

Product Guide for
LudgerLiberate™
Hydrazinolysis
Glycan Release Kit

Product # LL-HYDRAZ-A2

Ludger Document # LL-HYDRAZ-A2-Guide-v5.0

Ludger Ltd

Culham Science Centre

Oxford OX14 3EB

United Kingdom

Tel: +44 1865 408 554

Email: info@ludger.com

www.ludger.com

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Specifications for LL-HYDRAZ-A2

Application	For release of N + O-linked glycans from glycoprotein therapeutics
Description	The kit contains reagents for the release of N and O-linked glycans from glycoprotein biopharmaceuticals. Released glycans have free reducing termini to allow fluorescent tagging by reductive amination. The release conditions can be optimized for release of N-glycans, O-glycans or both N- and O-glycans.
Number of Samples	The kit contains reagents and materials for up to 12 glycoprotein samples analysed in parallel or two sets of 6.
Amount of Sample	Typically, up to 1 mg of glycoprotein per sample.
Suitable Samples	Biopharmaceutical glycoproteins.
Storage:	Store refrigerated at 4 - 10 °C in the dark. If you have limited cold storage space then store just the CEX cartridges at 4°C and the rest of the kit at room temperature. Protect from sources of heat, light, and moisture. When stored correctly, the reagents should be stable for at least 18 months from date of manufacture.
Shipping:	The product should be shipped at ambient temperature. As it contains small amounts of anhydrous hydrazine the kit must be packaged and shipped as dangerous goods (DG).

For research use only. Not for human or drug use

Kit Contents



The kit contains the following materials and reagents:

Cat. #	Item	Quantity
LL-HYDRAZINE-01	Hydrazinolysis Release Reagent	2 x 3ml
LL-BICARB-01	Solid sodium bicarbonate	2 x 0.33 g
LL-OCTANOL-01	Octanol	2 x 0.2 ml
LL-ACETANHYD-01	Acetic anhydride	2 x 0.5 ml
LL-TFA-5PC-01	TFA solution	2 x 4 ml
LC-EB20-01	LudgerClean™ EB20 cartridges	2 x 6 cartridges
LC-EB20-WASHA-01	EB20 Wash A Solution	2 x 12 ml
LC-EB20-WASHB-01	EB20 Wash B Solution	2 x 12 ml
LC-CEX-H-01	LudgerClean™ CEX cartridges	2 x 6 cartridges
LL-WASTEV-01	Wash waste vials	2 x 6 vials
LL-REACT-01	Glass reaction vials with PTFE lined caps	2 x 6 vials
LL-COLLV-01	Glass collection vials with PTFE lined caps	2 x 6 vials

Additional Reagents and Equipment Required

- Pure water: resistivity 18 MΩ-cm, particle free (>0.22 μm), TOC <10 ppb
- Dialysis membranes, PD10 columns, centrifugal concentrators[§] or similar for removal of salts and detergents from your glycoprotein samples*
- Glove box with dry, oxygen-free inert gas (e.g. nitrogen or argon) for handling anhydrous hydrazine. As an alternative to a glove box, hydrazinolysis can be performed in a dry fume hood with inverted funnel applying a blanket of dry argon.
- Syringe (glass or PTFE) to transfer anhydrous hydrazine – e.g. 1 ml Hamilton or SGE glass syringe for liquids with teflon tipped plunger and stainless steel or PTFE needle. Do not use plastic syringes.
- Heating block, oven, or similar dry heater (a water bath cannot be used) that can be set at between 40°C and 100 °C
- Centrifugal evaporator (e.g. ThermoSavant SpeedVac®, Heto or GeneVac®). If using the ThermoSavant SpeedVac® we recommend the use of the Thermo Savant RH32-13 Rotor.
- Pipettes

[§] Recommended for glycoprotein sample clean up and buffer exchange prior to O-glycan release

* Optional - depending on your sample

Safety and Handling

- Please read the Material Safety Data Sheets (MSDS's) for all chemicals used (see Appendix 2).
- All processes involving the kit reagents should be performed using appropriate personal safety protection - eyeglasses, good quality chemically resistant gloves (e.g. nitrile), etc. - and where appropriate in a laboratory fume cupboard.
- Ensure that any glass, plasticware or solvents used are free of glycosidases and environmental carbohydrates. Use powder-free gloves for all sample handling procedures and avoid contamination with environmental carbohydrate.
- All steps involving release reagents must be performed in a dry environment with dry glassware, syringes, needles and plasticware (you can dry these by baking in a warm drying oven). Ensure there are no sources of moisture (e.g. water baths) anywhere near the area used for the hydrazinolysis reaction.
- Once individual vials of reagents are opened, their contents should be used immediately and excess then discarded according to local safety rules.

