Cu RTM Solution Part B

Safety Data Sheet

Section 1: Identification

1.1 Identification

Product Name : Copper RTM Solution Part B

1.2 Relevant identified uses of the substance or mixture and uses advised against

Use of the substance/mixture : Component of Cu RTM Process

1.3 Details of the supplier of the safety data sheet

Nano3D Systems LLC
1110 NE Circle Blvd., ATAMI/Bldg. 11
Corvallis, OR 97330

1.4 Emergency telephone number

Emergency number Chemtrec : 800-424-9300

Section 2: Hazard(s) identification

2.1 Classification of the substance or mixture

Classification (GHS-US)

Flammable liquids (Category 2)	H225
Skin corrosion (Category 1B)	H315
Serious eye damage	H318
Reproductive toxicity (Category 2)	H361
Specific target organ toxicity – single exposure (Category 3), Central nervous system	H336
Specific target organ toxicity – repeated exposure (Category 2)	H373
Aspiration Hazard (Category 1)	H304
Short-term (acute) aquatic hazard (Category 2)	H401

For the full text of H-statements mentioned in this section, see section 16

2.2 Label elements

GHS-US labeling

Hazard pictogram (GHS-US)

Signal word (GHS-US) : Danger

Hazard statements (GHS-US)
: H225 – Highly flammable liquid and vapor.
: H302 – Harmful if swallowed
: H304 – May be fatal if swallowed and enters airways.
: H314 – Causes severe skin burns and eye damage.
: H317 – May cause an allergic skin reaction.
: H318 – Causes serious eye damage.
: H336 – May cause drowsiness or dizziness.
: H361 - Suspected of damaging fertility or the unborn child.

: H373 - May cause damage to organs through prolonged or repeated exposure.
H401 – Toxic to aquatic life.

Precautionary statements (GHS-US) : P201 - Obtain special instructions before use.
: P202 - Do not handle until all safety precautions have been read and understood.
: P210 – Keep away from heat/sparks/open flames/hot surfaces. No smoking.
: P233 – Keep container tightly closed.
: P240 – Ground/bond container and receiving equipment.
: P241 – Use explosion-proof electrical/ ventilating/ lighting/ equipment.
: P242 – Use only non-sparking tools.
: P243 – Take precautionary measures against static discharge.
: P260 – Do not breath dust/ fume/ gas/ mist/ vapors/ spray.
: P264 – Wash skin thoroughly after handling.
: P271 – Use only outdoors or in a well-ventilated area.
: P271 – Avoid release to the environment.
: P280 – Wear protective gloves/protective clothing/ eye protection/face protection.
: P301+P310 - IF SWALLOWED: Immediately call a POISON CENTER/doctor.
: P303+P361+P353 – If on skin (or hair): Remove/Take off immediately all contaminated clothing. Rinse skin with water/ shower.
: P304+P340+P312 – If inhaled: Remove person to fresh air and keep comfortable for breathing. Call a POISON CENTER/doctor if you feel unwell.
P305+P351+P338+P310 - IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. Immediately call a POISON CENTER or doctor/ physician.
: P308+P313 – IF exposed or concerned: Get medical advice/ attention.
: P331 - Do NOT induce vomiting.
: P332+P313 – If skin irritation occurs: Get medical advice/ attention.
: P362 - Take off contaminated clothing and wash before reuse.
: P370+P378 – In case of fire: Use dry sand, dry chemical or alcohol-resistant foam for extinction.
: P403+P233 – Store in a well-ventilated place. Keep container tightly closed and keep cool.
: P403+P235 - Store in a well-ventilated place. Keep cool.
: P405 – Store locked up.

: P501 – Dispose of contents/container to an approved waste disposal plant.

2.3 Other Hazards

No additional information available

2.4 Unknown acute toxicity (GHS US)

No additional information available

Section 3: Composition/information on ingredients

3.1 Substance

Not applicable

3.2 Mixture

Name	Product Identifier	%	Classification (GHS-US)
Toluene	(CAS-No.) 108-88-3	Trade Secret	Flam. Liq. 2; Skin Irrit. 2; Repr. 2; STOT SE 3; STOT RE 2; Asp. Tox. 1; Aquatic Acute 2; H225, H315, H361d, H336, H373, H304, H401 Concentration limits: 20 %: STOT SE 3, H336;
3-Aminopropyltriethoxysilane	(CAS-No.) 919-30-2	Trade Secret	Flam. Liq. 4; Acute Tox. 4; Skin Corr. 1B; Eye Dam. 1; Skin Sens. 1; H227, H302, H314, H317, H318

Section 4: First Aid Measures

4.1 Description of first aid measures

General : Consult a physician. Show this safety data sheet to the doctor in attendance. Move out of dangerous area.

