

ATSDR can tell you where to find occupational and environmental health clinics. Their specialists can recognize, evaluate, and treat illnesses resulting from exposure to hazardous substances. You can also contact your community or state health or environmental quality department if you have any more questions or concerns.

**For more information, contact**:

Agency for Toxic Substances and Disease Registry
Division of Toxicology
1600 Clifton Road NE, Mailstop F-32
Atlanta, GA 30333
Phone: 1-888-42-ATSDR (1-888-422-8737)
FAX: (770)-488-4178
Email: ATSDRIC@cdc.gov

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