GHK-Cu

Formula: C14H21CuN6O4-

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Section 1 — Product and Company Identification

Product Name	GHK-Cu
Synonyms	Copper tripeptide; GHK-Cu; HY-P0063
CAS Number	*Not determined*
Molecular Formula	C14H21CuN6O4-
IUPAC Name	copper (2S)-6-amino-2-[[(2S)-2-(2-azanidylacetyl) azanidyl-3-(1H-imidazol-4-yl)propanoyl]amino] hexanoate
Identified Uses	Research laboratory chemical for in vitro scientific research and development use only.
Restriction on Use	Not for human or veterinary use. Not for food, drug, cosmetic, household, agricultural, clinical, therapeutic, or diagnostic applications.

Manufacturer / Supplier

Company	Ruo.bio
Address	30 N Gould St, Sheridan, WY 82801, US
Phone	+1-804-636-6879
Website	https://ruo.bio/
Emergency Phone	+1(804)636-6879 - Monday-Friday: 9:00 AM - 5:00 PM Pacific

Section 2 — Hazard Identification

Classification of the substance

Not classified based on currently available data; however, data is limited and hazards cannot be fully characterized. The absence of classification should not be interpreted as a determination of the absence of hazard.

Classification has been conducted in accordance with 29 CFR 1910.1200 (OSHA HazCom 2012) and GHS Rev.8 using all available data and scientifically valid weight-of-evidence approaches (GHS Rev.8 Chapter 1.3.2.4), including read-across from chemical class and structural considerations where substance-specific study data is not available.

Signal Word: **None**

GHS Pictograms:
None required based on classification.

Hazard Statements
None. This substance is not classified for any GHS hazard class based on available data.

Precautionary Statements

- P261: Avoid breathing dust, fume, gas, mist, vapors, or spray.
- P264: Wash hands and exposed skin thoroughly after handling.
- P280: Wear protective gloves, protective clothing, and eye/face protection.
- P501: Dispose of contents and container in accordance with local, regional, national, and international regulations.

Precautionary statements are provided as best practice for handling substances with limited toxicological data, and are not a declaration of GHS classification.

Hazards Not Otherwise Classified (HNOC)
None known based on available data and weight-of-evidence assessment. The toxicological properties of this substance have not been fully characterized; handle as a potentially bioactive substance of unknown toxicity.

Section 3 — Composition / Information on Ingredients

Single-substance product. Chemical identity:

Ingredient	CAS Number	Mol. Formula	Mol. Weight	Concentration
GHK-Cu	Not determined	C14H21CuN6O4-	400.9 g/mol	>98% (research grade)

Impurities
No hazardous impurities known to be present above the GHS classification thresholds specified in 29 CFR 1910.1200 Appendix A. Residual synthesis reagents, solvents, and counter-ions may be present at levels consistent with research-grade (>98% purity) material. Balance: non-hazardous impurities. Refer to the accompanying Certificate of Analysis (CoA) for the lot-specific impurity profile.

Section 4 — First Aid Measures

Eye Contact
Rinse cautiously with water for several minutes. If irritation persists, seek medical advice.

Skin Contact
Wash with soap and water. Remove contaminated clothing and wash before reuse. If irritation persists, seek medical advice.

Inhalation
Move affected person to fresh air. If symptoms develop, seek medical advice.

Ingestion
Rinse mouth thoroughly with water. If large amounts are swallowed or if symptoms develop, seek medical advice. Do not induce vomiting unless directed by medical personnel.

Note to Physician
Treat symptomatically. No specific antidote known.

Section 5 — Fire Fighting Measures

Flash Point: *Not determined*

Suitable Extinguishing Media
Use extinguishing media appropriate to the surrounding fire conditions. Carbon dioxide (CO2), dry chemical powder, foam, or water spray.

Special Hazards
May produce toxic gases upon combustion. Carbon monoxide and other combustion products may be generated.

Protective Equipment for Firefighters
Wear self-contained breathing apparatus (SCBA) and full protective gear. Do not enter fire area without proper protective equipment.

Section 6 — Accidental Release Measures

Personal Precautions
Avoid dust formation. Avoid breathing vapors, mist, or gas. Ensure adequate ventilation. Evacuate personnel to safe areas. Use personal protective equipment as described in Section 8.

