

**SAFETY DATA SHEET**

**PITCHBLENDE/DUNITE MIXTURE**

---

**SECTION 1: CHEMICAL PRODUCTS & COMPANY IDENTIFICATION**

---

NBL Program Office  
U. S. Department of Energy,  
1 Science.gov Way,  
Oak Ridge, TN 37830  
1-865-576-0598

**Emergency Phone Numbers:** 1-865-576-0598

**Chemical Name:**

CAS Number: 1344-59-8

Substance: Pitchblende/Dunite Mixture

Other Identifiers: URANIUM OXIDE (U<sub>3</sub>O<sub>8</sub>), URANOUS OXIDE, TRIURANIUM OCTAOXIDE, PITCHBLENDE, URANITE NASTURAN DILUTED WITH (Mg,Fe)<sub>2</sub>SiO<sub>4</sub>, CRM 3-B, CRM 42-A

Chemical Family: metal oxide, mineral, radioactive, silicate

**Use and Restriction:** This material is prepared for use as a standard or intra-laboratory comparison program at analytical laboratories, which routinely handle uranium and/or plutonium. NBL expects that recipients of their material are in compliance with 29 CFR 1910.1200 (h) which requires employers to provide employees with effective information and training in hazardous chemicals in their workplace.

---

**SECTION 2: HAZARDS IDENTIFICATION**

---

OSHA Hazards

Toxic by inhalation, toxic by ingestion.

Target Organs

Kidney, Liver, Lungs, Brain.

GHS Label Elements

Pictogram



Signal Words: Danger

Hazard Statements: Toxic by inhalation and ingestion  
Causes damage to organs through prolonged or repeated exposure  
May damage kidneys

Precautionary Statements: Do not breathe dust  
Use personal protective equipment as required  
Avoid contact with skin, eyes and clothing  
When using do not eat, drink or smoke  
In case of accident or if you feel unwell seek medical advice immediately  
Use only with adequate ventilation

#### GHS Classification

Skin Irritation (Category 2)

Eye Irritation (Category 2)

Specific target organ toxicity - repeated exposure (Category 2)

Specific target organ toxicity – acute exposure (Category 2)

#### GHS Hazard Ratings

R23/25: Toxic by inhalation and ingestion

R33: Danger of cumulative effects

S20/21: When using do not eat, drink or smoke

S45: In case of accident or if you feel unwell seek medical advice immediately

S61: Avoid release to the environment.

Pitchblende is a naturally occurring radioactive material. It is the principal ore source of uranium, which occurs in it as uranium oxide (U<sub>3</sub>O<sub>8</sub>). Dunite is an ultramafic rock that is composed almost entirely of olivine (magnesium iron silicate).

CERCLA Ratings (SCALE 0-3): HEALTH=U FIRE=0 REACTIVITY=0  
PERSISTENCE = 3

NFPA RATINGS (SCALE 0-4): HEALTH=U FIRE=0 REACTIVITY=0

CARCINOGEN STATUS:

OSHA: N  
NTP: N  
IARC: N

---

### SECTION 3: COMPOSITION/INFORMATION ON INGREDIENTS

---

For CRM 3-B

Component: Pitchblende  
CAS Number: 1344-59-8  
Percentage: 3.90 Weight %  
Component: Dunite  
CAS Number: N/A  
Percentage: Balance  
Other Contaminants: None

For CRM 42-A

Component: Pitchblende  
CAS Number: 1344-59-8  
Percentage: 42A-1, 4.0; 42A-2, 2.0; 42A-3, 1.1; 42A-4, 0.5 Weight %  
Component: Dunite  
CAS Number: N/A  
Percentage: Balance  
Other Contaminants: None

For CRMs CRM 3-B and CRM 42-A

Component: Olivine (the primary component of Dunite)  
CAS Number: 19086-72-7

---

### SECTION 4: FIRST AID MEASURES

---

EYES: flush with running water.

INHALATION: Remove to fresh air. Give oxygen with artificial respiration as needed.  
Seek medical attention for treatment, observation and support as needed.

SKIN CONTACT: Wash with soap and water.