Inhalation : If breathed in, move person into fresh air. If not breathing, give artificial respiration. Consult a physician.

Skin contact : Wash off with soap and plenty of water. Consult a physician.

Eye contact : Flush eyes with water as a precaution.

Ingestion : Do NOT induce vomiting. Never give anything by mouth to an unconscious person. Rinse mouth with water. Consult a physician

4.2 Most important symptoms and effects, both acute and delayed

Inhalation	: No information available
Skin contact	: No information available
Eye contact	: No information available
Ingestion	: No information available

4.3 Indication of any immediate medical attention and special treatment needed

No further information available

Section 5: Firefighting measures

5.1 Extinguishing media

Suitable extinguishing media	: Use water spray, alcohol-resistant foam, dry chemical or carbon dioxide.
Unsuitable extinguishing media	: None

5.2 Special hazards arising from the substance or mixture

Fire hazard	: Carbon oxides, Nitrogen oxides (NOx), silicon oxides

5.3 Advice for firefighters

Protection during firefighting	: Wear self-contained breathing apparatus for firefighting if necessary.

Section 6: Accidental release measures

6.1 Personal precautions, protective equipment and emergency procedures

6.1.1 For non-emergency personnel	: Use personal protective equipment. Avoid breathing vapours, mist or gas. Ensure adequate ventilation. Remove all sources of ignition. Evacuate personnel to safe areas. Beware of vapours accumulating to form explosive concentrations. Vapours can accumulate in low areas. For personal protection see section 8.
6.1.2 For emergency personnel	: No additional information available

6.2 Environmental precautions

Prevent further leakage or spillage if safe to do so. Do not let product enter drains. Discharge into the environment must be avoided.

6.3 Methods and materials for containment and cleaning up

Contain spillage, and then collect with an electrically protected vacuum cleaner or by wet-brushing and place in container for disposal according to local regulations (see section 13).

6.4 Reference to other sections

For disposal see section 13.

Section 7: Handling and storage

7.1 Precautions for safe handling

Precautions for safe handling : Avoid contact with skin and eyes. Avoid inhalation of vapor or mist. Use explosion-proof equipment. Keep away from sources of ignition - No smoking. Take measures to prevent the buildup of electrostatic charge.

7.2 Conditions for safe storage, including any incompatibilities

Storage conditions : Keep container tightly closed in a dry and well-ventilated place. Containers which are opened must be carefully resealed and kept upright to prevent leakage. Handle and store under inert gas. Storage class (TRGS 510): 3: Flammable liquids.

Section 8: Exposure controls/personal protection

8.1 Control parameters

Component	CAS-No.	Value	Control Parameters	Basis
Toluene	108-88-3	TWA	100 ppm 375 mg/m3	USA. OSHA - TABLE Z-1 Limits for Air Contaminants - 1910.1000
		STEL	150 ppm 560 mg/m3	USA. OSHA - TABLE Z-1 Limits for Air Contaminants - 1910.1000
		TWA	200 ppm	USA. Occupational Exposure Limits (OSHA) - Table Z-2
	Remarks	Z37.12-1967		
		CEIL	300 ppm	USA. Occupational Exposure Limits (OSHA) - Table Z-2
		Z37.12-1967		
		Peak	500 ppm	USA. Occupational Exposure Limits (OSHA) - Table Z-2
		Z37.12-1967		
		Visual impairment Female reproductive		

		Pregnancy loss 2018 Adoption Substances for which there is a Biological Exposure Index or Indices (see BEI® section) Not classifiable as a human carcinogen		
		TWA	100 ppm 375 mg/m3	USA. NIOSH Recommended Exposure Limits
		ST	150 ppm 560 mg/m3	USA. NIOSH Recommended Exposure Limits

Biological occupational exposure limits.

