SAFETY DATA SHEET

Republic of Korea

In accordance with the Standard for Classification and Labeling of Chemical Substance and Safety Data Sheet, Article 10 Paragraph 1

Section 1. Chemical product and company identification

A. Product name CDM4PERMAb™ Recommended additions: 3.2 g/L Sodium Bicarbonate, 0.5 g/L Poloxamer 188, 4 mM L-Glutamine

Catalogue Number SH30872.05

Article Number 29182136

B. Recommended use of the chemical

For Further Manufacturing or Research Use. Not for Diagnostic or Therapeutic Use.

Restrictions on use

Uses advised against	Reason
Not applicable.	

C. Supplier's information

Manufacturer / Supplier

HyClone Laboratories
925 West 1800 South
Logan, Utah 84321
Phone: (435) 792-8000

Cytiva Austria
Kremplstr. 5
4061 Pasching
AUSTRIA
Phone: +43 7229 64865
Fax (+43) 7229 64866

Cytiva Singapore
1 Maritime Square #13-01
Harbourfront Centre
Singapore 099253

Distributor

유통업자 글로벌 라이프 사이언스 솔루션즈 코리아 유한회사
BRC BLDG., 2동 2층
송도미래로 9, 연수구
인천시
대한민국
+82 2 3478 4584

Emergency telephone number (with hours of operation) +82-2-3478-4584 (9.00 am - 6.00 pm)

Section 2. Hazards identification

A. Hazard classification

EYE IRRITATION - Category 2A
GERM CELL MUTAGENICITY - Category 1B
CARCINOGENICITY - Category 1A
AQUATIC HAZARD (LONG-TERM) - Category 3

This product is classified in accordance with the Industrial Safety and Health Act and the Chemical Control Act.

Percentage of the mixture consisting of ingredient(s) of unknown hazards to the aquatic environment: 47.9%

B. GHS label elements, including precautionary statements

Symbol

Signal word	Danger
Hazard statements	Causes serious eye irritation. May cause genetic defects. May cause cancer. Harmful to aquatic life with long lasting effects.
Precautionary statements	
Prevention	Obtain special instructions before use. Do not handle until all safety precautions have been read and understood. Wear protective gloves, protective clothing and eye or face protection. Avoid release to the environment. Wash thoroughly after handling.
Response	IF exposed or concerned: Get medical advice or attention. IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. If eye irritation persists: Get medical advice or attention.
Storage	Store locked up.
Disposal	Dispose of contents and container in accordance with all local, regional, national and international regulations.
C. Other hazards which do not result in classification	May form explosible dust-air mixture if dispersed.

Section 3. Composition/information on ingredients

Substance/mixture	Mixture
Other means of identification	Not available.

Ingredient name	Common name	Identifiers	%
POTASSIUM CHLORIDE		CAS: 7447-40-7 EC: 231-211-8	≥1 - ≤5
L-BETA-ASPARAGINE		CAS: 70-47-3 EC: 200-735-9	≥1 - ≤5
L-serine		CAS: 56-45-1 EC: 200-274-3	≥1 - ≤5
L-(+)-LYSINE MONOHYDROCHLORIDE		CAS: 657-27-2 EC: 211-519-9	≥1 - ≤5
L-(-)-LEUCINE		CAS: 61-90-5 EC: 200-522-0	≥1 - ≤5
L-valine		CAS: 72-18-4 EC: 200-773-6	≥1 - ≤5
L-(-)-THREONINE		CAS: 72-19-5 EC: 200-774-1	≥1 - ≤5
ASPARTIC ACID		CAS: 56-84-8 EC: 200-291-6	≥1 - ≤5
L-(+)-ARGININE MONOHYDROCHLORIDE		CAS: 1119-34-2 EC: 214-275-1	≥0.5 - ≤1
Ethanol		CAS: 64-17-5 EC: 200-578-6	≤0.5
MAGNESIUM SULFATE		CAS: 7487-88-9 EC: 231-298-2	≤0.5
Sulfuric acid copper(2+) salt (1:1), hydrate (1:5)		CAS: 7758-99-8 EC: 231-847-6	≤0.1
Copper chloride (CuCl2), dihydrate		CAS: 10125-13-0 EC: 231-210-2	≤0.1

There are no additional ingredients present which, within the current knowledge of the supplier and in the concentrations applicable, are classified as hazardous to health or the environment and hence require reporting in this section.

