

## SAFETY DATA SHEET

### 1. SUBSTANCE AND SOURCE IDENTIFICATION

**Product Identifier**

**SRM Number:** 4356  
**SRM Name:** Ashed Bone Radioactivity Standard  
**Other Means of Identification:** Not applicable.

**Recommended Use of This Material and Restrictions of Use**

This Standard Reference Material (SRM) is intended for use in tests of measurements of radioactivity contained in matrices similar to the sample, for evaluating analytical methods, and as a generally available calibrated "real" sample matrix for laboratory intercomparisons. A unit of SRM 4356 consists of approximately 15 g of freeze-dried radiation sterilized pulverized ashed bone powder.

**Company Information**

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### 2. HAZARDS IDENTIFICATION

**Classification**

**Physical Hazard:** Not classified.  
**Health Hazard:** Not classified.

**Label Elements**

**Symbol**  
 No Symbol/No Pictogram

**Signal Word**  
 No Signal Word

**Hazard Statement(s):** Not applicable.

**Precautionary Statement(s):** Not applicable.

**Hazards Not Otherwise Classified:** Not applicable.

**Ingredients(s) with Unknown Acute Toxicity:** Not applicable.

### 3. COMPOSITION AND INFORMATION ON HAZARDOUS INGREDIENTS

**Substance:** Ashed bone, powder.

**Other Designations:** Not applicable.

Radiological information is provided in this SDS for information for the user. This product contains environmental level quantities of radioactive material. This SRM is designed for use only in a radiochemistry facility experienced in the handling of radioactive materials. All appropriate precautions for the handling of radioactive materials should be in place at all times. At a minimum, the basic radiation safety principles of time, distance, and shielding, and appropriate radiation contamination control should be practiced to avoid/minimize any external and/or internal exposure. Consult with your safety office for your facility's radiation safety requirements/precautions specific to the radionuclide(s) (including its activity and chemical/physical form) in this SRM. This material is a fine powder with a readily respirable particle size.

SRM 4356 contains several radionuclides with an individual mass activities as high as 0.049 Bq·g<sup>-1</sup>.

Component	CAS Registry	EC Number (EINECS)	Nominal Mass Fraction (%)
Ashed bone	Not available	Not available	100
Radionuclide	CAS Registry	EC Number (EINECS)	Nominal Mass Fraction (%)
<sup>90</sup> Sr	Not applicable	Not applicable	<0.0001
<sup>226</sup> Ra	Not applicable	Not applicable	<0.0001
<sup>230</sup> Th	Not applicable	Not applicable	<0.0001
<sup>232</sup> Th	Not applicable	Not applicable	<0.0001
<sup>234</sup> U	Not applicable	Not applicable	<0.0001
<sup>238</sup> U	Not applicable	Not applicable	<0.0001
<sup>238</sup> Pu	Not applicable	Not applicable	<0.0001
<sup>239,240</sup> Pu	Not applicable	Not applicable	<0.0001
<sup>243</sup> Cm	Not applicable	Not applicable	<0.0001
<sup>244</sup> Cm	Not applicable	Not applicable	<0.0001
<sup>40</sup> K	Not applicable	Not applicable	<0.0001
<sup>210</sup> Pb	Not applicable	Not applicable	<0.0001
<sup>210</sup> Po	Not applicable	Not applicable	<0.0001
<sup>228</sup> Ac	Not applicable	Not applicable	<0.0001
<sup>228</sup> Ra	Not applicable	Not applicable	<0.0001
<sup>228</sup> Th	Not applicable	Not applicable	<0.0001
<sup>235</sup> U	Not applicable	Not applicable	<0.0001
<sup>241</sup> Am	Not applicable	Not applicable	<0.0001

**Note:**

(1) Decay products are present in different stages of equilibrium with their parent nuclide and are not accounted for in the component listing.

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## 4. FIRST AID MEASURES

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### Description of First Aid Measures:

**Inhalation:** If adverse effects occur, remove to uncontaminated area. If not breathing, give artificial respiration or oxygen by qualified personnel. Seek immediate medical attention.

**Skin Contact:** Wash skin with soap and water for at least 15 minutes. Thoroughly clean and dry contaminated clothing before reuse.

**Eye Contact:** Flush eyes with water for at least 15 minutes. If necessary, seek medical attention.

**Ingestion:** If adverse effects occur after ingestion, seek medical treatment.

**Most Important Symptoms/Effects, Acute and Delayed:** Skin or eye mechanical irritation.

**Indication of any immediate medical attention and special treatment needed, if necessary:** If any of the above symptoms are present, seek medical attention if needed.

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## 5. FIRE FIGHTING MEASURES

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**Fire and Explosion Hazards:** Negligible fire hazard. See Section 9, "Physical and Chemical Properties" for flammability properties.