The Hydrazinolysis Reaction

The hydrazinolysis reaction involves the following steps (see Figure 1):

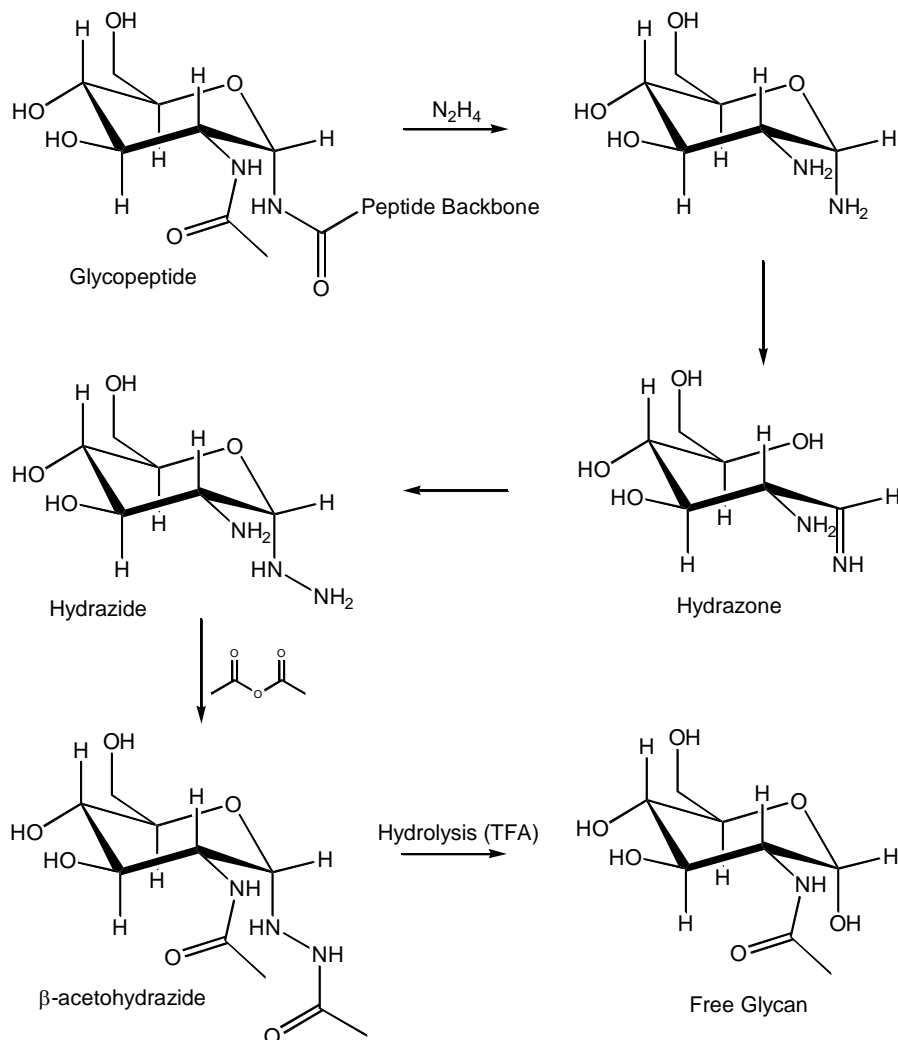


Figure 1: Hydrazinolysis Scheme

This illustrates the scheme for release of an N-linked glycan. The mechanism for hydrazinolysis of O-glycans is similar.

1. Liberation of the glycan as the hydrazide derivative.

Anhydrous hydrazine reacts at (a) the link between the glycan and peptide backbone and (b) the acetamido groups of monosaccharide residues such as GlcNAc. This results in liberation of the glycan as the de-*N*-acetylated hydrazone derivative which then converts to the hydrazide form.

2. *N*-acetylation.

Free amino groups on the hydrazide are *N*-acetylated to form the β -acetohydrazide derivatives. This repairs the de-*N*-acetylated monosaccharide residues and caps the hydrazide moiety of the

monosaccharide residue formerly linked to the peptide backbone.

3. Hydrolysis to form the free glycan.

The acid-labile β -acetohydrazide derivative is hydrolysed to produce the free glycan.