Occupational exposure limits, if available, are listed in Section 8.

Section 4. First aid measures

A.	**Eye contact**	Immediately flush eyes with plenty of water, occasionally lifting the upper and lower eyelids. Check for and remove any contact lenses. Continue to rinse for at least 10 minutes. Get medical attention.
B.	**Skin contact**	Flush contaminated skin with plenty of water. Remove contaminated clothing and shoes. Wash contaminated clothing thoroughly with water before removing it, or wear gloves. Continue to rinse for at least 10 minutes. Get medical attention. Wash clothing before reuse. Clean shoes thoroughly before reuse.
C.	**Inhalation**	Remove victim to fresh air and keep at rest in a position comfortable for breathing. If not breathing, if breathing is irregular or if respiratory arrest occurs, provide artificial respiration or oxygen by trained personnel. It may be dangerous to the person providing aid to give mouth-to-mouth resuscitation. Get medical attention. If unconscious, place in recovery position and get medical attention immediately. Maintain an open airway. Loosen tight clothing such as a collar, tie, belt or waistband. In case of inhalation of decomposition products in a fire, symptoms may be delayed. The exposed person may need to be kept under medical surveillance for 48 hours.
D.	**Ingestion**	Wash out mouth with water. Remove dentures if any. If material has been swallowed and the exposed person is conscious, give small quantities of water to drink. Stop if the exposed person feels sick as vomiting may be dangerous. Do not induce vomiting unless directed to do so by medical personnel. If vomiting occurs, the head should be kept low so that vomit does not enter the lungs. Get medical attention. Never give anything by mouth to an unconscious person. If unconscious, place in recovery position and get medical attention immediately. Maintain an open airway. Loosen tight clothing such as a collar, tie, belt or waistband.
E.	**Notes to physician**	In case of inhalation of decomposition products in a fire, symptoms may be delayed. The exposed person may need to be kept under medical surveillance for 48 hours.
	Specific treatments	No specific treatment.
	Protection of first-aiders	No action shall be taken involving any personal risk or without suitable training. If it is suspected that fumes are still present, the rescuer should wear an appropriate mask or self-contained breathing apparatus. It may be dangerous to the person providing aid to give mouth-to-mouth resuscitation. Wash contaminated clothing thoroughly with water before removing it, or wear gloves.

See toxicological information (Section 11)

Section 5. Fire-fighting measures

A. <u>Extinguishing media</u>

Suitable	Use dry chemical powder.
Not suitable	Avoid high pressure media which could cause the formation of a potentially explosible dust-air mixture.
B. Specific hazards arising from the chemical	May form explosible dust-air mixture if dispersed. This material is harmful to aquatic life with long lasting effects. Fire water contaminated with this material must be contained and prevented from being discharged to any waterway, sewer or drain.
Hazardous thermal decomposition products	Decomposition products may include the following materials: carbon dioxide carbon monoxide nitrogen oxides phosphorus oxides halogenated compounds metal oxide/oxides
C. Special protective equipment for fire-fighters	Fire-fighters should wear appropriate protective equipment and self-contained breathing apparatus (SCBA) with a full face-piece operated in positive pressure mode.
Special precautions for fire-fighters	Promptly isolate the scene by removing all persons from the vicinity of the incident if there is a fire. No action shall be taken involving any personal risk or without suitable training. Move containers from fire area if this can be done without risk. Use water spray to keep fire-exposed containers cool.

Section 6. Accidental release measures

A.	**Personal precautions, protective equipment and emergency procedures**	No action shall be taken involving any personal risk or without suitable training. Evacuate surrounding areas. Keep unnecessary and unprotected personnel from entering. Do not touch or walk through spilled material. Shut off all ignition sources. No flares, smoking or flames in hazard area. Avoid breathing dust. Provide adequate ventilation. Wear appropriate respirator when ventilation is inadequate. Put on appropriate personal protective equipment.
B.	**Environmental precautions**	Avoid dispersal of spilled material and runoff and contact with soil, waterways, drains and sewers. Inform the relevant authorities if the product has caused environmental pollution (sewers, waterways, soil or air). Water polluting material. May be harmful to the environment if released in large quantities.