Environmental Precautions
Prevent further leakage or spillage if safe to do so. Do not allow the product to enter drains, sewers, or waterways.

Containment and Cleanup
Sweep up and shovel. Keep in suitable, closed containers for disposal. Avoid raising dust. Clean contaminated surface thoroughly. Dispose of waste in accordance with local regulations (see Section 13).

Section 7 — Handling and Storage

Handling Precautions
Handle as a potentially bioactive research compound of incompletely characterized toxicity. Engineering controls and work practices should follow OSHA 29 CFR 1910.1200 and 29 CFR 1910.1450 (Laboratory Standard). Use only in well-ventilated areas, preferably within a chemical fume hood or local exhaust ventilation, especially when weighing or otherwise generating dust from the lyophilized powder. Wear appropriate personal protective equipment as described in Section 8, including chemical-resistant gloves, safety eyewear, and a laboratory coat. Avoid formation, inhalation, and ingestion of dust; avoid contact with skin, eyes, and clothing. Do not eat, drink, smoke, or apply cosmetics in areas where the substance is handled. Wash hands and exposed skin thoroughly after handling and before breaks and at the end of the workday, in accordance with general OSHA hygiene practice (29 CFR 1910.141). Keep containers tightly closed when not in use to minimize exposure to atmospheric moisture, oxygen, and light. Ground and bond containers when transferring to control static where appropriate. Avoid generating aerosols of reconstituted solutions. Promptly clean up spills using procedures that minimize dust generation (see Section 6). Empty containers may retain residue; handle accordingly.

Storage Conditions
Store the lyophilized solid in a tightly sealed container, protected from light, moisture, and air, in a cool, dry, well-ventilated area away from incompatible materials. For long-term storage of the lyophilized powder, freezer storage (typically at or below -20 degC) under desiccated conditions is commonly recommended in the peer-reviewed and technical literature for copper-peptide complexes to preserve chemical integrity; reconstituted aqueous solutions are

reported to be susceptible to thermal and photolytic degradation and should be kept refrigerated and protected from light, with repeated freeze-thaw cycles avoided. Use amber glass or otherwise light-protected containers where practical. Storage areas should comply with applicable OSHA requirements for hazardous chemicals in laboratories (29 CFR 1910.1450) and general housekeeping/storage provisions (29 CFR 1910.176). Do not store with food, feed, or drinking water. Segregate from incompatible materials listed below. Keep out of reach of unauthorized personnel.

Incompatibilities

Avoid contact with strong oxidizing agents and strong reducing agents, as the Cu(II) center of the complex can participate in redox reactions. Avoid strong acids and low-pH media, which can protonate the peptide ligands and dissociate the copper complex; avoid strong bases, which may precipitate copper hydroxide and hydrolyze peptide bonds. Avoid contact with strong chelating agents (e.g., EDTA) that can sequester copper from the complex. Avoid alpha-hydroxy and beta-hydroxy carboxylic acids (e.g., glycolic, lactic, salicylic acid) and ascorbic acid (vitamin C), which are reported in the literature to disrupt or reduce copper-peptide complexes. Avoid retinol/retinoid alcohols, which can be oxidized in the presence of copper. Avoid prolonged exposure to elevated temperatures, direct sunlight/UV light, atmospheric moisture, and air, all of which may promote degradation. Incompatible packaging includes reactive metals and uncoated aluminum that may react with copper salts in the presence of moisture.

Section 8 — Exposure Controls / Personal Protection

Exposure Limits

No regulatory occupational exposure limits (OEL) have been established specifically for GHK-Cu (copper tripeptide) by OSHA, ACGIH, NIOSH, or equivalent bodies. No biological exposure indices (BEIs) have been established for this substance. Because the molecule is a 1:1 copper(II) complex, exposure limits established for copper and soluble copper compounds (expressed as Cu) may be considered as reference values for the copper content of any airborne dust or mist: OSHA PEL (29 CFR 1910.1000 Table Z-1) - 1 mg/m3 TWA (as Cu, dusts and mists); NIOSH REL - 1 mg/m3 TWA (as Cu, dusts and mists, per NIOSH Pocket Guide to Chemical Hazards); ACGIH TLV - 1 mg/m3 TWA (as Cu, dusts and mists). The NIOSH IDLH for copper dusts and mists is 100 mg/m3 (as Cu). These limits address the inorganic copper fraction only and do not characterize hazards of the intact peptide. Handle as a potentially bioactive substance of unknown toxicity and control exposure to the lowest level reasonably achievable (ALARA).