Time Line for Hydrazinolysis

Procedure	Time
Start with pure glycoprotein samples	
Transfer samples to reaction vials and dry completely	24 hours
Add hydrazine	15 min
Incubate samples *	6 - 16 hour
Remove hydrazine	2-24 hours
Acetylation	2 hours
Purification of released glycans	2 hours

* The incubation time will vary depending on the types of glycans you need to release (i.e. N-glycans, O-glycans or N+O-glycans).

The following are typical incubation regimes:

O-Mode Hydrazinolysis:	Incubate 6 hours at 60°C
N-Mode Hydrazinolysis (Fast):	Incubate 5 hours at 100°C
N-Mode Hydrazinolysis (Normal):	Incubate 16 hours at 85°C
N+O Mode Hydrazinolysis :	Incubate 16 hours at 60°C

The fast and normal N-modes should give equivalent results. Typically, you would choose the fast mode if you plan to work up the samples the same day and the normal mode so the incubation can be done overnight with sample workup the next morning.

Outline of the Hydrazinolysis Protocol

- **Prepare the glycoprotein**

Prepare the glycoprotein or glycopeptide samples by removing contaminants such as salts, detergents and dyes that could interfere with the release procedure.

- **Dry the glycoprotein**

Place the samples in reaction vials and dry down completely.

- **Add hydrazine release reagent**

Add hydrazine release reagent to each sample.

- **Incubate**

Incubate the sample to allow the release reaction to progress. Use the temperature-time profile optimized for the type of glycans (i.e. N-, O- or N+O) you need to release.

- **Remove hydrazine**

Remove excess hydrazine by centrifugal evaporation.

- **Acetylation**

Acetylate free amino groups using acetic anhydride in an aqueous buffer to produce the β -acetohydrazide. Use slightly different protocols depending on the type of released glycans.

- **Acidification and purification of the free glycans**

Use one of two different protocols for the acidification and purification step, depending on the type of released glycans:

- **N-Glycans**

- Acidify the sample and incubate to produce the free N-glycans

- Purify the N-glycans using an EB20 glycan purification cartridge (Cat # LC-EB20-01)

O-Glycans or N+O-Glycans

Acidify and purify the O-glycans (or N + O-glycans) using a CEX glycan purification cartridge (Cat# LC-CEX-H-01)

- **Store or analyse released glycans**

The released glycans are now ready for direct analysis or fluorescent labelling.

Protocol Steps 1-7 (For All Glycan Types)

Sample Preparation



1 Purify the Glycoprotein

The glycopeptide or glycoprotein samples must be free of contaminants that can interfere with the release reaction. These include the following:

- Non-volatile solvents
- Non-volatile salts, in particular transition metal ions
- Detergents
- Dyes and stains such as Coomassie Blue

Methods that are generally good for removal of such contaminants include the following:

- Dialysis against water or 0.1% trifluoroacetic acid (TFA) as some glycoproteins tend to precipitate in water
- Size exclusion chromatography using a small desalting column (e.g. PD10) with water or 0.1% TFA as eluant
- Centrifugal concentration with buffer exchange into water or 0.1 % TFA

The preferred method for preparing glycoproteins for O-glycan release is centrifugal concentration with buffer exchange into 0.1 % TFA. Washing of the glycoproteins and buffer exchanging them with 0.1 % TFA in this way can significantly decrease the amount of 'peeling product' that is associated with O-glycan release using the hydrazinolysis method.

2 Transfer Samples to Reaction Vials

The amount of sample for each reaction vial (Cat# LL-REACT-01) should be in the range 50 µg to 1 mg.

The reaction vials (5 ml glass vials with Teflon PTFE lined screw caps) included in the kit are pre-cleaned.

3 Dry the Samples

Dry the samples using a centrifugal evaporator or a freeze drier. Samples should be as dry as possible to minimise peeling.

If freeze-drying, be careful to ensure that the sample dries to a small, compact mass at the very bottom of the vial. To do this, freeze dry from a small volume of relatively concentrated glycoprotein solution (typical conditions would be 0.5 mg of glycoprotein sample freeze dried from 200µl of a 2.5 mg/ml solution).

Do not subject samples to high temperatures (> 28 °C) or extremes of pH as these conditions can result in acid catalyzed loss of sialic acids (high temperatures, low pH) or uncontrolled glycan release (at high pH).