C. <u>Methods and materials for containment and cleaning up</u>

Small spill	Move containers from spill area. Use spark-proof tools and explosion-proof equipment. Avoid dust generation. Do not dry sweep. Vacuum dust with equipment fitted with a HEPA filter and place in a closed, labeled waste container. Place spilled material in a designated, labeled waste container. Dispose of via a licensed waste disposal contractor.
Large spill	Move containers from spill area. Use spark-proof tools and explosion-proof equipment. Approach release from upwind. Prevent entry into sewers, water courses, basements or confined areas. Avoid dust generation. Do not dry sweep. Vacuum dust with equipment fitted with a HEPA filter and place in a closed, labeled waste container. Avoid creating dusty conditions and prevent wind dispersal. Dispose of via a licensed waste disposal contractor.

Section 7. Handling and storage

A. Precautions for safe handling

Protective measures	Eating, drinking and smoking should be prohibited in areas where this material is handled, stored and processed. Workers should wash hands and face before eating, drinking and smoking. Remove contaminated clothing and protective equipment before entering eating areas. See also Section 8 for additional information on hygiene measures.
Advice on general occupational hygiene	Eating, drinking and smoking should be prohibited in areas where this material is handled, stored and processed. Workers should wash hands and face before eating, drinking and smoking. Remove contaminated clothing and protective equipment before entering eating areas. See also Section 8 for additional information on hygiene measures.
B. Conditions for safe storage, including any incompatibilities	Store between the following temperatures: 2 to 8°C (35.6 to 46.4°F). Store in accordance with local regulations. Store in a segregated and approved area. Store in original container protected from direct sunlight in a dry, cool and well-ventilated area, away from incompatible materials (see Section 10) and food and drink. Store locked up. Eliminate all ignition sources. Separate from oxidizing materials. Keep container tightly closed and sealed until ready for use. Containers that have been opened must be carefully resealed and kept upright to prevent leakage. Do not store in unlabeled containers. Use appropriate containment to avoid environmental contamination. See Section 10 for incompatible materials before handling or use.

Section 8. Exposure controls/personal protection

A. Control parameters

Occupational exposure limits

Ingredient name	Exposure limits
Ethanol	**ISHA Article 42 (Republic of Korea, 1/2020)** Carcinogenicity 1A. TWA 8 hours: 1000 ppm.
Sulfuric acid copper(2+) salt (1:1), hydrate (1:5)	**ISHA Article 42 (Republic of Korea, 1/2020) [copper (dust & mist)]** TWA 8 hours: 1 mg/m³ (as Cu). Form: Dusts and Mists. STEL 15 minutes: 2 mg/m³ (as Cu). Form: Dusts and Mists.

Biological exposure indices

No exposure indices known.

B. Appropriate engineering controls	Use only with adequate ventilation. If user operations generate dust, fumes, gas, vapor or mist, use process enclosures, local exhaust ventilation or other engineering controls to keep worker exposure to airborne contaminants below any recommended or statutory limits. The engineering controls also need to keep gas, vapor or dust concentrations below any lower explosive limits. Use explosion-proof ventilation equipment.
Environmental exposure controls	Emissions from ventilation or work process equipment should be checked to ensure they comply with the requirements of environmental protection legislation. In some cases, fume scrubbers, filters or engineering modifications to the process equipment will be necessary to reduce emissions to acceptable levels.