Engineering Controls

Handle within a ventilated enclosure that prevents release of airborne particulate: a certified chemical fume hood, ventilated balance enclosure, glove box, or Class II biological safety cabinet is recommended for weighing, opening containers, and preparing solutions of the dry powder. Use local exhaust ventilation at any point where dust or aerosols may be generated. General room ventilation alone is not sufficient when handling the neat solid. Provide accessible emergency eyewash and safety shower in the work area in accordance with ANSI/ISEA Z358.1. Minimize the quantity handled at the open bench, work over spill trays or absorbent liners, and use closed transfer systems where feasible. Wherever practicable, work with pre-weighed aliquots or stock solutions to reduce dust generation. Hand-washing facilities must be provided; eating, drinking, and cosmetic use must be prohibited in handling areas (29 CFR 1910.141).

Personal Protective Equipment

Respiratory Protection: Respiratory protection is generally not required when handling small quantities within a properly functioning fume hood, glove box, or other containment that captures airborne particulate at the source. If containment is not feasible, if dust or aerosols may be generated, or if airborne concentrations may approach or exceed the OSHA PEL for copper dusts and mists (1 mg/m3 as Cu), use a NIOSH-approved air-purifying respirator with N95 or higher-efficiency particulate filters (N100/P100 preferred for fine powders), selected and used under a written respiratory protection program meeting 29 CFR 1910.134 (including medical clearance, fit testing, and training). For higher exposure potential, large-scale handling, or unknown airborne concentrations, use a powered air-purifying

respirator (PAPR) with HEPA filters or supplied-air respiration. Surgical/procedure masks are not acceptable respiratory protection.

Hand Protection: Wear chemically resistant, impervious laboratory gloves selected in accordance with EN 374 / ISO 374 and 29 CFR 1910.138. Disposable nitrile gloves of at least 0.11 mm (4 mil) thickness are appropriate for incidental contact with the dry powder and dilute aqueous solutions; double gloving is recommended for prolonged or direct contact, or when working with concentrated stock solutions or organic solvent vehicles (e.g., DMSO), which can increase skin permeation. Inspect gloves before use, replace immediately if punctured, torn, or contaminated, and remove using proper aseptic technique to avoid skin contact. Wash hands thoroughly with soap and water after glove removal. Verify chemical compatibility with the specific glove manufacturer's permeation data for any solvent used in formulation.

Eye / Face Protection: Wear ANSI Z87.1-compliant chemical splash goggles when handling the powder, solutions, or any operation that could generate dust, splashes, or aerosols, in accordance with 29 CFR 1910.133. Safety glasses with side shields are acceptable only for closed-container handling with negligible splash or dust potential. A full-face shield worn over goggles is recommended for operations involving larger quantities, vigorous mixing, sonication, or pressurized transfers. Do not handle while wearing contact lenses unless additional eye protection is worn. An emergency eyewash meeting ANSI/ISEA Z358.1 must be immediately accessible in the work area.

Skin Protection: Wear a long-sleeved, fully buttoned laboratory coat or chemical-resistant lab gown, full-length trousers, and closed-toe, non-absorbent footwear in accordance with 29 CFR 1910.132. For handling larger quantities, weighing the dry powder outside containment, or any operation with splash potential, wear a chemical-resistant apron or impervious sleeves over the lab coat. Remove and segregate contaminated clothing promptly; do not take contaminated PPE outside the work area or home. Launder reusable garments separately from personal clothing. Wash any skin contact area immediately with soap and water. Do not eat, drink, smoke, apply cosmetics, or store food in areas where this substance is handled.

