SAFETY DATA SHEET

Revision Date: 28 September 2016

SECTION I - MATERIAL IDENTIFICATION

Trade/Material Name:	**DEPLETED URANIUM**
Description:	Metal
Other Designations:	DU, U
Use of the Substance/Preparation:	A byproduct of the enrichment cycle, DU is artificially depleted in the lighter isotopes (^{233}U, ^{234}U and ^{235}U). This depletion process effectively eliminates nuclear criticality concerns. Depleted Uranium is used in research and in applications where its high density and/or high atomic number are advantageous. DU uses include counterweights, radiation shields or collimators, armor piercing munitions, and armor are common. NOTE: Depleted Uranium (DU) is regulated by the U.S. Nuclear Regulatory Commission (NRC), or Agreement State, which should be consulted for specific requirements on all aspects of the production and distribution of this radioactive material.
Supplier:	Manufacturing Sciences Corporation 804 South Illinois Avenue Oak Ridge, TN 37830 Tel: 865-481-0455 Fax: 865-481-3142
E-Mail Address:	mscinfo@gmisotope.com
Emergency Telephone Number:	INFOTRAC EMERGENCY RESPONSE USA & Canada (800)-535-5053 International +1(352) 323-3500

SECTION II - HAZARDS

Danger

Depleted uranium has not been classified to be a carcinogen by the National Toxicology Program (NTP), International Agency for Research on Cancer (IARC), or the Environmental Protection Agency. The American Conference of Governmental Industrial Hygienists list uranium and its compounds as a confirmed human carcinogen. The National Institute for Occupational Safety and Health also list uranium and its compounds as a potential occupational carcinogen because of its alpha-emitting radioactivity if it is inhaled, ingested, or injected.

Warning

Depleted uranium is pyrophoric. Finely divided turnings, shavings, or chips of uranium are more reactive than bulk form. Freshly prepared powder or fines may react exothermically with air or water and may reach ignitiontemperature. Do not disperse powders or fines into a dust cloud, which may be explosive. Water reactions may generate hydrogen gas, which is flammable.

Warning

NOTE: Depleted Uranium (DU) is regulated by the U. S. Nuclear Regulatory Commission (NRC), or Agreement State, which should be consulted for specific requirements on all aspects of the production, handling and distribution of this radioactive material.

SECTION III –MATERIAL INFORMATION

Ingredient Name:	CAS Number:	Percent:
Uranium (Depleted)	7440-61-1	100

SECTION IV – FIRST AID

Eye Contact: Flush immediately, including under the eyelids, gently but thoroughly with flooding amounts of running water for at least 15 minutes.

Skin Contact: Immediately wash with soap and water. Decontaminate body surfaces following radiation standards. Be careful not to abrade skin, in order to avoid systemic uptake.

Inhalation: Remove exposed person to fresh air and support breathing as needed.

Ingestion: Seek professional medical assistance immediately. Never give anything by mouth to someone who is unconscious or convulsing.

Safety Stations: Where powders, fines, dusts, or fumes of the metal are likely to be present, make emergency eye wash stations, safety/quick-drench showers, and washing facilities available in the work area. At a minimum, emergency eyewashes and showers should meet the design and performance requirements of the current ANSI Z358.1 Emergency Eyewash and Shower Standard.

GET MEDICAL HELP FOR ALL EXPOSURES. Seek prompt medical assistance for further treatment, observation, and support after first aid. Follow established procedures including radiation monitoring programs. **NOTE TO PHYSICIAN:** Following significant ingestion, gastric lavage, with 2% bicarbonate solution, is recommended. A 5% bicarbonate solution has been used by some poison control specialists in radiation treatment. Depending on the solubility of the material, follow-up bioassay (urine) sampling can be used to assess the severity of a potential assimilation.

SECTION V - FIRE

Flash Point (Method): 255 - 320°C in air **Limits: LEL %:** None reported **UEL %:** None reported

NFPA Fire Hazard Symbol Codes: Flammability: 1 Health: 1 Reactivity: 0 Special: NONE **

** Values determined by manufacturer, not found in NFPA guidebook references.

Extinguishing Media:	Use dry chemical Class D or carbon dioxide to fight small uranium fires. Flood large fires with water per Department of Transportation Emergency Response Guidebook Guide 162.
Unusual Fire or Explosion Hazards:	Finely divided turnings, shavings, or chips of uranium are more reactive than bulk form. Freshly prepared powder or fines may react exothermically with air or water and may reach ignition temperature. Do not disperse powders or fines into a dust cloud, which may be explosive. Water reactions may generate hydrogen gas, which is flammable.
Special Fire-Fighting Procedures:	Wear an approved self-contained breathing apparatus (SCBA) with a full-face piece operated in the pressure demand or positive-pressure mode. Use a Class D fire extinguisher.