C. Personal protective equipment

Respiratory protection	Based on the hazard and potential for exposure, select a respirator that meets the appropriate standard or certification. Respirators must be used according to a respiratory protection program to ensure proper fitting, training, and other important aspects of use.
Eye protection	Safety eyewear complying with an approved standard should be used when a risk assessment indicates this is necessary to avoid exposure to liquid splashes, mists, gases or dusts. If contact is possible, the following protection should be worn, unless the assessment indicates a higher degree of protection: chemical splash goggles. If operating conditions cause high dust concentrations to be produced, use dust goggles.
Hand protection	Chemical-resistant, impervious gloves complying with an approved standard should be worn at all times when handling chemical products if a risk assessment indicates this is necessary. Considering the parameters specified by the glove manufacturer, check during use that the gloves are still retaining their protective properties. It should be noted that the time to breakthrough for any glove material may be different for different glove manufacturers. In the case of mixtures, consisting of several substances, the protection time of the gloves cannot be accurately estimated.
Skin 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.
Hygiene measures	Wash hands, forearms and face thoroughly after handling chemical products, before eating, smoking and using the lavatory and at the end of the working period. Appropriate techniques should be used to remove potentially contaminated clothing. Wash contaminated clothing before reusing. Ensure that eyewash stations and safety showers are close to the workstation location.

Section 9. Physical and chemical properties

The conditions of measurement of all properties are at standard temperature and pressure unless otherwise indicated.

A.	**Appearance**	
	Physical state	Solid. [Powder.]
	Color	White. to Off-white.
B.	**Odor**	Not available.
C.	**Odor threshold**	Not available.
D.	**pH**	5 to 7 [Conc. (% w/w): 1.7%]
E.	**Melting/freezing point**	Not available.
F.	**Boiling point or initial boiling point and boiling range**	Not available.
G.	**Flash point**	Not applicable.
	Fire point	Not available.
	Burning time	Not available.
	Burning rate	Not available.
H.	**Evaporation rate**	Not available.
I.	**Flammability (solid, gas)**	Not available.
J.	**Lower and upper explosive (flammable) limits**	Not applicable.
K.	**Vapor pressure**	Not available.
L.	**Solubility in water**	Not available.
M.	**Vapor density**	Not applicable.
N.	**Relative density**	Not available.
O.	**Partition coefficient: n-octanol/water**	Not applicable.
P.	**Auto-ignition temperature**	Not applicable.
Q.	**Decomposition temperature**	Not available.
	SADT	Not available.
R.	**Viscosity**	Dynamic (room temperature): Not available. Kinematic (room temperature): Not available. Kinematic (40°C (104°F)): Not available.
	Flow time (ISO 2431)	Not available.
S.	**Molecular weight**	Not applicable.

Particle characteristics

Median particle size	Not available.

Section 10. Stability and reactivity

A.	**Chemical stability**	The product is stable.
	Possibility of hazardous reactions	Under normal conditions of storage and use, hazardous reactions will not occur.
B.	**Conditions to avoid**	Avoid the creation of dust when handling and avoid all possible sources of ignition (spark or flame). Take precautionary measures against electrostatic discharges. To avoid fire or explosion, dissipate static electricity during transfer by grounding and bonding containers and equipment before transferring material. Prevent dust accumulation.
C.	**Incompatible materials**	Reactive or incompatible with the following materials: oxidizing materials
D.	**Hazardous decomposition products**	Under normal conditions of storage and use, hazardous decomposition products should not be produced.

Section 11. Toxicological information

A. Information on the likely routes of exposure

Routes of entry anticipated: Oral, Dermal, Inhalation, Eyes.

Potential acute health effects

Respiratory	Exposure to airborne concentrations above statutory or recommended exposure limits may cause irritation of the nose, throat and lungs.
Oral	No known significant effects or critical hazards.
Skin	No known significant effects or critical hazards.
Eyes	Causes serious eye irritation.

Over-exposure signs/symptoms

Inhalation	Adverse symptoms may include the following: respiratory tract irritation coughing
Ingestion	No specific data.
Skin contact	No specific data.
Eye contact	Adverse symptoms may include the following: pain or irritation watering redness