Section 9 — Physical and Chemical Properties

Physical State	Solid (research-grade lyophilised powder or crystalline solid)
Appearance	Blue to dark blue powder
Odor	Odorless
Odor Threshold	Not available.
Boiling Point	*Not determined*
Melting Point	*Not determined*
Flash Point	*Not determined*
Auto-ignition Temperature	No data available.
Decomposition Temperature	No experimental data available.
Vapor Pressure	*Not determined*
Vapor Density	*Not determined*
Specific Gravity	*Not determined*
Partition Coefficient (log Kow)	No experimental data available.
Solubility	Soluble in water; slightly soluble in DMSO and methanol
Stability in Solution	Subject to hydrolytic and oxidative degradation typical of the chemical class; store reconstituted solutions refrigerated or frozen, protect from light, and use within the stability window indicated on the Certificate of Analysis.
pH	*Not determined*

Molecular Weight	400.9 g/mol
Molecular Formula	C14H21CuN6O4-

Section 10 — Stability and Reactivity

Chemical Stability: Stable under normal conditions of use, storage, and transport.

Conditions to Avoid: Excessive heat, open flames, sparks, incompatible materials.

Incompatible Materials: Avoid contact with strong oxidizing agents and strong reducing agents, as the Cu(II) center of the complex can participate in redox reactions. Avoid strong acids and low-pH media, which can protonate the peptide ligands and dissociate the copper complex; avoid strong bases, which may precipitate copper hydroxide and hydrolyze peptide bonds. Avoid contact with strong chelating agents (e.g., EDTA) that can sequester copper from the complex. Avoid alpha-hydroxy and beta-hydroxy carboxylic acids (e.g., glycolic, lactic, salicylic acid) and ascorbic acid (vitamin C), which are reported in the literature to disrupt or reduce copper-peptide complexes. Avoid retinol/retinoid alcohols, which can be oxidized in the presence of copper. Avoid prolonged exposure to elevated temperatures, direct sunlight/UV light, atmospheric moisture, and air, all of which may promote degradation. Incompatible packaging includes reactive metals and uncoated aluminum that may react with copper salts in the presence of moisture.

Hazardous Decomposition Products: Upon combustion or decomposition may produce: carbon monoxide (CO), carbon dioxide (CO2), nitrogen oxides (NOx).

Hazardous Polymerization: Will not occur.

Section 11 — Toxicological Information

The toxicological properties of this substance have not been fully characterized. Where no authoritative study data was identified, endpoint classifications are based on a weight-of-evidence approach using read-across from the compound's chemical class and structural features, per GHS Rev.8 Chapter 1.3.2.4. “Not classified” entries below mean “not classified based on currently available data” — hazards cannot be excluded.

Acute Toxicity: Acute toxicity data specific to GHK-Cu (copper-glycyl-L-histidyl-L-lysinate; CAS 49557-75-7) are limited and the toxicological profile is not fully characterized. No oral, dermal, or inhalation LD50/LC50 values from authoritative regulatory sources (ECHA, NIOSH, NTP) have been identified for this specific complex. The Cosmetic Ingredient Review (CIR) Expert Panel safety assessment of copper tripeptide-1 (Johnson et al., Int J Toxicol 2018) reported low acute oral toxicity in available animal studies submitted in support of cosmetic use. Because the complex contains ionic copper, hazards associated with soluble copper compounds (as Cu) cannot be excluded: NIOSH REL, OSHA PEL, and ACGIH TLV for copper dusts and mists are each 1 mg/m3 as an 8-hour TWA (NIOSH Pocket Guide to Chemical Hazards). Not classified for acute toxicity based on currently available data; hazards cannot be excluded (GHS Rev.8 S1.3.2.4). Treat as potentially harmful if swallowed, inhaled as dust/mist, or absorbed through skin until further data are available.

Skin Corrosion / Irritation: Compound-specific skin corrosion/irritation data for GHK-Cu from regulatory sources (ECHA, OECD TG 404) have not been identified. The CIR Expert Panel review of copper tripeptide-1 (Johnson et al., Int J Toxicol 2018) summarized available skin irritation studies for the ingredient at cosmetic-use concentrations and did not identify it as a primary skin irritant under those conditions; however, neat powder behavior in occupational settings is not fully characterized. Not classified for skin corrosion/irritation based on currently available data; hazards cannot be excluded (GHS Rev.8 S1.3.2.4). Mechanical irritation from dust and potential local effects from the copper(II) moiety on broken or compromised skin should be considered.