Component	CAS-No.	Parameters	Value	Biological specimen	Basis
Toluene	108-88-3	Toluene	0.02 mg/l	In blood	ACGIH - Biological Exposure Indices (BEI)
	Remarks	Prior to last shift of workweek			
		Toluene	0.03 mg/l	Urine	ACGIH - Biological Exposure Indices (BEI)
		End of shift (As soon as possible after exposure ceases)			
		o-Cresol	0.3mg/g Creatinine	Urine	ACGIH - Biological Exposure Indices (BEI)
		End of shift (As soon as possible after exposure ceases)			

Predicted No Effect Concentration (PNEC) – Toluene, CAS-No. 108-88-3

Compartment	Value
Soil	2.89 mg/kg
Marine water	0.68 mg/l
Fresh water	0.68 mg/l
Marine sediment	16.39 mg/kg
Fresh water sediment	16.39 mg/kg
Sewage treatment plant	13.61 mg/l
Aquatic intermittent release	0.68 mg/l

8.2 Exposure controls

Appropriate engineering controls : Handle in accordance with good industrial hygiene and safety practice. Wash hands before breaks and at the end of workday.

Hand protection : Handle with gloves. Gloves must be inspected prior to use. Use proper glove removal technique (without touching glove's outer surface) to avoid skin contact with this product. Dispose of

	contaminated gloves after use in accordance with applicable laws and good laboratory practices. Wash and dry hands.
Eye protection	: Tightly fitting safety goggles. Faceshield (8-inch minimum). Use equipment for eye protection tested and approved under appropriate government standards such as NIOSH (US) or EN 166(EU).
Skin and body protection	: Complete suit protecting against chemicals, flame retardant antistatic protective clothing., The type of protective equipment must be selected according to the concentration and amount of the dangerous substance at the specific workplace.
Respiratory protection	: Use respirators and components tested and approved under appropriate government standards such as NIOSH (US) or CEN (EU).

Section 9: Physical and chemical properties

9.1 Information on basic physical and chemical properties

Physical state	: Liquid
Color	: Colorless
Odor	: aromatic
Odor threshold	: No information available
pH	: No information available
Melting point/freezing point	: Melting point/range: -93 °C (-135 °F) (Toluene)
Boiling point range	: 110 - 111 °C (230 - 232 °F) (Toluene)
Flash point	: 4.0 °C (39.2 °F) - closed cup (Toluene)
Relative evaporation rate (butyl acetate = 1)	: No information available
Flammability (solid, gas)	: No information available
Explosion limits	: 1.2 – 7 % (V) (Toluene)
Explosive properties	: No information available
Vapor pressure	: 29.1 hPa at 20.0 °C (68.0 °F) (Toluene)
Relative density	: No information available
Relative density at 20 °C	: 0.865 g/mL at 25 °C (77 °F) (Toluene)
Water Solubility	: 0.5 g/l at 15 °C (59 °F) (Toluene)
Log Pow	: log Pow: 1.7 at 20 °C (68 °F) (3-Aminopropyltriethoxysilane)
Auto-ignition temperature	: 535.0 °C (995.0 °F) (Toluene); 270 °C (518 °F) (3-Aminopropyltriethoxysilane)
Viscosity	: No information available
Viscosity, kinematic	: No information available
Viscosity, dynamic	: No information available

9.2 Other information

No further information available

Section 10: Stability and reactivity

10.1 Reactivity

No information available

10.2 Chemical Stability

Stable under recommended storage conditions.

10.3 Possibility of hazardous reactions

Vapors may form explosive mixture with air.

10.4 Conditions to avoid

Heat, flames and sparks. Extremes of temperature and direct sunlight.

10.5 Incompatible materials

Strong oxidizing agents

10.6 Hazardous decomposition products

Hazardous decomposition products formed under fire conditions - Carbon oxides
Other decomposition products – No data available

Section 11: Toxicological information

11.1 Control parameters

Toluene (CAS-No.) 108-88-3

Acute toxicity
LD50 Oral - Rat - male - 5,580 mg/kg
(Tested according to Directive 92/69/EEC.)
LC50 Inhalation - Rat - male and female - 4 h - 25.7 mg/l
(OECD Test Guideline 403)
LD50 Dermal - Rabbit - 12,124 mg/kg
Remarks: (ECHA)
No data available

Skin corrosion/irritation
Skin - Rabbit
Result: Irritating to skin. - 4 h
Remarks: (ECHA)

Serious eye damage/eye irritation
Eyes - Rabbit
Result: No eye irritation
(OECD Test Guideline 405)

Respiratory or skin sensitisation
No data available

Germ cell mutagenicity
In vitro mammalian cell gene mutation test
Mouse lymphoma test
Result: negative
Ames test
S. typhimurium
Result: negative

Rat - Bone marrow
Result: negative
(ECHA)

Carcinogenicity
IARC: No component of this product present at levels greater than or equal to 0.1% is identified as probable, possible or confirmed human carcinogen by IARC.