Release Reaction



4 Add Anhydrous Hydrazine

Using a clean, dry glass syringe with PTFE tipped plunger and teflon or stainless steel needle transfer 450 µl of hydrazine reagent (vial LL-HYDRAZINE-01) to each dried sample.

Cap the reaction vials and mix by vortexing.

N.B. This step must be performed in a dry, anaerobic environment - ideally a purpose-built glove box filled with a dry, inert gas (e.g. nitrogen or argon). Alternatively, you can use a dry nitrogen or argon blanket in a chemical fume hood. Contact us for advice.

Ensure that the reaction vial caps are tightly screwed on. For extra security you can seal the caps onto the vials using laboratory PTFE tape. Do not use other laboratory tapes (e.g. Parafilm) that react with hydrazine. Make sure to wind the tape in the same direction as the cap screws onto the vial.

5 Hydrazinolysis Incubation

Place the reaction vials in a heating block, sand tray, or dry oven and incubate according to the type of glycan release you require:

O-Mode Hydrazinolysis:	Incubate 6 hours at 60°C
N-Mode Hydrazinolysis (Fast):	Incubate 5 hours at 100°C
N-Mode Hydrazinolysis (Normal):	Incubate 16 hours at 85°C
N+O Mode Hydrazinolysis:	Incubate 16 hours at 60°C

The incubation must be performed in a dry environment. Use an oven or dry block - do not use a water

bath.

The samples must be completely dissolved in the hydrazine for efficient glycan release. To encourage complete dissolution the samples can be vortexed 15 and 30 minutes after the start of the incubation then the incubation continued.

The kinetics of glycan release depends on the type of sample and the glycans. The incubation regimes above give good release for most samples. However, in some cases it may be useful to perform a time-course to optimize the release conditions. When performing a time-course, there are two factors to consider; (a) the yield and (b) side reactions (particularly peeling). The shorter the incubation time, the lower the peeling and lower the yield. Increasing the incubation time increases yield but can result in higher levels of peeling.

The fast and normal N-modes should give equivalent results. Typically, you would choose the fast mode if you plan to work up the samples the same day and the normal mode so the incubation can be done overnight with sample workup the next morning

6 Cool the Samples

After the incubation period, remove the samples from the incubation apparatus and allow them to cool completely to room temperature.

Hydrazine Removal



7 Remove Unreacted Hydrazine

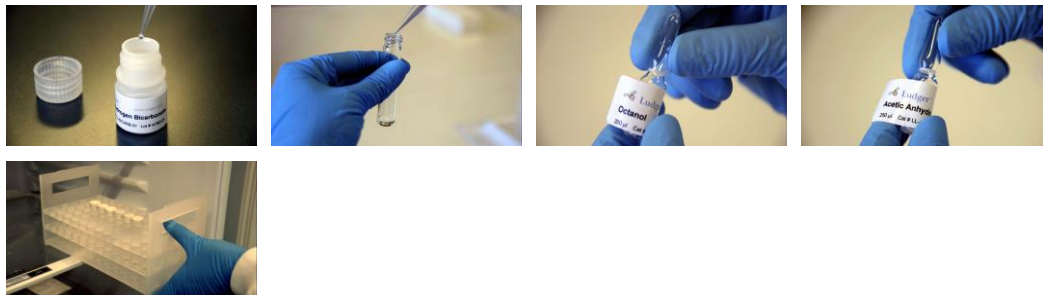
Remove unreacted hydrazine by evaporation in a centrifugal evaporator.

Use gentle heat (maximum 50°C) and a good vacuum. The sample should dry to a small spot at the bottom of the tube.

N.B. Make sure that your centrifugal evaporator is rated to handle hydrazine. Your evaporator should be serviced and clean with good seals. Use an efficient cold trap with temperature -40°C or lower between the evaporation chamber and the pump. Dispose of the cold trap waste according to hazardous waste regulations. Contact your local waste management service for advice.

Protocol Steps 8-N to 16-N: (For N-Glycan Release)

Acetylation (N-Glycans)



8-N Prepare Cold 1 M Sodium Bicarbonate Solution

Add 4 ml water to a vial of sodium hydrogen carbonate (bicarbonate - vial LL-BICARB-01) and mix carefully to dissolve all the salt. Cool by placing the vial on ice or in a refrigerator at 0-4 °C.

9-N Dissolve the Dry Sample in Cold Sodium Bicarbonate Solution

Add 450 µl of cold sodium bicarbonate solution to each dried sample and vortex to mix. Place on ice.