Serious Eye Damage / Irritation: Compound-specific eye irritation data for GHK-Cu meeting OECD TG 405/437/491/-492 from authoritative regulatory sources have not been identified. The CIR Expert Panel review of copper tripeptide-1 (Johnson et al., Int J Toxicol 2018) cited ocular irritation testing supporting safety at cosmetic-use concentrations, but the neat substance has not been formally characterized for severe eye damage. Not classified for serious eye damage/eye irritation based on currently available data; hazards cannot be excluded (GHS Rev.8 S1.3.2.4). Soluble

copper(II) species are recognized eye irritants (NIOSH Pocket Guide lists eyes as a target organ for copper dusts/mists), so direct contact with dust or solutions should be avoided.

Skin / Respiratory Sensitization: No respiratory sensitization data for GHK-Cu have been identified in authoritative regulatory databases (ECHA, NIOSH). For skin sensitization, the CIR Expert Panel review of copper tripeptide-1 (Johnson et al., Int J Toxicol 2018) reviewed available human repeat-insult patch test and animal sensitization data and did not identify the ingredient as a sensitizer at cosmetic-use concentrations; OECD TG 442-series (LLNA, DPRA, KeratinoSens, h-CLAT) results on the neat substance are not publicly reported. Not classified for skin or respiratory sensitization based on currently available data; sensitization potential cannot be excluded (GHS Rev.8 S1.3.2.4), particularly given the copper(II) content (copper salts have been associated with contact sensitization in case reports).

Germ Cell Mutagenicity / Genotoxicity: Not classified based on currently available data; hazards cannot be excluded. Weight-of-evidence assessment applied using read-across from chemical class and structural considerations (GHS Rev.8 Chapter 1.3.2.4); no authoritative substance-specific study data identified.

Carcinogenicity: GHK-Cu (CAS 49557-75-7) is not listed by IARC, NTP (15th Report on Carcinogens), OSHA (29 CFR 1910 Subpart Z), ACGIH, or the U.S. EPA IRIS as a known, probable, or possible human carcinogen. No long-term carcinogenicity bioassays specific to this compound have been identified in peer-reviewed literature or authoritative regulatory dossiers. The CIR Expert Panel safety assessment (Johnson et al., Int J Toxicol 2018) did not identify carcinogenicity concerns for copper tripeptide-1 at reviewed cosmetic-use levels. Not classified for carcinogenicity based on currently available data; the absence of listing does not constitute evidence of non-carcinogenicity, and hazards cannot be excluded (GHS Rev.8 S1.3.2.4).

Reproductive Toxicity: No reproductive, developmental, or germ cell mutagenicity studies specific to GHK-Cu meeting OECD TG 414/416/421/422/443 or TG 471/473/476/487/489 have been identified in ECHA, NTP, or EPA databases. The CIR Expert Panel review of copper tripeptide-1 (Johnson et al., Int J Toxicol 2018) did not identify reproductive or developmental toxicity concerns at reviewed cosmetic-use concentrations, but a full reproductive toxicity dataset on the neat substance is not publicly available. Excess systemic copper exposure is recognized as a hazard to the developing organism in animal studies of soluble copper salts. Not classified for reproductive toxicity or germ cell mutagenicity based on currently available data; hazards cannot be excluded (GHS Rev.8 S1.3.2.4).

Specific Target Organ Toxicity (STOT): No specific target organ toxicity (STOT-SE or STOT-RE) studies on GHK-Cu meeting OECD TG 407/408/410/412/413 have been identified in authoritative regulatory sources. Because the complex liberates copper(II) ion on dissociation, the target organs identified by NIOSH for copper dusts and mists (as Cu) are relevant for read-across consideration: eyes, skin, respiratory system, liver, and kidneys, with increased risk in individuals with Wilson's disease (NIOSH Pocket Guide to Chemical Hazards). The applicable occupational exposure limit for copper (as Cu) dusts and mists is 1 mg/m3 TWA (NIOSH REL, OSHA PEL, ACGIH TLV). Not classified for STOT-SE or STOT-RE based on currently available data on the specific substance; target-organ hazards from the copper moiety cannot be excluded with repeated or prolonged exposure (GHS Rev.8 S1.3.2.4). The toxicological profile of GHK-Cu is not fully characterized.