SECTION VI – ACCIDENTAL RELEASE

Spill/Leak Procedures:	Accidental leaks or spills of uranium and its compounds must be planned for well in advance of starting any work procedure. Special radiation procedures are required and professional assistance may be needed. Notify safety or health physics personnel, evacuate all non-essential personnel, and provide adequate ventilation. Clean-up personnel need protection against contact with and inhalation of dust or oxides.
Waste Management/Disposal:	Follow all applicable federal, state, and/or local regulations governing the disposal of radioactive waste and contaminated materials.

SECTION VII – HANDLING AND STORAGE

Storage Segregation:	Store uranium in closed containers; prevent access by unauthorized personnel. Depending on quantity stored, containers and area may require special placarding or postings based on RQ and dose rate. Deliberate breaching of a container seal or gasket to prevent buildup of hydrogen gas, which may evolve from residual oxidation reactions with moisture, can minimize the potential for explosive situations.
Contamination:	Practice good personal hygiene. Always wash thoroughly after using this material. Avoid transferring it from your hands to your mouth while eating, drinking, or smoking. Do not eat, drink, or smoke in work areas. Do not allow exposure of personnel with open wounds or cuts. Use radiation monitoring equipment, if available, responsive to alpha and beta emissions.
Handling/Storage:	Do not allow moisture contamination of storage facilities or containers. Moisture contact may complete the oxidation of any residual metal and evolve potentially explosive concentrations of hydrogen gas. Follow established federal and state regulations for the use and storage of radioactive materials.

SECTION VIII- EXPOSURE CONTROLS/ PPE

Ingredient Name:	CAS Number:	Percent:	Exposure Limits:
Uranium	**7440-61-1**	**ca 100**	*** OSHA PEL: 0.05 mg/m^3, 8-hr TWA** **(Soluble Compounds)** **OSHA PEL: 0.25 mg/m^3, 8-hr TWA** **(Insoluble Compounds)** *** ACGIH: 0.2 mg/m^3, TLV-TWA** **0.6 mg/m^3, Ceiling** **Toxicity Data: Not Listed** **NRC inhalation DAC: 2E-11 μCi/ml (occupational), 6E-14 μCi/ml air (effluent), insoluble. Weekly intake limit: 10 mg soluble uranium (10 CFR 20 Appendix B)**

***Defined for both soluble and insoluble uranium compounds.**

Personal Protective Equipment:

Goggles:	Wear safety glasses with side shields. In dusty environments, wear chemical safety goggles and a face shield, per OSHA eye- and face-protection regulations.
Respirator:	For emergency operations, entry into unknown atmospheres, or atmospheres immediately dangerous to life or health (IDLH), wear a SCBA with a full-face piece operated in the pressure demand (positive pressure) mode. If significant oxide or powder formation has become airborne or the concentrations exceed OSHA, and/or NRC limits, wear a properly fitted NIOSH-approved air-purifying respirator equipped with HEPA cartridges. Because each type of respirator has an assigned protection factor, respirator selection should be done by an industrial hygienist, health physicist, or other qualified individual.
Other:	Wear impervious gloves, boots, aprons, etc., as appropriate, to prevent prolonged or repeated skin contact.

Workplace Considerations:

Ventilation:	Provide local ventilation as required to maintain exposure below the USNRC DAC (Derived Air Concentration) and OSHA PELs specified in this section.

SECTION IX – PHYSICAL AND CHEMICAL PROPERTIES

Appearance & Odor: **A silver white, lustrous, heavy, mildly radioactive metal. Appearance will change upon exposure to air or water, as oxidation occurs. Color darkens through brass, brown, to charcoal gray. Powders, fines, chips, or turnings oxidize rapidly yielding a dull or flat dark gray or brown color. Some alloys will oxidize more slowly, retaining the silver-white and then brassy color. No odor found.**

Boiling point:	**3700 - 4200°C**	**Specific Gravity (H_2O=l):**	**18.95**
Vapor Density (Air=1):	**NA**	**Vapor Pressure:**	**NA**
Water Solubility (%):	**Insoluble**	**Melting Point:**	**1132°C**
Evaporation Rate:	**NA**	**% Volatile By Volume:**	**NA**

Melting point data provided for the pure metal only.

SECTION X – STABILITY AND REACTIVITY

Chemical Incompatibilities: Uranium metal can react dangerously with carbon tetrachloride, chlorine, fluorine, nitric acid, nitric oxide, selenium, sulfur, and water (in finely divided form).

Conditions to Avoid: Prevent contact with incompatible chemicals. Do not create dusty work conditions. Do not expose to oxidizers.