### Extinguishing Media:

Suitable: Use extinguishing media appropriate for surrounding fire.

Unsuitable: None listed.

**Specific Hazards Arising from the Chemical:** None listed.

**Special Protective Equipment and Precautions for Fire-Fighters:** Avoid inhalation of material or combustion byproducts. Wear full protective clothing and NIOSH approved self-contained breathing apparatus (SCBA).

**NFPA Ratings** (0 = Minimal; 1 = Slight; 2 = Moderate; 3 = Serious; 4 = Severe)

Health = 1                  Fire = 0                  Reactivity = 0

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## 6. ACCIDENTAL RELEASE MEASURES

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**Occupational Release:** This product contains environmental level quantities of radioactive material. **DO NOT touch spilled material.** Immediately notify safety personnel of a spill.

### Methods and Materials for Containment and Clean up:

#### Radiological Emergency Procedures

*The following is a guide for first responders. The following actions, including remediation, should be carried out by qualified individuals. In cases where a life-threatening injury occurs, concurrent with personal contamination, treat the injury first.*

Do not touch damaged packages or spilled material. Handle as a radioactive material spill.

### Spill and Leak Control

- Alert and clear everyone from the area affected by the spill.
- Take actions to limit the spread of contamination.
- Summon aid.

### Damage to the Radioactive Source

- Evacuate the immediate vicinity around the source.
- Place a barrier at a safe distance from the source.
- Identify area as a radiation hazard.

### Suggested Emergency Protective Equipment

- Gloves
- Footwear covers
- Outer layer or easily removed protective clothing (as situation requires)

## 7. HANDLING AND STORAGE

**Safe Handling Precautions:** Handle in accordance with good laboratory practices. This product is intended for use only by people trained in the safety and handling of chemicals, radioactive materials, and laboratory preparations. See Section 8, "Exposure Controls and Personal Protection".

**Storage:** Store and handling in accordance with all current regulations and standards. Keep separated from incompatible substances.

## 8. EXPOSURE CONTROLS AND PERSONAL PROTECTION

**Exposure Limits:** No occupational exposure limits have been established for ashed bone powder. This material is a particulate matter and adequate inhalation/respiratory protection should be used to minimize exposure. The exposure limits for Particulates Not Otherwise Regulated (PNOR) are applicable.

OSHA (PEL): 15 mg/m<sup>3</sup> (TWA, total particulates)

OSHA (PEL) 5 mg/m<sup>3</sup> (TWA, respirable particulates)

NIOSH (REL): 10 mg/m<sup>3</sup> (TWA, total particulates, 8 h)

NIOSH (REL): 5 mg/m<sup>3</sup> (TWA, respirable particulates)

### Exposure Limits For Radionuclides:

Radionuclide	ALI <sub>(ing)</sub>	ALI <sub>(inh)</sub>
<sup>90</sup> Sr	3E+1μCi or 1.11 MBq (Bone surface)	4E+0μCi or 148 kBq
<sup>226</sup> Ra	2E+0μCi or 74 kBq	6E-1μCi or 22.2 kBq
<sup>230</sup> Th	4E+0μCi or 148 kBq (Bone surface)	6E-3μCi or 0.222 kBq (Bone surface)
<sup>232</sup> Th	7E-1μCi or 25.9 kBq (Bone surface)	1E-3μCi or 0.037 kBq (Bone surface)
<sup>234</sup> U	1E+1μCi or 370 kBq (Bone surface)	4E-2μCi or 1.48 kBq
<sup>238</sup> U	1E+1μCi or 370 kBq (Bone surface)	4E-2μCi or 1.48 kBq
<sup>238</sup> Pu	9E-1μCi or 33.3 kBq (Bone surface)	7E-3μCi or 0.259 kBq (Bone surface)
<sup>239,240</sup> Pu	8E-1μCi or 29.6 kBq (Bone surface)	6E-3 μCi or 0.222 kBq (Bone surface)
<sup>243</sup> Cm	1E+0μCi or 37.0 kBq (Bone surface)	9E-3μCi or 333 Bq (Bone surface)
<sup>244</sup> Cm	1E+0μCi or 37.0 kBq (Bone surface)	1E-2μCi or 370 Bq (Bone surface)
<sup>40</sup> K	3E+2μCi or 11.1 MBq	4E+2μCi or 14.8 MBq
<sup>210</sup> Pb	6E-1μCi or 22.2 kBq (Bone surface)	2E-1μCi or 7.4 kBq (Bone surface)
<sup>210</sup> Po	3E+0μCi or 111 kBq	6E-1μCi or 22.2 kBq
<sup>228</sup> Ac	2E+3μCi or 74 MBq	9E+0μCi or 333 kBq (Bone surface)
<sup>228</sup> Ra	2E+0μCi or 74 kBq (Bone surface)	1E+0μCi or 37.0 kBq (Bone surface)
<sup>228</sup> Th	6E+0μCi or 222 kBq (Bone surface)	1E-2μCi or 0.37 kBq (Bone surface)
<sup>235</sup> U	1E+1μCi or 370 kBq (Bone surface)	4E-2μCi or 1.48 kBq
<sup>241</sup> Am	8E-1μCi or 29.6 kBq (Bone surface)	6E-3 μCi or 0.222 kBq (Bone surface)

**Engineering Controls:** Provide local exhaust or process enclosure ventilation system. Ensure compliance with applicable exposure limits.