10-N Add Octanol

Add 5 µl of octanol (vial LL-OCTANOL-01) to each vial.

The octanol reduces the foaming and will form a small globule that floats on top of the sample solution

11-N Re-N-acetylation

Add 21 µl of acetic anhydride (vial LL-ACETANHYD-01) to each vial, cap and vortex to mix.

You may see small bubbles forming in the sample as the *N*-acetylation occurs. Incubate at 4°C for 1 hour with gentle shaking.

Use a shaker set up that keeps the tubes vertical - e.g. use a test tube rack on a lab 'belly dancer' in a fridge or cold room.

Alternatively, keep the samples in a fridge or on ice and shake gently every 15 minutes.

Acidification (N-Glycans)



12-N Add 5% TFA (aq)

Add 600 μ l of 5% trifluoroacetic acid (TFA) solution (vial LL-TFA-5PC-01) to each sample, cap the reaction tube, vortex to mix.

13-N Incubate for Acidification

Incubate at 4°C for 1 hour with gentle shaking.

Incubate with shaking as per step 11-N.

This step allows acid catalyzed conversion of the β -acetohydrazones to free unreduced glycans.

The reaction is performed at 4°C to minimize acid catalyzed desialylation.

Post-Release Sample Purification (N-Glycans)



14-N Prime the LudgerClean™ EB20 Cartridges

For each sample, prepare a LudgerClean™ EB20 cartridge (cat # LC-EB20-01) by:

- placing over a waste vial (cat # LL-WASTEV-01) and
- washing with 1 x 0.5 ml LC-EB Wash B (vial # LC-EB20-WASHB-01)
- washing with 1 x 1 ml LC-EB Wash A (vial # LC-EB20-WASHA-01)

If the flow is restricted, e.g. by an air gap, then apply a slight pressure to the top of the cartridge (e.g. using a pipette) in order to resume normal flow.

Allow each aliquot to flow through the resin bed before the next solution is applied.

15-N Apply the Sample and Wash with Wash A

- Apply each sample to a primed EB20 cartridge and allow it to flow through the resin bed slowly, under gravity.
- Wash with 0.7 ml water
- Wash with 0.7 ml LC-EB20 Wash A (vial # LC-EB20-WASHA-01)

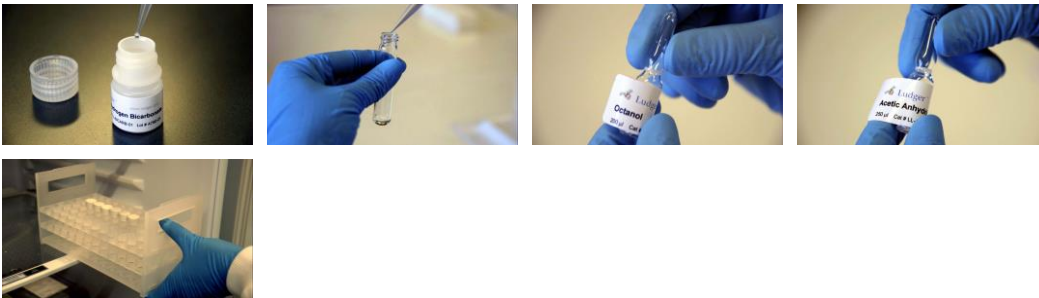
*Allow each aliquot to flow through the resin bed before the next solution is applied.
During this step the glycans bind to the resin and salts wash through the cartridge.*

16-N Elute Glycans into Collection Vial

- Place each cartridge over a collection vial (cat # LL-COLLV-01)
- Elute glycans with 4 x 0.2 ml LC-EB20 Wash B (vial # LC-EB20-WASHB-01) slowly, under gravity.

Protocol Steps 8-O to 13-O: (For O- and N+O-Glycan Release)

Acetylation (O-Glycans and N+O-Glycans)



8-O Prepare Cold 1 M Sodium Bicarbonate Solution

Add 4 ml water to a vial of sodium hydrogen carbonate (bicarbonate - vial LL-BICARB-01) and mix carefully to dissolve all the salt. Cool by placing the vial on ice or in a refrigerator at 0-4 °C.

9-O Dissolve the Dry Sample in Cold Sodium Bicarbonate Solution

Add 200 µl of cold sodium bicarbonate solution to each dried sample and vortex to mix. Place on ice.