B. Health hazards

Acute toxicity

Product/ingredient name	Result
POTASSIUM CHLORIDE	**Rat - Male - Oral - LD50** 2600 mg/kg Toxic effects: Gastrointestinal - Hypermotility, diarrhea Gastrointestinal - Nausea or vomiting
L-serine	**Rat - Oral - LD50** 14 g/kg
L-(+)-LYSINE MONOHYDROCHLORIDE	**Rat - Oral - LD50** 10 g/kg Toxic effects: Behavioral - Altered sleep time (including change in righting reflex) Behavioral - Ataxia Lung, Thorax, or Respiration - Dyspnea
L-(-)-LEUCINE	**Rat - Oral - LD50** 16000 mg/kg
L-valine	**Rat - Oral - LD50** 2000 mg/kg
ASPARTIC ACID	**Rat - Oral - LD50** 5000 mg/kg **Rabbit - Dermal - LD50** 5000 mg/kg
L-(+)-ARGININE MONOHYDROCHLORIDE	**Rat - Oral - LD50** 12 g/kg Toxic effects: Behavioral - Altered sleep time (including change in righting reflex) Behavioral - Ataxia Lung, Thorax, or Respiration - Dyspnea
Ethanol	**Rat - Oral - LD50** 7060 mg/kg Toxic effects: Lung, Thorax, or Respiration - Other changes **Rat - Inhalation - LC50 Vapor** 124700 mg/m³ [4 hours]
Sulfuric acid copper(2+) salt (1:1), hydrate (1:5)	**Rat - Oral - LD50** 300 mg/kg

Conclusion/Summary [Product] Not available.

Skin corrosion/irritation

Not available.

Conclusion/Summary [Product] Not available.

Ingredient name	Conclusion/Summary

L-serine	May cause skin irritation.
L-(+)-LYSINE MONOHYDROCHLORIDE	May cause skin irritation.
L-(-)-LEUCINE	May cause skin irritation.
L-valine	May cause skin irritation.
L-(-)-THREONINE	May cause skin irritation.

Serious eye damage/eye irritation

Not available.

Conclusion/Summary [Product] Not available.

Ingredient name	Conclusion/Summary
L-serine	May cause eye irritation.
L-(+)-LYSINE MONOHYDROCHLORIDE	May cause eye irritation.
L-(-)-LEUCINE	May cause eye irritation.
L-valine	May cause eye irritation.
L-(-)-THREONINE	May cause eye irritation.

Respiratory corrosion/irritation

Not available.

Conclusion/Summary [Product] Not available.

Respiratory or skin sensitization

Not available.

Skin

Conclusion/Summary [Product] Not available.

Respiratory

Conclusion/Summary [Product] Not available.

CMR - ISHA Article 42 Occupational Exposure Limits

Product/ingredient name	Identifiers	Name on list	Classification
Ethanol	CAS: 64-17-5 EC: 200-578-6	-	Carcinogenicity 1A

Germ cell mutagenicity

Not available.

Conclusion/Summary [Product] Not available.

Carcinogenicity

Not available.

Conclusion/Summary [Product] Not available.

Classification

Product/ingredient name	OSHA	IARC	NTP	ACGIH
Ethanol	-	-	-	A3

Reproductive toxicity

Not available.

Conclusion/Summary [Product] Not available.

Specific target organ toxicity (single exposure)

Product/ingredient name	Result

POTASSIUM CHLORIDE	SPECIFIC TARGET ORGAN TOXICITY (SINGLE EXPOSURE) - Category 2 SPECIFIC TARGET ORGAN TOXICITY (SINGLE EXPOSURE) (Respiratory tract irritation) - Category 3
L-BETA-ASPARAGINE	SPECIFIC TARGET ORGAN TOXICITY (SINGLE EXPOSURE) (Respiratory tract irritation) - Category 3
L-(-)-THREONINE	SPECIFIC TARGET ORGAN TOXICITY (SINGLE EXPOSURE) (Respiratory tract irritation) - Category 3
ASPARTIC ACID	SPECIFIC TARGET ORGAN TOXICITY (SINGLE EXPOSURE) (Respiratory tract irritation) - Category 3
Ethanol	SPECIFIC TARGET ORGAN TOXICITY (SINGLE EXPOSURE) (Narcotic effects) - Category 3

Specific target organ toxicity (repeated exposure)

Product/ingredient name	Result
Ethanol	SPECIFIC TARGET ORGAN TOXICITY (REPEATED EXPOSURE) - Category 2

Aspiration hazard

Not available.

Potential chronic health effects

Not available.

Conclusion/Summary [Product]	Not available.
General	Repeated or prolonged inhalation of dust may lead to chronic respiratory irritation.
Carcinogenicity	May cause cancer. Risk of cancer depends on duration and level of exposure.
Mutagenicity	May cause genetic defects.
Reproductive toxicity	No known significant effects or critical hazards.