**Personal Protection:** In accordance with OSHA 29 CFR 1910.132, subpart I, wear appropriate Personal Protective Equipment (PPE) to minimize exposure to this material.

**Respiratory Protection:** If workplace conditions warrant a respirator, a respiratory protection program that meets OSHA 29CFR 1910.134 must be followed. Refer to NIOSH 42 CFR 84 for applicable certified respirators.

**Eye/Face Protection:** Wear splash resistant safety goggles with a face shield. An eye wash station should be readily available near areas of use.

**Skin and Body Protection:** Personal protective equipment for the body should be selected based on the task being performed and the risks involved and should be approved by a specialist before handling this product. Chemical-resistant gloves should be worn at all times when handling chemicals.

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## 9. PHYSICAL AND CHEMICAL PROPERTIES

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### Descriptive Properties:

<b>Appearance</b> (physical state, color, etc.):	gray amorphous powder
<b>Molecular Formula:</b>	not applicable
<b>Molar Mass (g/mol):</b>	not applicable
<b>Odor:</b>	not available
<b>Odor threshold:</b>	not available
<b>pH:</b>	not available
<b>Evaporation rate:</b>	not applicable
<b>Melting point/freezing point (°C):</b>	not available
<b>Relative Density (g/L):</b>	not available
<b>Vapor Pressure (mmHg):</b>	not applicable
<b>Vapor Density (air = 1):</b>	not applicable
<b>Viscosity (cP):</b>	not applicable
<b>Solubility(ies):</b>	not available
<b>Partition coefficient (n-octanol/water):</b>	not available
<b>Particle Size:</b>	<75 µm

### Thermal Stability Properties:

<b>Autoignition Temperature (°C):</b>	not available
<b>Thermal Decomposition (°C):</b>	not available
<b>Initial boiling point and boiling range (°C):</b>	not available
<b>Explosive Limits, LEL (Volume %):</b>	not available
<b>Explosive Limits, UEL (Volume %):</b>	not available
<b>Flash Point (°C):</b>	not available
<b>Flammability (solid, gas):</b>	not available

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## 10. STABILITY AND REACTIVITY

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**Reactivity:** Stable at normal temperatures and pressure.

**Stability:**  Stable  Unstable

**Possible Hazardous Reactions:** None listed.

**Conditions to Avoid:** Avoid generating dust.

**Incompatible Materials:** None listed.

**Fire/Explosion Information:** See Section 5, "Fire Fighting Measures".

**Hazardous Decomposition:** Thermal decomposition will produce oxides of carbon.

**Hazardous Polymerization:**  Will Occur  Will Not Occur

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## 11. TOXICOLOGICAL INFORMATION

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**Route of Exposure:**  Inhalation  Skin  Ingestion

**Symptoms Related to the Physical, Chemical and Toxicological Characteristics:** Skin or eye mechanical irritation.

**Potential Health Effects (Acute, Chronic and Delayed):**

**Inhalation:** Acute exposure to large concentrations of dust may cause irritation. Chronic exposure to large concentrations of dust may cause pneumoconiosis characterized by chest pain, cough, dyspnea, reduced thoracic excursion.

**Skin Contact:** Skin exposure may result in mechanical irritation.

**Eye Contact:** No data available; may cause mechanical irritation.

**Ingestion:** Ingestion of this material is unlikely under normal conditions of use.

**Numerical Measures of Toxicity:**

**Acute Toxicity:** Not classified; no data available.

**Skin Corrosion/Irritation:** Not classified; no data available.

**Serious Eye damage/ Eye irritation:** Not classified; no data available.

**Respiratory Sensitization:** Not classified; no data available.

**Skin Sensitization:** Not classified; no data available.

**Germ Cell Mutagenicity:** Not classified; no data available.

**Carcinogenicity:** Not classified.

**Listed as a Carcinogen/Potential Carcinogen**  Yes  No

Ashed bone is not listed by NTP, IARC or OSHA as a carcinogen.