10-O Add Octanol

Add 5 µl of octanol (vial LL-OCTANOL-01) to each vial.

The octanol reduces the foaming and will form a small globule that floats on top of the sample solution

11-O Re-N-acetylation

Add 21 μ l of acetic anhydride (vial LL-ACETANHYD-01) to each vial, cap and vortex to mix. Leave on ice for 10 min, then add a further 21 μ l of acetic anhydride (vial LL-ACETANHYD-01) to each vial, cap and vortex to mix. Take off the ice and incubate at room temperature for a further 50 min.

You should see phase-separation between the acetic anhydride and aqueous phases. This helps reduce peeling of O-glycans.

Acidification and Glycan Purification (O-Glycans and N+O-Glycans)



The acidification and post-release sample purification of either O-glycans or N+O-glycans are performed in a single step utilizing the LudgerClean CEX Cartridges

12-O Prime the LudgerClean™ CEX Cartridges

For each sample, prepare a LudgerClean™ CEX cartridge (cat # LC-CEX-H-01) by washing with 10 x 1 ml water

If the flow is restricted, e.g. by an air gap, then apply a slight pressure to the top of the cartridge (e.g. using a pipette) in order to resume normal flow.

Do not allow the resin to dry out.

Allow each aliquot to flow through the resin bed before the next solution is applied.

13-O Apply the Sample and Elute Glycans

- Place the cartridges over a collection vial (cat # LL-COLLV-01)
- Apply each sample to a prepared LudgerClean™ CEX cartridge (cat # LC-CEX-H-01) and allow the solution to flow through the resin bed slowly under gravity.
- Wash out each vial with 200 μ l water and add to the top of each column.
- Further elute with 3 x 0.5 ml water.

The eluted fluid will contain the purified, released glycans.

If the flow through the column is restricted, e.g. by an air gap, then apply a slight pressure to the top of the cartridge (e.g. using a pipette) in order to resume normal flow.

Proceed to Step 17

Protocol Steps 17 to 18: (For All Glycan Types)

Sample Storage

17 Dry the Glycan Solutions

If required, the samples should be dried by centrifugal evaporation

Keep the sample temperature <28 °C to minimize desialylation.

This step is optional and can be omitted if you are analyzing aliquots by any method that first involves drying (e.g. addition to a MALDI-MS plate or fluorescence labeling).

Note that at the stage the N-glycans will be in a water-acetonitrile-TFA mixture having been eluted from the EB20 cartridge and O- or N+O-glycans will be in slightly acidic water after elution from the CEX cartridge.

18 Store the Glycans Frozen

For long-term storage, store the glycans at -20°C or lower temperature.

The released glycans can be stored frozen either dried or after reconstitution with water.

Analysis of Released Glycans

The released glycans can be analyzed by a variety of techniques including the following:

- Fluorescence labeling with LudgerTag™ fluorophores followed by HPLC, CE or MS
The following table lists the current LudgerTag™ fluorophores and rates them according to the suitability for various analysis methods.

Fluorophore	HPLC	MS	CE
2-AB (2-aminobenzamide)	* * * * *	* * *	
2-AA (2-aminobenzoic acid)	* * * * *	* * * * *	* *
AA-Ac (3-(Acetylamino)-6-aminoacridine)	* * * * *	* * * * *	* * * * *
APTS (1-aminopyrene-3,6,8-trisulfonate)			* * * * *
2-AP (2-aminopyridine)	* * *	* * * * *	

Key:

5 stars = excellent, 4 stars = good, 3 stars = fair, 1 - 2 stars = poor, no stars = not applicable

- Mass spectrometry
- HPAE-PAD (high pH anion exchange chromatography with pulsed amperometric detection)

Warranties and Liabilities

Ludger warrants that the above product conforms to the attached analytical documents. Should the product fail for reasons other than through misuse Ludger will, at its option, replace free of charge or refund the purchase price. This warranty is exclusive and Ludger makes no other warrants, expressed or implied, including any implied conditions or warranties of merchantability or fitness for any particular purpose. Ludger shall not be liable for any incidental, consequential or contingent damages.

This product is intended for *in vitro* research only.

Document Revision Number

Document # LL-HYDRAZ-A2-Guide-v5.0

Appendix 1: Troubleshooting Guide

The hydrazinolysis protocol is an efficient, robust method. If problems do arise they can normally be corrected without difficulty. The following is a guide to the most likely problems, possible causes, and solutions.

