

SAFETY DATA SHEET

1. SUBSTANCE AND SOURCE IDENTIFICATION

Product Identifier

SRM Number: 4222d
SRM Name: Carbon-14-n-hexadecane Radioactivity Standard
Other Means of Identification: Not Applicable.

Recommended Use of This Material and Restrictions of Use

This Standard Reference Material (SRM) is intended primarily for the calibration of instruments that are used to measure radioactivity and for the monitoring of radiochemical procedures. A unit of SRM 4222d consists of approximately 5 mL of a ^{14}C -labeled n-hexadecane. The solution is contained in a 5 mL flame sealed borosilicate ampoule.

Company Information

National Institute of Standards and Technology
 Standard Reference Materials Program
 100 Bureau Drive, Stop 2300
 Gaithersburg, Maryland 20899-2300

Telephone: 301-975-2200
 FAX: 301-948-3730
 E-mail: SRMMSDS@nist.gov
 Website: <http://www.nist.gov/srm>

Emergency Telephone ChemTrec:
 1-800-424-9300 (North America)
 +1-703-527-3887 (International)

2. HAZARDS IDENTIFICATION

Radiological Hazard:

Warning: THIS MATERIAL SHOULD ONLY BE USED BY PERSONS QUALIFIED TO HANDLE RADIOACTIVE MATERIAL!

This product contains licensed radioactive material and is therefore subject to the requirements of 10 CFR Part 20 (e.g., public and occupational exposure limits, waste disposal). 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 Radiation Safety office for your facility's radiation safety requirements/precautions specific to the radionuclide(s) (including its activity and chemical/physical form) in this Radioactive SRM.

Warning: SRM 4222d is a radioactive material, carbon-14-n-hexadecane, with a massic activity of approximately $54 \text{ kBq}\cdot\text{g}^{-1}$ solution. Carbon-14 decays by beta-particle emission. During the decay process no photons are emitted.

Classification

Physical Hazard: Not classified.
Health Hazard: Skin Irritation: Category 2
 Aspiration Hazard: Category 1

Label Elements

Symbol



Signal Word

DANGER

Hazard Statement(s)

H315 Causes skin irritation.
H304 May be fatal if swallowed and enters airways.

Precautionary Statement(s):

P264 Wash hands thoroughly after handling.
P280 Wear protective gloves.

P302 + P352 If on skin: Wash with plenty of water
P301 + P310 If swallowed: Immediately call a doctor.
P331 Do NOT induce vomiting.
P332 + P313 If skin irritation occurs: Get medical attention.
P362 + P364 Take off contaminated clothing and wash it before reuse.

P405 Store locked up.
P501 Dispose of contents and container according to local regulations.

Hazards Not Otherwise Classified: Not applicable.

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

3. COMPOSITION AND INFORMATION ON HAZARDOUS INGREDIENTS

Substance: ¹⁴C-labeled n-hexadecane, solution.

Other Designations: n-Hexadecane (cetane; n-cetane; hexadecane, anhydrous; hexadecane).

Hazardous Components	CAS Number	EC Number (EINECS)	Nominal Mass Concentration (%)
n-Hexadecane	544-76-3	208-878-9	>99.9
Carbon-14	NA	NA	0.000 3

NOTE: Components are listed in compliance with OSHA 29 CFR 1910.1200.

4. FIRST AID MEASURES

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 exposed skin with soap and water for at least 15 minutes. Seek medical attention if needed.

Eye Contact: Immediately flush eyes, including under the eyelids with copious amounts of water for at least 15 minutes. Seek immediate medical attention.

Ingestion: Aspiration hazard. Do not induce vomiting. If vomiting occurs, keep head lower than hips to prevent aspiration. If not breathing, give artificial respiration by qualified personnel. Seek immediate medical attention.

Most Important Symptoms/Effects, Acute and Delayed: Irritation, dizziness, nausea, coughing, and aspiration.

Indication of any immediate medical attention and special treatment needed, if necessary: Not applicable.

5. FIRE FIGHTING MEASURES

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

Extinguishing Media:

Suitable: Regular dry chemical, carbon dioxide, regular foam.

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 = 2 Fire = 1 Reactivity = 0

6. ACCIDENTAL RELEASE MEASURES

This material is radioactive. DO NOT touch spilled material. Immediately notify safety personnel of a spill.

Personal Precautions, Protective Equipment, 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. In addition to those actions described below, the guidelines in the Emergency Response Guidebook (ERG) provide more specific measures that should be followed.

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 and Storage: This material is radioactive. Store and handle in accordance with all current regulations and standards. See NRC 10 CFR 20 or state regulations. See Section 8, "Exposure Controls and Personal Protection".

8. EXPOSURE CONTROLS AND PERSONAL PROTECTION

Exposure Limits: C-14

- ALI_{inh}: 2000 µCi (74 MBq) (See NRC 10 CFR 20 Appendix B)
- ALI_{ing}: 2000 µCi (74 MBq)
- OSHA: See OSHA 29 CFR and NRC 10 CFR 20.
- ACGIH: See International Commission on Radiological Protection guidelines

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

Personal Protection Measures: 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.