**Radiological Hazard:** SRM 4356

Ionizing radiation is a known carcinogen

**Reproductive Toxicity:** Not classified; no data available.

**Specific Target Organ Toxicity, Single Exposure:** Not classified; no data available.

**Specific Target Organ Toxicity, Repeated Exposure:** Not classified; no data available.

**Aspiration Hazard:** Not classified; no data available.

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## 12. ECOLOGICAL INFORMATION

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**Ecotoxicity Data:** No data available.

**Persistence and Degradability:** No data available.

**Bioaccumulative Potential:** No data available.

**Mobility in Soil:** No data available.

**Other Adverse effects:** No data available.

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## 13. DISPOSAL CONSIDERATIONS

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**Waste Disposal:** Dispose of waste in accordance with all applicable federal, state, and local regulations.

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## 14. TRANSPORTATION INFORMATION

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**U.S. DOT and IATA:** Not regulated by DOT or IATA.

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## 15. REGULATORY INFORMATION

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### U.S. Regulations:

CERCLA Sections 102a/103 (40 CFR 302.4): Not regulated.

SARA Title III Section 302 (40 CFR 355.30): Not regulated.

SARA Title III Section 304 (40 CFR 355.40): Not regulated.

SARA Title III Section 313 (40 CFR 372.65): Not regulated.

OSHA Process Safety (29 CFR 1910.119): Not regulated.

SARA Title III Sections 311/312 Hazardous Categories (40 CFR 370.21):

ACUTE HEALTH:	No.
CHRONIC HEALTH:	No.
FIRE:	No.
REACTIVE:	No.
PRESSURE:	No.

### State Regulations:

California Proposition 65: Not listed.

**U.S. TSCA Inventory:** Not listed.

**TSCA 12(b), Export Notification:** Not listed.

### Canadian Regulations:

WHMIS Information: Not provided for this material.

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## 16. OTHER INFORMATION

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**Issue Date:** 31 July 2014

**Sources:** 29 CFR Occupational Health and Safety Office (OSHA) 1910.1000, *Limits for Air Contaminants*, Table Z-1; available at [http://www.osha.gov/pls/oshaweb/owadisp.show\\_document?p\\_table=STANDARDS&p\\_id=9992](http://www.osha.gov/pls/oshaweb/owadisp.show_document?p_table=STANDARDS&p_id=9992) (accessed July 2014).

Center for Disease Control (CDC) NIOSH Pocket Guide to Chemical Hazards, *Particulates not otherwise regulated*; available at <http://www.cdc.gov/niosh/npg/npgd0480.html> (accessed July 2014).

OSHA 29 CFR, Subpart Z, Ionizing radiation, 1910.1096.

NRC 10 CFR 20, Standards for Protection Against Radiation.

DOT 49 CFR 173, Shippers General Requirements for Shipments and Packages.

### Key of Acronyms:

ACGIH	American Conference of Governmental Industrial Hygienists	NRC	Nuclear Regulatory Commission
ALI	Annual Limit on Intake	NTP	National Toxicology Program
CAS	Chemical Abstracts Service	OSHA	Occupational Safety and Health Administration
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act	PEL	Permissible Exposure Limit
CFR	Code of Federal Regulations	RCRA	Resource Conservation and Recovery Act
DOT	Department of Transportation	REL	Recommended Exposure Limit
EC50	Effective Concentration, 50 %	RM	Reference Material
EINECS	European Inventory of Existing Commercial Chemical Substances	RQ	Reportable Quantity
EPCRA	Emergency Planning and Community Right-to-Know Act	RTECS	Registry of Toxic Effects of Chemical Substances
IARC	International Agency for Research on Cancer	SARA	Superfund Amendments and Reauthorization Act
IATA	International Air Transportation Agency	SCBA	Self-Contained Breathing Apparatus
IDLH	Immediately Dangerous to Life and Health	SRM	Standard Reference Material
LC50	Lethal Concentration, 50 %	STEL	Short Term Exposure Limit
LD50	Lethal Dose, 50 %	TLV	Threshold Limit Value
LEL	Lower Explosive Limit	TPQ	Threshold Planning Quantity
MSDS	Material Safety Data Sheet	TSCA	Toxic Substances Control Act
NFPA	National Fire Protection Association	TWA	Time Weighted Average
NIOSH	National Institute for Occupational Safety and Health	UEL	Upper Explosive Limit
NIST	National Institute of Standards and Technology	WHMIS	Workplace Hazardous Materials Information System

**Disclaimer:** Physical and chemical data contained in this SDS are provided only for use in assessing the hazardous nature of the material. The SDS was prepared carefully, using current references; however, NIST does not certify the data in the SDS. The certified values for this material are given in the NIST Certificate.

Users of this SRM should ensure that the SDS in their possession is current. This can be accomplished by contacting the SRM Program: telephone (301) 975-2200; fax (301) 948-3730; e-mail [srmmsds@nist.gov](mailto:srmmsds@nist.gov); or via the Internet at <http://www.nist.gov/srm>.