Low Yield

The temperature for hydrazinolysis incubation was incorrect.

Please ensure that the oven or heating block is equilibrated to the incubation temperature and that the reaction tube is subjected to this temperature for the entire release period.

The sample was incompletely solubilized.

The glycoconjugate sample must be completely dissolved in the hydrazine reagent for maximum release efficiency. Please ensure that the sample is thoroughly mixed with the hydrazine reagent prior to the incubation and, as a precaution, re-mix the samples 15 and 30 minutes after the start of the incubation.

The sample contained contaminants that interfered with the release

Ensure that all samples are adequately purified before hydrazinolysis (see protocol step 1).

There was less starting glycoprotein or glycopeptide than was originally estimated.

The glycans were lost during the sample workup

Please ensure that the acidification and glycan purification steps are performed as in the protocol.

Peeling of Glycans

The peeling reaction is degradation of the released glycans characterized by loss of monosaccharide residues from the reducing terminus. O-glycans are generally more susceptible to peeling than N-glycans.

The hydrazinolysis reaction was contaminated with moisture

The incubation of your glycoprotein sample with hydrazine must be done in strictly anhydrous conditions.

- Make sure your sample is completely dry before hydrazinolysis
- Take care to conduct the hydrazine transfer in a dry atmosphere
- Use an absolutely dry transfer syringe.
- Use a dry oven or dry heating block for the incubation.

The hydrazinolysis mode did not match the type of glycans

O-glycans will peel, degrade and be lost under N-mode hydrazinolysis conditions.

N-glycans will not be removed efficiently under O-mode hydrazinolysis conditions

The hydrazinolysis temperature-time profile was too harsh for the glycans

Use the temperature-time profiles given in this protocol as a starting point. If you see peeling that is not related to moisture contamination then for subsequent experiments reduce the temperature or time for the hydrazine incubation.

Desialylation of the Glycans

The sample was subjected to acidic conditions in aqueous solutions at elevated temperatures

Avoid prolonged periods of exposure of sialylated glycan or glycoprotein samples in aqueous solutions at low pH and elevated temperatures.

In general, try to keep samples in solutions in the pH range 5 – 8.5 and avoid exposure to temperatures above 28 °C. Samples in pH buffered aqueous solutions (with pH between 5 and 8.5) tend to be resistant to acid catalyzed de-sialylation even at temperatures higher than 28 °C. However, even then it is wise to err on the side of caution and keep the samples cool whenever possible.

Contamination with Non-Sample Related Sugars

The sample has been contaminated with environmental sugars

Ensure that all possible sources of sugar contamination are eliminated or contained.

Common sources of contamination include the following:

- Powdered laboratory gloves – the powder often contains starch so use powder-free gloves in glycan analysis labs
- Sugars from food contamination on clothing, hair and skin. Avoid handling sugary foods (e.g. doughnuts) and wash your hands thoroughly before performing glycan analyses (glycoprofiling can help promote a clean and healthy way of living).

Cannot Assign Peaks on Samples Analyzed by HPLC, MS or CE

Use glycoprotein and glycan standards appropriate for your project

Select reference glycoprotein standards to use as positive controls for hydrazinolysis and use relevant glycan standards in subsequent analyses. Ludger is developing a range of matched glycoprotein and released glycans as certified reference standards for use in glycoprofiling studies. Please contact us for advice on what standards to use for your particular application.

Appendix 2: Material Safety Data Sheets

The advice offered in the following material safety data sheets (MSDS's) is derived from the currently available information on the hazardous materials in this product or component. Consideration has been made regarding the quantities offered in the pre-dispensed container. The advice offered is, therefore, not all inclusive nor should it be taken as descriptive of the compound generally.

The following notes apply to all materials listed in the following MSDS's:

Transport information

Contact Ludger for transportation information.