---

## SECTION 5: FIRE FIGHTING MEASURES

---

**FIRE AND EXPLOSION HAZARD:** Negligible when exposed to flame or heat.

**EXTINGUISHING MEDIA:** Dry chemical, carbon dioxide, water spray or regular foam (most recent *Emergency Response Guidebook* (ERG), developed jointly by Transport Canada (TC), the U. S. Department of Transportation (DOT) and the Secretariat of Transportation and Communications of Mexico (SCT).)

For Larger Fires, use water spray or fog (flooding amounts) (*Emergency Response Guidebook* ERG).

**FIREFIGHTING:** Move container from fire area if you can do it without risk. Apply cooling water to sides of containers exposed to flames until well after fire is out (*Emergency Response Guidebook* ERG).

Do not move damaged containers; move undamaged containers out of fire zone. For massive fire in cargo area, use unmanned hose holder or monitor nozzles (*Emergency Response Guidebook* ERG.)

Contact the local, State, or Department of Energy radiological response team. Use suitable agent for surrounding fire. Cool containers with flooding amounts of water; apply from as far a distance as possible. Avoid breathing dusts or vapors, keep upwind. Keep unnecessary people out of area until declared safe by radiological response team.

**FLASH POINT:** Non-flammable solid.

**HAZARDOUS COMBUSTION PRODUCTS:** Thermal decomposition may release toxic/hazardous gases.

---

## SECTION 6: ACCIDENTAL RELEASE MEASURES

---

**OCCUPATIONAL SPILL:** Do not touch damaged containers or spilled material. Damage to outer container may not affect primary inner container. For dry spills, cover with plastic sheet or tarp to minimize spreading. Keep unnecessary people at least 150 feet upwind. Isolate hazard area and deny entry. Limit entry to shortest possible time. Cleanup should be performed only by qualified radiation worker(s).

---

## SECTION 7: HANDLING AND STORAGE

---

Observe all Federal, State and local regulations when storing this substance.

---

## SECTION 8: EXPOSURE CONTROLS/PERSONAL PROTECTION

---

### EXPOSURE LIMITS:

Uranium, insoluble compounds (As U):

0.05 mg/m<sup>3</sup> OSHA PEL-TWA

0.2 mg/m<sup>3</sup> ACGIH TWA; 0.6 mg/m<sup>3</sup> ACGIH STEL

0.2 mg/m<sup>3</sup> NIOSH Recommended TWA; 0.6 mg/m<sup>3</sup> NIOSH Recommended STEL

Silica (Dunite primarily consists of Olivine which contains sand mostly of magnesium iron silicate, containing low levels of free silica).

30 mg/m<sup>3</sup>/%SiO<sub>2</sub> + 2 total dust OSHA PEL

10 mg/m<sup>3</sup>/%SiO<sub>2</sub> +2 respirable dust (silica fused) OSHA PEL

Occupational exposure to radioactive substances must adhere to standards established by the Occupational Safety and Health Administration. 29 CFR 1910.96, and/or the Nuclear Regulatory Commission, 10 CFR Part 20.

**VENTILATION:** At a minimum, provide local exhaust or process enclosure ventilation. Depending upon the specific workplace activity and the radioactivity of the isotope, a more stringent ventilation system may be necessary to comply with exposure limits set forth by law (10 CFR 20.103).

One method of controlling external radiation exposure is to provide adequate shielding.

**ALPHA PARTICLES:** The typical alpha particles emitted by uranium oxide are easily shielded by a fraction of a millimeter of any ordinary material or a few inches of air. Thick paper, plastic, or cardboard will suffice.

**BETA PARTICLES:** Beta particles are more penetrating than alpha, and require more shielding. This certified reference material does not emit significant amounts of beta radiation.

**GAMMA RAYS:** Gamma rays are highly penetrating and are most easily shielded by heavier elements (high Z number). This certified reference material in the quantities used for laboratory work does not emit significant amounts of gamma radiation. If large (kg)

quantities of this material are to be stored or used, consult a radiation protection specialist or health physicist to determine if shielding is required.

**EYE PROTECTION:** Employee must wear appropriate eye protection that will not allow the introduction of particles into the eyes. Contact lenses should not be worn.

**Emergency eyewash:** If there is any possibility that an employee's eyes may be exposed to this substance, the employer must provide an eye wash station within the immediate area for emergency use.