Aspiration Hazard: Not classified based on currently available data; hazards cannot be excluded. Weight-of-evidence assessment applied using read-across from chemical class and structural considerations (GHS Rev.8 Chapter 1.3.2.4); no authoritative substance-specific study data identified.

Derived No-Effect Level (DNEL): No data available — no substance-specific DNEL has been derived.

Predicted No-Effect Concentration (PNEC): No data available — no substance-specific PNEC has been derived.

Section 12 — Ecological Information

No authoritative substance-specific ecotoxicity study data was identified. In the absence of experimental data, adverse environmental effects cannot be fully excluded.

Ecotoxicity: No substance-specific experimental aquatic toxicity data (e.g., LC50/EC50 for fish, Daphnia, or algae) have been identified for GHK-Cu (glycyl-L-histidyl-L-lysine copper(II) complex) in authoritative databases (PubChem, ECHA, EPA). The substance contains a copper(II) ion coordinated to the tripeptide. Free copper ions are recognized

by ECHA and US EPA as toxic to aquatic organisms at low concentrations; the US EPA Aquatic Life Ambient Water Quality Criteria for copper and ECHA registration dossier for copper indicate acute and chronic effect values in the low ug Cu/L range. Upon dissociation or degradation of the complex, released copper may contribute to aquatic toxicity. In the absence of substance-specific test data, releases to surface water, drains, or the environment should be avoided as a precaution.

Persistence and Degradability: No substance-specific experimental biodegradation or abiotic degradation data (e.g., OECD 301/310 ready biodegradability) have been identified for GHK-Cu in authoritative sources. The organic tripeptide ligand portion is expected to undergo hydrolytic/biotic transformation under environmental conditions; the copper(II) moiety is an element and is not degradable - per ECHA's copper registration dossier, copper is a naturally occurring element that persists in the environment and partitions between water, sediment, and soil compartments. No authoritative half-life values for the intact complex have been identified.

Bioaccumulative Potential: No substance-specific experimental bioconcentration factor (BCF) or log Kow data have been identified for GHK-Cu in authoritative sources. The compound exists as an ionic copper-peptide complex with high water solubility and low expected lipophilicity, suggesting limited potential for bioaccumulation of the intact complex. As noted in ECHA's copper registration dossier, BCF values are not considered appropriate descriptors for essential metals such as copper, and copper has been shown not to biomagnify in aquatic or terrestrial food webs, although it can accumulate in specific target tissues (e.g., fish gills) under elevated exposure.

Mobility in Soil: No substance-specific experimental data identified.

Other Adverse Effects: No other adverse environmental effects identified. The substance is not included on the Montreal Protocol list of ozone-depleting substances.

Section 13 — Disposal Considerations

Dispose of contents and container in accordance with all local, state, and federal regulations. Do not dispose of this material into sewers or waterways. Contact a licensed waste disposal company for disposal guidance.

US: Dispose in accordance with 40 CFR Parts 261-270 (RCRA). **EU:** Dispose according to Directive 2008/98/EC (Waste Framework Directive).

Section 14 — Transport Information

DOT (US)	Not regulated as dangerous goods under DOT (49 CFR) based on current classification.
IATA	Not regulated as dangerous goods under IATA Dangerous Goods Regulations based on current classification.
IMDG	Not regulated as dangerous goods or as a marine pollutant under the IMDG Code based on current classification.
UN Number	Not applicable.

Transport classifications above are based on the substance's intrinsic hazard classification; the shipper must independently verify the classification, packaging, labelling, and documentation requirements for their specific shipment configuration, quantity, and carrier (including airline policies) prior to dispatch.

Section 15 — Regulatory Information

United States

TSCA (Toxic Substances Control Act): May be eligible for exemption from TSCA inventory listing requirements under the R&D provisions of 40 CFR 720.36, depending on actual conditions of use. This substance is supplied solely for use in scientific research and development in small quantities; it is not intended for, and shall not be used for, any commercial manufacturing, processing, or distribution in commerce. The importer/end user is responsible for confirming that the R&D exemption criteria are met for their specific use. **OSHA HazCom 2012:** This SDS was prepared in accordance with 29 CFR 1910.1200 (HazCom 2012), aligned with the Globally Harmonized System (GHS) Rev. 8. **CERCLA / SARA Title III:** Not listed as a CERCLA Hazardous Substance (40 CFR 302.4); not subject to SARA 313 reporting based on available classification data. Users must independently verify applicability for their facility.