NTP: No component of this product present at levels greater than or equal to 0.1% is identified as a known or anticipated carcinogen by NTP.

OSHA: No component of this product present at levels greater than or equal to 0.1% is on OSHA's list of regulated carcinogens.

Reproductive toxicity
Suspected of damaging the unborn child.

Specific target organ toxicity - single exposure
May cause drowsiness or dizziness. - Central nervous system

Specific target organ toxicity - repeated exposure
May cause damage to organs through prolonged or repeated exposure. - Central nervous system

Aspiration hazard
Aspiration hazard, Aspiration may cause pulmonary oedema and pneumonitis.

Additional Information
RTECS: XS5250000

Drowsiness, irritant effects, Dizziness, Convulsions, Headache, Nausea, Vomiting, Circulatory collapse, somnolence, inebriation, Unconsciousness, respiratory arrest, CNS disorders, respiratory paralysis, death.
To the best of our knowledge, the chemical, physical, and toxicological properties have not been thoroughly investigated.

Stomach - Irregularities - Based on Human Evidence

Stomach - Irregularities - Based on Human Evidence

3-Aminopropyltriethoxysilane (CAS-No.) 919-30-2

Acute toxicity
LD50 Oral - Rat - male - 1,780 mg/kg

LC50 Inhalation - Rat - male - 6 h - > 5 ppm
(OECD Test Guideline 403)

LC50 Inhalation - Rat - female - 6 h - > 16 ppm
(OECD Test Guideline 403)

LD50 Dermal - Rabbit - 3.8 g/kg

Skin corrosion/irritation	: Rabbit Results: Causes burns. - 1 h (OECD Test Guideline 404)
Serious eye damage/irritation	: Rabbit (OECD Test Guideline 405) Remarks: Severe eye irritation
Respiratory or skin sensitization	: Buehler Test - Guinea pig May cause sensitisation by skin contact. (OECD Test Guideline 406)
Germ cell mutagenicity	: No information available
Carcinogenicity	: No component of this product present at levels greater than or equal to 0.1% is identified as probable, possible or confirmed human carcinogen by IARC, NTP or OSHA.
Reproductive toxicity	: No information available
Specific target organ toxicity (single exposure)	: No information available
Specific target organ toxicity (repeated exposure)	: No information available
Aspiration hazard	: No information available

Additional information
Material is extremely destructive to tissue of the mucous membranes and upper respiratory tract, eyes, and skin., spasm, inflammation and edema of the bronchi, pneumonitis, pulmonary edema, burning sensation, Cough, wheezing, laryngitis, Shortness of breath, Headache, Nausea, Vomiting
To the best of our knowledge, the chemical, physical, and toxicological properties have not been thoroughly investigated.

Liver - Irregularities - Based on Human Evidence

Section 12: Ecological information

12.1 Toxicity

Toluene (CAS-No.) 108-88-3	
Toxicity to fish	LC50 - Oncorhynchus mykiss (rainbow trout) - 5.8 mg/l - 96 h Remarks: (ECOTOX Database) NOEC - Pimephales promelas (fathead minnow) - 5.44 mg/l - 7 d
Toxicity to daphnia and other aquatic invertebrates	Immobilization EC50 - Daphnia magna (Water flea) - 6 mg/l - 48 h Remarks: (ECOTOX Database)
Toxicity to algae	EC50 - Chlorella vulgaris (Fresh water algae) - 245.00 mg/l - 24 h Remarks: (ECOTOX Database) EC50 - Pseudokirchneriella subcapitata (green algae) - 10.00 mg/l - 24 h Remarks: (ECOTOX Database)

Aminopropyltriethoxysilane (CAS-No.) 919-30-2	
Toxicity to fish	semi-static test LC50 - Danio rerio (zebra fish) - > 934 mg/l - 96 h (OECD Test Guideline 203)
Toxicity to daphnia and other aquatic invertebrates	Immobilization EC50 - Daphnia magna (Water flea) - 331 mg/l - 48 h (OECD Test Guideline 202)
Toxicity to algae	static test EC50 - Desmodesmus subspicatus (green algae) - > 1,000 mg/l – 72 h
Toxicity to bacteria	EC50 - Pseudomonas putida - 43 mg/l - 5.75 h