**CLOTHING:** Employee must wear impervious clothing to prevent repeated or prolonged skin contact with this substance.

**GLOVES:** Employee must wear appropriate protective gloves to prevent contact with this substance. Used gloves may present a radiation hazard and should be disposed of as radioactive waste.

**RESPIRATOR:** The following respirators and maximum use concentrations are recommendations by the U.S. Department of Health and Human Services, NIOSH pocket guide to chemical hazards; NIOSH criteria documents or by the U.S. Department of Labor, 29 CFR 1910 Subpart Z.

The specific respirator selected must be based on contamination levels found in the work place. Airborne contamination must not exceed the working limits of the respirator. Respirators must be jointly approved by the National Institute for Occupational Safety and Health and the Mine Safety and Health Administration (NIOSH-MSHA).

**URANIUM, Insoluble compounds (As U):**

**AT ANY DETECTABLE CONCENTRATION:**

Any self-contained breathing apparatus that has a full facepiece and is operated in a pressure-demand or positive-pressure mode.

Any supplied air respirator that has a full facepiece and is operated in a pressure-demand or other positive-pressure mode in combination with an auxiliary self-contained breathing apparatus operated in a pressure-demand or other positive-pressure mode.

Escape: Any air-purifying, full-facepiece respirator with a high-efficiency particulate filter. Any appropriate escape-type, self-contained breathing apparatus.

**FOR FIREFIGHTING AND OTHER IMMEDIATELY DANGEROUS TO LIFE OR HEALTH CONDITIONS:** Any self-contained breathing apparatus that has a full facepiece respirator with a high efficiency particulate filter.

Any supplied-air respirator that has a full facepiece and is operated in a pressure-demand or other positive-pressure mode in combination with an auxiliary self-contained breathing apparatus operated in a pressure-demand or other positive-pressure mode.

---

## SECTION 9: PHYSICAL AND CHEMICAL PROPERTIES

---

**DESCRIPTION:** Dark green or black, dense, radioactive powder or crystals composed of a mixture of magnesium iron silicate mineral powder and radioactive uranium oxide (U<sub>3</sub>O<sub>8</sub>) powder.

### Uranium

Molecular weight: Approximately 833 to 842 (depending on enrichment)

Molecular formula: U<sub>3</sub>O<sub>8</sub>

Boiling point: Decomposes

Melting point: 1300C (2372F) decomposes

Specific Gravity: 8.30

Water Solubility: Insoluble

Solvent Solubility: Nitric acid, sulfuric acid

### Olivine

Molecular weight: 766.54

Molecular formula: Fe.2H4-O4-Si.3Mg

---

## SECTION 10: STABILITY AND REACTIVITY

---

**URANIUM OXIDE:** Stable under normal temperatures and pressures.

**CONDITIONS TO AVOID:** No potentially hazardous conditions could be found in the literature, nor could any accidents be recalled in which uranium oxide reacted in a hazardous manner.

### INCOMPATIBILITIES:

Bromine Trifluoride: Reaction is rapid below the boiling point of the trifluoride.

**HAZARDOUS DECOMPOSITION:** Thermal decomposition may release hazardous and toxic gases.

### POLYMERIZATION:

Hazardous polymerization has not been reported to occur under normal temperature and pressure.

---

## SECTION 11: TOXICOLOGY INFORMATION

---

Uranium oxide is irritating to the skin, eyes, and mucous membranes. Uranium compounds may be toxic to the kidneys (nephrotoxins). Chronic inhalation of insoluble uranium compounds may damage the lungs and effect the lymph nodes. Pneumoconiosis may occur. Deposition of uranium in the tissue of the bone occurs most readily with soluble uranium compounds.

Deposition may occur, to a lesser degree, with insoluble compounds. Adverse effects of uranium bone deposition include blood disorders such as anemia and leukopenia. In humans, cancer of the lung, lymphatic and hemopoietic systems, and bone have been reported. Uranium compounds usually do not constitute an external radiation exposure hazard since uranium emits mainly alpha-radiation at a low energy level. Uranium may constitute an internal radiation hazard if it is absorbed into the body, thus delivering alpha emission onto tissues in which it is stored.