9. PHYSICAL AND CHEMICAL PROPERTIES

Descriptive Properties:

Appearance (physical state, color, etc.):	liquid colorless and hygroscopic
Molecular Formula:	$\text{H}_3\text{C}-(\text{CH}_2)_{14}-\text{CH}_3$
Molar Mass (g/mol):	226.45
Odor:	none
Odor threshold:	not available
pH:	not applicable
Evaporation rate (Butyl acetate = 1):	<1
Melting point/freezing point(°C)::	18 (64.4 °F)
Density:	0.773 20 °C
Vapor Pressure:	1 mmHg at 105.3 °C
Vapor Density (air=1):	7.8
Viscosity (SUS):	39.1
Solubility(ies):	insoluble in water; soluble in ether, acetone and alcohol
Partition coefficient (n-octanol/water):	~8.3

Thermal Stability Properties:

Autoignition Temperature:	202 °C (396 °F)
Thermal Decomposition	not available
Initial boiling point and boiling range:	287 °C (548 °F)
Explosive Limits, LEL:	not available
Explosive Limits, UEL:	not available
Flash Point (°C):	135
Flammability (solid, gas):	not applicable

10. STABILITY AND REACTIVITY

Reactivity: Stable at normal temperatures and pressure.

Stability: X Stable Unstable

Possible Hazardous Reactions: None listed.

Conditions to Avoid: Avoid excessive heat; high energy ignition sources. Avoid contact with incompatible materials.

Incompatible Materials: Oxidizers.

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

Hazardous Decomposition: Oxides of carbon.

Hazardous Polymerization: Will Occur X Will Not Occur

11. TOXICOLOGICAL INFORMATION

Route of Exposure: X Inhalation X Skin X Ingestion

Symptoms Related to the Physical, Chemical and Toxicological Characteristics: Skin irritation, coughing.

Potential Health Effects (Acute, Chronic and Delayed):

Inhalation: May cause severe irritation of the mucous membranes of the upper respiratory tract. Effects may include a burning sensation, headache, coughing, wheezing, laryngitis, shortness of breath, nausea and vomiting.

Skin Contact: Fifty milligrams may cause severe irritation in humans exposed for 48 hours. Contact may also cause epidermal hyperplasia, erythema and edema. Repeated or prolonged exposure to irritants may cause dermatitis.

Eye Contact: May cause irritation.

Ingestion: When aspirated, may cause chemical pneumonitis with pulmonary edema and hemorrhage, and possible death.

Numerical Measures of Toxicity:

Acute Toxicity: No data available. No classified.

Skin Corrosion/Irritation: Category 2.

Rabbit, skin (irritation): 100 mg/24 h, severe

Serious Eye Damage/Eye Irritation: No data available. Not classified.

Respiratory Sensitization: No data available. Not Classified.

Skin Sensitization: No data available. Not classified.

Germ Cell Mutagenicity: No data available.

Carcinogenicity: No data available.

Listed as a Carcinogen/Potential Carcinogen _____ Yes X No

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

Radiological Hazard: ¹⁴C

While radionuclides have been identified as carcinogens, occupational exposure limits as prescribed by the NRC can only be exceeded with this SRM under prolonged and **direct** exposure.

Reproductive Toxicity: Not classified.

Specific Target Organ Toxicity, Single Exposure: Not classified.

Specific Target Organ Toxicity, Repeated Exposure: Not classified.

Aspiration Hazard: Category 1.

12. ECOLOGICAL INFORMATION

Ecotoxicity Data: No data available.

Persistence and Degradability: Expected to be biodegradable

Bioaccumulative Potential: No data available

Mobility in Soil: No data available.

Other Adverse effects: No data available.

13. DISPOSAL CONSIDERATIONS

Waste Disposal: **This material is radioactive.** Dispose in accordance with all applicable federal, state, and local regulations for **RADIOACTIVE** materials. See NRC 10 CFR 20 subpart K.

14. TRANSPORTATION INFORMATION

U.S. DOT and IATA:

Primary Risk: Not regulated by DOT or IATA.

Subsidiary Risk: This SRM is not a radioactive material for shipping purposes.

15. REGULATORY INFORMATION

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

State Regulations:

California Proposition 65: Not listed.

U.S. TSCA Inventory: Hexadecane is listed.

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

Canadian Regulations:

WHMIS Information: Not provided for this material.

16. OTHER INFORMATION

Issue Date: 08 December 2017

Sources: ChemAdvisor, Inc., SDS *Hexadecane*, 20 March 2015.

U.S. National Library of Medicine, Hazardous Substances Data Bank (HSDB); *Hexadecane*, available at <https://toxnet.nlm.nih.gov/newtoxnet/hsdb.htm> (access Dec 2017)

CRC Handbook of Chemistry and Physics, 96th Edition, W.M. Haynes, Editor-in-Chief. CRC Press, Inc. (2015).

USEPA (1992), Reference Guide to Odor Thresholds for Hazardous Air Pollutants Listed in the Clean Air Act Amendments of 1990; available at <http://www3.epa.gov/airtoxics/odorguide1992.pdf>. (accessed Dec 2017)

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
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 Transport Association	SCBA	Self-Contained Breathing Apparatus
IDLH	Immediately Dangerous to Life and Health	RM	Reference Material
LC50	Lethal Concentration	STEL	Short Term Exposure Limit
LD50	Median Lethal Dose or 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 SRMRM Program: telephone (301) 975-2200; fax (301) 948-3730; e-mail srmmsds@nist.gov; or via the Internet at <http://www.nist.gov/srm>.