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Manufacturing Sciences Corporation

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## SAFETY DATA SHEET

Revision Date: 18 October 2016

### SECTION I - MATERIAL IDENTIFICATION

<b>Trade/Material Name:</b>	<b>DEPLETED URANIUM OXIDE</b>
<b>Description:</b>	Metal Oxide
<b>Other Designations:</b>	DU, U, U-238, U3O8, triuranium octaoxide
<b>Use of the Substance/Preparation:</b>	<p>Depleted uranium oxide is a byproduct of the enrichment cycle, DU is artificially depleted in the lighter isotopes (<sup>233</sup>U, <sup>234</sup>U and <sup>235</sup>U). This depletion process effectively eliminates nuclear criticality concerns. Depleted uranium oxide is used in research, coloring glass and ceramics, radiation shielding, and as a catalyst in chemical reactions.</p> <p>Depleted Uranium Oxide refers to an unspecified mixture of U3O8 with trace amounts of UO3 and UO2. Typically in a powder form it is not considered pyrophoric, combustible or flammable.</p> <p>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.</p>
<b>Supplier:</b>	Manufacturing Sciences Corporation 804 South Illinois Avenue Oak Ridge, TN 37830 Tel: 865-481-0455 Fax: 865-481-3142
<b>E-Mail Address:</b>	mscinfo@gmisotope.com
<b>Emergency Telephone Number:</b>	INFOTRAC EMERGENCY RESPONSE USA & Canada (800)-353-5053 International +1(352) 323-3500



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## SECTION II - HAZARDS

### Danger



Depleted uranium oxide 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 (ACGIH) lists 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



NOTE: Depleted Uranium Oxide (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.



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### SECTION III – MATERIAL INFORMATION

Ingredient Name:	CAS Number:	Percent:
Uranium Oxide (Depleted)	1344-59-8	100

### SECTION IV – FIRST AID

<b>Eye Contact:</b>	Flush immediately, including under the eyelids, gently but thoroughly with flooding amounts of running water for at least 15 minutes.
<b>Skin Contact:</b>	Immediately wash with soap and water. Decontaminate body surfaces following radiation standards. Be careful not to abrade skin, in order to avoid systemic uptake.
<b>Inhalation:</b>	Remove exposed person to fresh air and support breathing as needed.
<b>Ingestion:</b>	Seek professional medical assistance immediately. Never give anything by mouth to someone who is unconscious or convulsing.
<b>Safety Stations:</b>	Where powders, fines, dusts, or fumes of the metal oxide 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.



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## SECTION V - FIRE

**Flash Point (Method):** None reported      **Limits: LEL %:** None reported      **UEL %:** None reported

**NFPA Fire Hazard Symbol Codes: Flammability: 0 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:** Uranium Oxide is not combustible and poses no fire risk or explosion hazards.

**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 before 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

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



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## SECTION VII – HANDLING AND STORAGE

**Storage Segregation:**

Store uranium oxide 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.

**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:**

Follow established federal and state regulations for the use and storage of radioactive materials.

## SECTION VIII- EXPOSURE CONTROLS/ PPE

<b>Ingredient Name:</b>	<b>CAS Number:</b>	<b>Percent:</b>	<b>Exposure Limits:</b>
Uranium Oxide	1344-59-8	ca 100	* OSHA PEL: 0.05 mg/m <sup>3</sup> , 8-hr TWA (Soluble Compounds) OSHA PEL: 0.25 mg/m <sup>3</sup> , 8-hr TWA (Insoluble Compounds) * ACGIH: 0.2 mg/m <sup>3</sup> , TLV-TWA 0.6 mg/m <sup>3</sup> , 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.



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**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:** Black to gray crystals or powder and mildly radioactive. No odor found.

<b>Boiling point:</b>	<b>NA</b>	<b>Specific Gravity (H<sub>2</sub>O=1):</b>	<b>8.30</b>
<b>Vapor Density (Air=1):</b>	<b>NA</b>	<b>Vapor Pressure:</b>	<b>NA</b>
<b>Water Solubility (%):</b>	<b>Insoluble</b>	<b>Melting Point:</b>	<b>&gt;1300°C</b>
<b>Evaporation Rate:</b>	<b>NA</b>	<b>% Volatile By Volume:</b>	<b>NA</b>



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## SECTION X – STABILITY AND REACTIVITY

**Chemical Incompatibilities:** Uranium oxide can react with bromine trifluoride rapidly below 275°F.

**Conditions to Avoid:** Do not create dusty work conditions.

**Hazardous Decomposition Products:** 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.

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

## SECTION XI – TOXICOLOGICAL

**Summary of Risk:** Uranium oxide is 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.



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**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 oxide 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 oxide 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.



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## 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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Revised: October 2016

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