**SKIN CONTACT:** Uranium oxide may be irritating to the skin; however, there is no evidence that insoluble uranium compounds can be absorbed through unbroken skin. Penetration through damaged skin may result in internal damage or deposition of radioactive materials. Prolonged skin contact with insoluble uranium compounds should be avoided because of potential radiation damage to basal cells. Dermatitis has occurred as a result of handling some insoluble uranium compounds.

**EYE CONTACT:** Radiation affects the eye by inducing acute inflammation of the conjunctiva and the cornea. The most sensitive part of the eye is the lens. An effect of eye irradiation is cataract formation. Cataracts may begin to develop anywhere from 6 months to several years after a single, large exposure or after prolonged exposure. The rate of growth and the degree of opacity are dependent upon the dose of radiation. It is important to note that long-term eye contact with this certified reference material would most likely result in serious damage to the cornea long before cataracts would be formed.

**INGESTION:** Uranium oxide is not biologically soluble and the primary dose received would be to the lining of the gut. Repeated ingestion of alpha emitters may lead to increased cancer risk.

Dunite is almost entirely composed of Olivine. Olivine is a sand of primarily magnesium iron silicate, containing low levels of free silica; suggested as a less injurious substitute for silica quartz in foundries. Unlike crystalline silica,



amorphous silica is considered biologically benign. However, as with any dust hazard, it may cause discomfort to the eyes, skin and respiratory tract.

---

## SECTION 12: ECOLOGICAL INFORMATION

---

Environmental Impact Rating (0-4): No data available

Acute Aquatic Toxicity: No data available

Degradability: No data available

Log Bioconcentration Factor (BCF): No data available

Log Octanol/water partition coefficient: No data available

---

## SECTION 13: DISPOSAL INFORMATION

---

Observe all Federal, State and local Regulations when disposing of this substance.

---

## SECTION 14: TRANSPORTATION INFORMATION

---

The U.S. Department of Transportation (D.O.T.) Code of Federal Regulations (49 CFR Parts 100-185), the International Air Transportation Association (IATA), International Civil Aviation Organization (ICAO) and International Maritime Organization (IMDG) are all factored into the classification and transport of material.

Proper Shipping Name:  
Hazard Class:  
UN/ID Number:  
Special Information:  
Packing Group:



To be determined on a case by case basis.

Classification of substances with multiple hazards must be determined in accordance with the criteria presented in the above mentioned regulations. Due to the various quantities/combinations of materials being shipped at one time, the information above must be determined based on the characteristics of the specific shipment.

---

**SECTION 15: REGULATORY INFORMATION**

---

TSCA STATUS: Y

CERCLA SECTION 103 (40 CFR 302.4):	N
SARA SECTION 302 (40 CFR 355.30):	N
SARA SECTION 304 (40 CFR 355.40):	N
SARA SECTION 313 (40 CFR 372.65):	N
OSHA PROCESS SAFETY (29 CFR 1910.119):	N
CALIFORNIA PROPOSITION 65:	N

SARA HAZARD CATEGORIES, SARA SECTIONS 311/312 (40 CFR 370.21)

ACUTE HAZARD:	Y
CHRONIC HAZARD:	Y
FIRE HAZARD:	N
REACTIVITY HAZARD:	N
SUDDEN RELEASE HAZARD:	N

---

**SECTION 16: OTHER INFORMATION**

---

This material is prepared for use as a standard or in inter-laboratory comparison programs at analytical laboratories that routinely handle uranium and/or plutonium. The New Brunswick Laboratory (NBL) assumes that recipients of this material have developed internal safety procedures that guard against accidental exposure to radioactive and toxic materials, contamination of the laboratory environment, or criticality. NBL further expects that personnel who handle radioactive materials have been thoroughly trained in the safety procedures developed by and for their Laboratory.

The information and recommendations set forth herein are presented in good faith and believed to be correct as of the revision date. However, recipients of this material should use this information only as a supplement to other information gathered by them, and should make independent judgement of the suitability and accuracy of this information.

This statement is not intended to provide comprehensive instruction in developing an appropriate safety program and does not include all regulatory guidelines.

This information is furnished without warranty, and any use of the product not in conformance with this Safety Data Sheet, or in combination with any other product or process, is the responsibility of the user.

Creation Date: June 1, 1994

Revision Date: June 24, 2020