12.2 Persistence and degradability

Toluene (CAS-No.) 108-88-3	
Biodegradability	aerobic - Exposure time 20 d Result: 86 % - Readily Remarks: (IUCLID)

Aminopropyltriethoxysilane (CAS-No.) 919-30-2

Biodegradability	aerobic - Exposure time 28 d Result: 67 % - Not biodegradable

12.3 Bioaccumulative potential

Toluene (CAS-No.) 108-88-3

Bioaccumulation	Leuciscus idus (Golden orfe) - 3 d - 0.05 mg/l(Toluene)

Aminopropyltriethoxysilane (CAS-No.) 919-30-2

Bioaccumulation	Cyprinus carpio (Carp) - 5 mg/l Bioconcentration factor (BCF): 3.4

12.4 Mobility in soil

Toluene (CAS-No.) 108-88-3

No information available

Aminopropyltriethoxysilane (CAS-No.) 919-30-2

No information available

12.4 Other adverse effects

No information available

Section 13: Disposal considerations

13.1 Waste treatment methods

Product

Burn in a chemical incinerator equipped with an afterburner and scrubber but exert extra care in igniting as this material is highly flammable. Offer surplus and non-recyclable solutions to a licensed disposal company. Contact a licensed professional waste disposal service to dispose of this material.

Contaminated packaging

Dispose of as unused product.

Section 14: Transportation information

14.1 Transportation information

Department of Transportation (DOT)

UN number: 2924 Class: 3 Packing group: II
Proper shipping name: Flammable liquid, corrosive, n.o.s. (Toluene and Aminopropyltriethoxysilane)
Reportable Quantity (RQ):
Poison Inhalation Hazard: No

IMDG
UN number: 2924 Class: 3 Packing group: II EMS-No: F-E, S-D

IATA

UN number: 2924 Class: 3 Packing group: II

Proper shipping name: Flammable liquid, corrosive, n.o.s. (Toluene and Aminopropyltriethoxysilane)

Section 15: Regulatory information

15.1 US Federal regulations

SARA 302 Components

No chemicals in this material are subject to the reporting requirements of SARA Title III, Section 302.

SARA 313 Components

The following components are subject to reporting levels established by SARA Title III, Section 313:

	CAS-No.	Revision Date
Toluene	108-88-3	2007-07-01

SARA 311/312 Hazards

Fire Hazard, Acute Health Hazard, Chronic Health Hazard

15.2 US State regulations

Massachusetts Right To Know Components

	CAS-No.	Revision Date
Toluene	108-88-3	2007-07-01

Pennsylvania Right To Know Components

	CAS-No.	Revision Date
Toluene	108-88-3	2007-07-01
3-Aminopropyltriethoxysilane	919-30-2	

New Jersey To Know Components

	CAS-No.	Revision Date
Toluene	108-88-3	2007-07-01
3-Aminopropyltriethoxysilane	919-30-2	

California Prop. 65 Components

, which is/are known to the State of California to cause birth defects or other reproductive harm. For more information go to www.P65Warnings.ca.gov.Toluene	CAS-No. 108-88-3	Revision Date 2009-02-01

Section 16: Other information

Full text of H-statements:

Acute Tox.	Acute toxicity
Eye Dam.	Serious eye damage
Flam. Liq.	Flammable liquids
Skin Corr.	Skin corrosion
H225	Highly flammable liquid and vapour.
H304	May be fatal if swallowed and enters airways.
H315	Causes skin irritation.
H318	Causes serious eye damage.
H336	May cause drowsiness or dizziness.
H361	Suspected of damaging fertility or the unborn child.
H373	May cause damage to organs through prolonged or repeated exposure.
H402	Harmful to aquatic life

HMIS Rating

Health	3
Chronic Health	*
Flammability	2
Physical	2

NFPA Rating

Health	3
Fire	2
Reactivity	0

SDS Preparation date: May 14, 2019 **Supersedes previous version:** New SDS

This SDS contains revisions in the following sections(s): Not applicable. New SDS.

The information above is believed to be accurate and represents the best information currently available to us. However, we make no warranty of merchantability or any other warranty, express or implied, with respect to such information, and we assume no liability resulting from its use. Users should make their own investigations to determine the suitability of the information for their particular purposes. In no event shall Nano3D Systems LLC be liable for any claims, losses, or damages of any third party or for lost profits or any special, indirect, incidental, consequential or exemplary damages, howsoever arising, even if Nano3D Systems LLC has been advised of the possibility of such damages.

End of Safety Data Sheet