Numerical measures of toxicity

Acute toxicity estimates

Product/ingredient name	Oral (mg/kg)	Dermal (mg/kg)	Inhalation (gases) (ppm)	Inhalation (vapors) (mg/l)	Inhalation (dusts and mists) (mg/l)
CDM4PERMAb™	27492.3	85689.8	N/A	N/A	N/A
POTASSIUM CHLORIDE	2600	N/A	N/A	N/A	N/A
L-serine	14000	N/A	N/A	N/A	N/A
L-(+)-LYSINE MONOHYDROCHLORIDE	10000	N/A	N/A	N/A	N/A
L-(-)-LEUCINE	16000	N/A	N/A	N/A	N/A
L-valine	2000	N/A	N/A	N/A	N/A
ASPARTIC ACID	5000	5000	N/A	N/A	N/A
L-(+)-ARGININE MONOHYDROCHLORIDE	12000	N/A	N/A	N/A	N/A
Ethanol	7000	N/A	N/A	124.7	N/A
Sulfuric acid copper(2+) salt (1:1), hydrate (1:5)	500	N/A	N/A	N/A	N/A

Section 12. Ecological information

A. Ecotoxicity

Product/ingredient name	Result
POTASSIUM CHLORIDE	**Acute - LC50 - Fresh water** Crustaceans - Water flea - *Pseudosida ramosa* - Neonate Age: ≤24 hours 9.68 mg/l [48 hours] Effect: Mortality **Acute - EC50 - Fresh water** ISO Algae - Green algae - *Desmodesmus subspicatus* 9.24 g/l [72 hours] Effect: Population **Acute - LC50 - Fresh water** Fish - Zebra danio - *Danio rerio* 509.65 mg/l [96 hours] Effect: Mortality
L-serine	**Acute - EC50** Daphnia 83 mg/l [48 hours] **Acute - NOEC** Algae 1000 mg/l [72 hours]

L-valine	**LC50** Fish 10000 mg/l [96 hours]
Ethanol	**Acute - LC50 - Marine water** Fish - Bleak - *Alburnus alburnus* Size: 8 to 10 cm 11 g/l [96 hours] Effect: Mortality **Chronic - NOEC - Marine water** Algae - Green algae - *Ulva pertusa* 4.995 mg/l [96 hours] Effect: Reproduction **Acute - EC50 - Fresh water** Crustaceans - Ostracod - *Cypris subglobosa* 1074 mg/l [48 hours] Effect: Intoxication **Chronic - NOEC - Fresh water** Daphnia - Water flea - *Daphnia magna* - Neonate Age: <24 hours 100 µl/l [21 days] Effect: Mortality **Acute - EC50 - Marine water** Algae - Green algae - *Ulva pertusa* Size: 9.4 mm 3306 mg/l [96 hours] Effect: Reproduction
MAGNESIUM SULFATE	**Chronic - NOEC - Fresh water** Daphnia - Water flea - *Daphnia magna* - Neonate Age: <24 hours 360 mg/l [3 weeks] Effect: Reproduction **Chronic - IC10 - Fresh water** Aquatic plants - Lesser Duckweed - *Lemna aequinoctialis* 1.9 mg/l [96 hours] Effect: Population **Acute - IC50 - Fresh water** Aquatic plants - Lesser Duckweed - *Lemna aequinoctialis* 4.4 mg/l [96 hours] Effect: Population **Acute - LC50 - Fresh water** Fish - Purple Spotted Gudgeon - *Mogurnda mogurnda* - Larvae 40 mg/l [96 hours] Effect: Mortality **Acute - EC50 - Fresh water** Daphnia - Water flea - *Daphnia magna* 343.56 mg/l [48 hours] Effect: Intoxication
Sulfuric acid copper(2+) salt (1:1), hydrate (1:5)	**Acute - EC50 - Fresh water** US EPA Daphnia - Water flea - *Daphnia magna* Age: 1 182 ppb [48 hours] Effect: Intoxication **Acute - LC50 - Fresh water** US EPA Fish - Rainbow trout,donaldson trout - *Oncorhynchus mykiss* Weight: 0.6 g 0.032 ppm [96 hours] Effect: Mortality
Copper chloride (CuCl2), dihydrate	**Acute - EC50 - Marine water** US EPA Algae - Diatom - *Skeletonema costatum* Age: 3 days 9.52 ppb [72 hours] Effect: Population **Chronic - NOEC - Marine water** US EPA Crustaceans - Harpacticoid copepod - *Tisbe battagliai* Age: <24 hours 18 ppb [21 days] Effect: Mortality

Conclusion/Summary [Product] Not available.