Hazardous Decomposition Products: Uranium metal fume and/or oxide can be produced during uranium fires. Radioactive progeny (daughters) thorium-234, protactinium-234, and -234m (metastable) are produced by natural radioactive decay; they are the source of the majority of the penetrating radiation. These isotopes can be concentrated in situations where the metal is melted, condensed, or dissolved, potentially elevating the observed external dose rate.

Stability/Polymerization: Material is stable in closed containers at room temperature under normal storage and handling conditions. Hazardous polymerization cannot occur.

In the presence of moisture or humidity, uranium metal may react to evolve flammable hydrogen gas.

SECTION XI – TOXICOLOGICAL

Summary of Risk: Uranium and its salts are both toxic and radioactive. Dermatitis, renal damage, acute necrotic arterial lesions, and possibly death may occur from extreme exposure. Inhalation of fine uranium particles presents increased radiation hazards; isolated uranium particles in the lungs may be a long-term cancer hazard. The more soluble uranium compounds are considered most toxic to the kidneys; the lung is the critical organ for insoluble respirable dusts or fines such as oxide powders. Uranium dusts are respiratory irritants, with coughing, shortness of breath as possible outcomes. Prolonged skin contact can cause damage to the basal cells. Radioactivity is the property of the spontaneous emissions of alpha or beta particles and gamma rays, by the disintegration of the nuclei of the atoms.

Medical Conditions Which May Be Aggravated by Contact: None reported.

Target Organs: Respiratory system; skin; eyes; kidneys; liver; blood; lymphatic system; and bone marrow.

Primary Entry Route(s):	In solid forms, ingestion, skin, or eye contact. Inhalation of dusts or fines.
Acute Effects:	Nausea, vomiting, shortness of breath, and coughing.
Chronic Effect(s):	Primarily the effects of radiation from insoluble compounds. Possibilities include pneumoconiosis, pulmonary fibrosis, lymphoma, osteosarcoma, and lung cancer.

GET MEDICAL HELP (INPLANT OR COMMUNITY) FOR ALL EXPOSURES. Seek prompt medical assistance for further treatment, observation, and support after first aid. Follow established procedures including radiation monitoring programs. **NOTE TO PHYSICIAN:** Following significant ingestion, gastric lavage, with 2% bicarbonate solution, is recommended. A 5% bicarbonate solution has been used by some poison control specialists in radiation treatment. Depending on the solubility of the material, follow-up bioassay (urine) sampling can be used to assess the severity of a potential assimilation.

Carcinogenicity:	Depleted uranium has not been classified to be a carcinogen by the National Toxicology Program (NTP), International Agency for Research on Cancer (IARC), or the Environmental Protection Agency. The American Conference of Governmental Industrial Hygienists list uranium and its compounds as confirmed human carcinogen. The National Institute for Occupational Safety and Health also list uranium and its compounds as a potential occupational carcinogen because of its alpha-emitting radioactivity if it is inhaled, ingested, or injected.

SECTION XII – ECOLOGICAL

Uranium is present naturally in virtually all soil, rock and water. Uranium in soil and rocks is distributed throughout the environment by wind, rain and geologic processes. Rocks weather and break down to form soil, and soil can be washed by water and blown by wind, moving uranium into streams and lakes, and ultimately settling out and reforming as rock. Uranium can also be removed and concentrated by people through mining and refining. These mining and refining processes produce wastes such as mill tailings which may be introduced back into the environment by wind and water if they are not properly controlled. Manufacturing of nuclear fuel, and other human activities also release uranium to the environment.

Information provided by United States Environmental Protection Agency

SECTION XIII – DISPOSAL

Follow all applicable federal, state, and/or local regulations governing the disposal of radioactive waste and contaminated materials.

SECTION XIV – TRANSPORTATION

Transportation Data (49 CFR 172.101-2):

Proper Shipping Name:	Radioactive Material, Low Specific Activity, n.o.s.
Identification Number:	UN 2912
DOT Hazard Class:	Radioactive Material, Class 7 UN Register: UN 2912

SECTION XV – REGULATORY

OSHA Designations:

Listed as Air Contaminant (29 CFR 1910.1000)

EPA Designations:

RCRA Hazardous Waste (40 CFR 261.33): Exempted from RCRA regulation as Source Material.

SARA Extremely Hazardous Substance (40 CFR 355): Not listed.

SARA Section 313 Toxic Chemical (40 CFR 372.65): Not listed.

Reported in EPA TSCA Inventory: Yes

U.S. Nuclear Regulatory Commission Designations:

Depleted Uranium (DU) is regulated by the NRC, or Agreement State, which should be consulted for specific requirements on all aspects of the production, handling and distribution of this radioactive material.

SECTION XVI – OTHER INFORMATION

Prepared By: Manufacturing Sciences Corporation
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