European Union

REACH (EC 1907/2006): Supplied solely for Scientific Research and Development (SR&D) use in quantities below 1 tonne per year per legal entity. Where applicable, this use may be exempt from REACH registration obligations under the scientific research and development provisions of REACH Article 3(23) and the conditions of Article 26(3); importers/users should independently verify the applicable exemption pathway for their specific use. If the substance is used as part of a formally notified Product and Process Oriented Research and Development (PPORD) programme, the separate notification procedure under REACH Article 9 (with a 5-year exemption renewable once) may apply instead. **CLP (EC 1272/2008):** Not classified under CLP based on available data; no harmonized classification entry identified in Annex VI of CLP or the ECHA Classification and Labelling (C&L) Inventory.

Canada

WHMIS 2015 / HPR: Not classified as a hazardous product under the Hazardous Products Act and Hazardous Products Regulations (SOR/2015-17) based on available data and weight-of-evidence assessment. Supplied for laboratory research use only. **DSL/NDSL:** Research-use exemption applies; substance is not intended for commercial import or manufacture in Canada.

Note: The regulatory statements above reflect the intended use of this substance for scientific research and development only and do not constitute a legal determination of regulatory status. If the substance is used outside the R&D exemption scope, users are solely responsible for independently verifying applicable regulatory obligations (TSCA, REACH, WHMIS, state, and local) for their specific use and jurisdiction prior to any such use.

Section 16 — Other Information

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Prepared By	Prepared in accordance with GHS Rev.8 and OSHA HazCom 2012 (29 CFR 1910.1200). Independent review by a qualified chemical safety professional is recommended prior to use.

Revision History

Revision date: 2026-08-13
Version: 1.0
Change description: Initial issue. Document prepared in 16-section GHS Rev.8 / OSHA HazCom 2012 format.

Sources Used

- PubChem (U.S. National Library of Medicine / NCBI) — https://pubchem.ncbi.nlm.nih.gov
- Peer-reviewed chemistry and toxicology literature (class-based read-across and weight-of-evidence assessment per GHS Rev.8 Chapter 1.3.2.4)
- OSHA HazCom 2012 / 29 CFR 1910.1200 Appendix A–C; GHS Rev.8; OECD Test Guidelines

Key to Abbreviations

CAS = Chemical Abstracts Service; GHS = Globally Harmonized System of Classification and Labelling of Chemicals; OSHA = U.S. Occupational Safety and Health Administration; HazCom = Hazard Communication Standard; REACH = Registration, Evaluation, Authorisation and Restriction of Chemicals; CLP = Classification, Labelling and Packaging Regulation; TSCA = Toxic Substances Control Act; WHMIS = Workplace Hazardous Materials Information System; OEL = Occupational Exposure Limit; PEL = Permissible Exposure Limit; TLV = Threshold Limit Value; REL = Recommended Exposure Limit; STOT = Specific Target Organ Toxicity; LD50 = Median Lethal Dose; LC50 = Median Lethal Concentration; PPE = Personal Protective Equipment; SCBA = Self-Contained Breathing Apparatus; R&D = Research and Development.

Disclaimer

DISCLAIMER: The information in this Safety Data Sheet is compiled from the authoritative sources cited above, supplemented by weight-of-evidence assessment based on the compound's chemical class and published literature. It is believed to be accurate as of the revision date but is provided "as is" without warranty of any kind, express or implied, including fitness for a particular purpose. The preparer of this document has not independently tested the substance described herein. Users bear sole responsibility for verifying all information, ensuring safe handling, and compliance with all applicable federal, state, provincial, and local regulations. This SDS is not a substitute for independent chemical safety assessment by a qualified professional. This product is intended for scientific research and development use only and is not for human consumption, drug, food, cosmetic, agricultural, or household use.

This SDS complies with GHS Revision 8 / UN GHS Rev.8 and OSHA HazCom 2012 (29 CFR 1910.1200).