Ingredient name	**Conclusion/Summary**

L-BETA-ASPARAGINE	Naturally occurring substance
L-serine	Naturally occurring substance
L-(+)-LYSINE MONOHYDROCHLORIDE	Naturally occurring substance
L-(-)-LEUCINE	Naturally occurring substance
L-valine	Naturally occurring substance
L-(-)-THREONINE	Naturally occurring substance
ASPARTIC ACID	Naturally occurring substance
L-(+)-ARGININE MONOHYDROCHLORIDE	Naturally occurring substance

B. Persistence/degradability

Product/ingredient name	Result
L-valine	82% [28 days]
Ethanol	**Aerobic** 100% [20 days] - Readily

Conclusion/Summary [Product] Not available.

Ingredient name	Conclusion/Summary
L-serine	Not expected to bioaccumulate. Naturally occurring substance
L-(+)-LYSINE MONOHYDROCHLORIDE	Not expected to bioaccumulate. Naturally occurring substance
L-(-)-LEUCINE	Not expected to bioaccumulate. Naturally occurring substance
L-valine	Not expected to bioaccumulate. Naturally occurring substance
ASPARTIC ACID	Not expected to bioaccumulate. Naturally occurring substance
L-(+)-ARGININE MONOHYDROCHLORIDE	Not expected to bioaccumulate. Naturally occurring substance

Product/ingredient name	Aquatic half-life	Photolysis	Biodegradability
L-valine	-	-	Readily
Ethanol	-	-	Readily

C. Bioaccumulative potential

Product/ingredient name	$LogP_{ow}$	BCF	Potential
asparagine	-3.82	3	Low
L-serine	-3.07	0.609	Low
lysine hydrochloride	<-3.3	1.041	Low
L-leucine	-1.52	0.849	Low
L-valine	-2.26	0.846	Low
L-threonine	-2.94	0.811	Low
aspartic acid	-3.89	-	Low
ethanol	-0.35	0.66	Low

D. Mobility in soil

Soil/Water partition coefficient Not available.

E. Other adverse effects No known significant effects or critical hazards.

Section 13. Disposal considerations

A. Disposal methods The generation of waste should be avoided or minimized wherever possible. Disposal of this product, solutions and any by-products should at all times comply with the requirements of environmental protection and waste disposal legislation and any regional local authority requirements. Dispose of surplus and non-recyclable products via a licensed waste disposal contractor. Waste should not be disposed of untreated to the sewer unless fully compliant with the requirements of all authorities with jurisdiction. Waste packaging should be recycled. Incineration or landfill should only be considered when recycling is not feasible.

B. Disposal precautions This material and its container must be disposed of in a safe way. Care should be taken when handling emptied containers that have not been cleaned or rinsed out. Empty containers or liners may retain some product residues. Avoid dispersal of spilled material and runoff and contact with soil, waterways, drains and sewers.

Section 14. Transport information

UN

A. UN number Not regulated.

B. Proper shipping name Not regulated.

C. Classes Not regulated.

D. Packing group Not regulated.

E. Marine pollutant No.

F. Additional information -

Label

IMDG

A. UN number Not regulated.

B. Proper shipping name Not regulated.

C. Classes Not regulated.

D.	**Packing group**	Not regulated.
E.	**Marine pollutant**	No.
F.	**Additional information**	-
	Label	

IATA

A.	**UN number**	Not regulated.
B.	**Proper shipping name**	Not regulated.
C.	**Classes**	Not regulated.
D.	**Packing group**	Not regulated.
E.	**Marine pollutant**	No.
F.	**Additional information**	-
	Label	

Special precautions for user	**Transport within user's premises:** always transport in closed containers that are upright and secure. Ensure that persons transporting the product know what to do in the event of an accident or spillage.
Transport in bulk according to IMO instruments	Not available.

Section 15. Regulatory information

A. Regulation according to ISHA

ISHA article 117 (Harmful substances prohibited from manufacture)	None of the components are listed.
ISHA article 118 (Harmful substances requiring permission)	None of the components are listed.

Exposure Limits of Chemical Substances and Physical Factors

The following components have an OEL:
Ethanol
Sulfuric acid copper(2+) salt (1:1), hydrate (1:5)

ISHA Enforcement Regs Annex 19 (Exposure standards established for harmful factors)	The following components are listed: cobalt and its inorganic compounds, manganese and its inorganic compounds, Cadmium and its compounds
ISHA Enforcement Regs Annex 21 (Harmful factors subject to Work Environment Measurement)	None of the components are listed.
ISHA Enforcement Regs Annex 22 (Harmful Factors Subject to Special Health Check-up)	None of the components are listed.
Standard of Industrial Safety and Health Annex 12 (Hazardous substances subject to control)	None of the components are listed.

B. Regulation according to Chemicals Control Act

Article 11 (TRI)	None of the components are listed.
Article 18 Prohibited (K-Reach Article 27)	None of the components are listed.
Article 19 Candidate substances subject to authorization (K-Reach Article 25)	None of the components are listed.
Article 19 Subject to authorization (K-Reach Article 25)	None of the components are listed.
Article 20 Toxic Chemicals (K-Reach Article 20)	Not applicable

Article 20 Restricted (K-Reach Article 27) None of the components are listed.

Article 39 (Accident Precaution Chemicals)

Not listed.

MoE 2021-51 - Regulations on the quantity of toxic substances, restricted substances, prohibited substances and permitted substances

Ingredient name	Higher regulated quantity	Lower regulated quantity
inorganic zinc, salts	400 tonnes	20 tonnes
2-Methyl-1,4-naphthalenedione	400 tonnes	20 tonnes
acetic acid	400 tonnes	20 tonnes
Ergocalciferol	400 tonnes	20 tonnes
selenium compounds	200 tonnes	5 tonnes
cadmium compounds	400 tonnes	20 tonnes
inorganic tin, salts	-	20 tonnes

Existing Chemical Substances Subject to Registration The following components are listed: Sulfuric acid copper(2+) salt (1:1), hydrate (1:5), Sulfuric acid, zinc salt (1:1), heptahydrate, Cadmium chloride, hydrate (2:5), Tin chloride (SnCl2), dihydrate

C. Dangerous Materials Safety Management Act Not applicable.

D. Wastes regulation Dispose of contents and container in accordance with all local, regional, national and international regulations.

E. Regulation according to other foreign laws

Article 2 of Youth Protection Act on Substances Hazardous to Youth Not applicable.

International regulations

Chemical Weapon Convention List Schedules I, II & III Chemicals

Not listed.

Montreal Protocol

Not listed.

Stockholm Convention on Persistent Organic Pollutants

Not listed.

Rotterdam Convention on Prior Informed Consent (PIC)

Not listed.

UNECE Aarhus Protocol on POPs and Heavy Metals

Not listed.

Inventory list

Republic of Korea Not determined.

United States Not determined.

China Not determined.

Japan **Japan inventory (CSCL)**: Not determined.
Japan inventory (ISHL): Not determined.

Section 16. Other information

A. References

B. First issue date 17 February 2026

C. Date of issue/Date of revision 17 February 2026 / 17 February 2026

D. Version 1

Date of printing **17 February 2026**

sds_author@cytiva.com

E. Other

Indicates information that has changed from previously issued version.

Key to abbreviations

ATE = Acute Toxicity Estimate
BCF = Bioconcentration Factor
GHS = Globally Harmonized System of Classification and Labelling of Chemicals
IATA = International Air Transport Association
IBC = Intermediate Bulk Container
IMDG = International Maritime Dangerous Goods
LogPow = logarithm of the octanol/water partition coefficient
MARPOL = International Convention for the Prevention of Pollution From Ships, 1973 as modified by the Protocol of 1978. ("Marpol" = marine pollution)
N/A = Not available
UN = United Nations

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