Abbreviations

GLP Good Laboratory Practice

SAFETY DATA SHEET

Version: 1.1

 Date written: 27th March 2014

Date reviewed: 03 Mar 2021

SECTION 1. IDENTIFICATION OF THE SUBSTANCE/PREPARATION AND OF THE COMPANY / UNDERTAKING

Product Name	Hydrazine
Product Catalogue Name	LL-HYDRAZINE-01
CAS-No.	302-01-2
Company:	Ludger Ltd Culham Science Centre Abingdon Oxfordshire OX14 3EB
Telephone:	01865 408554
Emergency Telephone:	01865 408554
Email:	info@ludger.com

SECTION 2. HAZARDS IDENTIFICATION

2.1 Classification of the substance or mixture

Classification according to Regulation (EC) No 1272/2008 [EU-GHS/CLP]

Flammable liquids (Category 3), H226
 Carcinogenicity (Category 1B), H350
 Acute toxicity, Inhalation (Category 2), H330
 Acute toxicity, Dermal (Category 3), H311
 Acute toxicity, Oral (Category 3), H301
 Skin corrosion (Category 1B), H314
 Skin sensitization (Category 1), H317
 Serious eye damage (Category 1), H318
 Acute aquatic toxicity (Category 1), H400
 Chronic aquatic toxicity (Category 1), H410

Classification according to EU Directives 67/548/EEC or 1999/45/EC

Flammable. May cause cancer. Toxic by inhalation, in contact with skin and if swallowed. Causes burns. May cause sensitization by skin contact. Very toxic to aquatic organisms.

2.2 Label elements



Signal Word: Danger

Hazard Statement(s)

H226	Flammable liquid and vapour.
H301	Toxic if swallowed.
H311	Toxic in contact with skin.
H314	Causes severe burns and eye damage.
H317	May cause an allergic skin reaction.
H330	Fatal if inhaled.

H350 May cause cancer.
 H410 Very toxic to aquatic life with long lasting effects.

Precautionary Statement(s)

P201 Obtain special instructions before use.
 P210 Keep away from heat, hot surfaces, sparks, open flames and other ignition sources. No smoking.
 P261 Avoid breathing vapours.
 P273 Avoid release to the environment.
 P280 Wear protective gloves/ protective clothing/ eye protection/ face protection.
 P303 + P361 + P353 IF ON SKIN (or hair): Take off immediately all contaminated clothing. Rinse skin with water.
 P304 + P340 + P310 IF INHALED: Remove person to fresh air and keep comfortable for breathing. Immediately call a POISON CENTER/ doctor.
 P305 + P351 + P338 IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing.

2.3 Other hazard information:

This substance/mixture contains no components considered to be either persistent, bioaccumulative and toxic (PBT), or very persistent and very bioaccumulative (vPvB) at levels of 0.1% or higher.

SECTION 3. COMPOSITION/INFORMATION ON INGREDIENTS

3.1 Substances

Synonyms: None
 Formula: H_4N_2
 Molecular weight: 32.05 g/mol

Component	Classification	Concentration
Name Hydrazine	Flam. Liq. 3; Acute Tox. 3; Acute Tox. 2;	< = 100%
CAS-No. 302-01-2	Acute Tox. 3; Skin Corr. 1B; Eye Dam. 1;	
EC-No. 206-114-9	Skin Sens. 1; Carc. 1B; Aquatic Acute 1;	
Index-No. 007-008-00-3	Aquatic Chronic 1;	
This chemical is included in the Candidate List of Substances of Very High Concern (SVHC) according to Regulation (EC) No. 1907/ 2006 (REACH).	H226, H301, H330, H311, H314, H318, H317, H350, H400, H410	

SECTION 4. FIRST AID MEASURES

4.1 Description of first aid measures

General Advice

Consult a physician if exposure causes ill effects and if in any doubt. First aider needs to protect himself. Show this safety data sheet to the physician/ first responder in attendance.

If Ingested

If swallowed: give water to drink (two glasses at most). Seek medical advice immediately. In exceptional cases only, if medical care is not available within one hour, induce vomiting (only in persons who are wide awake and fully conscious), administer activated charcoal (20 - 40 g in a 10% slurry) and consult a doctor as quickly as possible. Do not attempt to neutralise.

If skin is exposed

Remove contaminated clothing and shoes immediately. Wash the affected area well with plenty of soap and water. Immediately consult medical advice.

If eyes are exposed

Rinse thoroughly with plenty of water/ eye wash solution for at least 15 minutes, if safe and practical to do so, remove contact lenses and continue rinsing. Immediately consult medical advice.

If inhaled

Move the effected person to a source of fresh air. If not breathing, give artificial respiration. Immediately consult medical advice.

4.2 Most important symptoms and effects, both acute and delayed

Spasm, inflammation and edema of the larynx, spasm, inflammation and edema of the bronchi, pneumonitis, pulmonary edema, burning sensation, coughing, wheezing, laryngitis, shortness of breath, headache, nausea, vomiting.

4.3 Indication of immediate medical attention and special treatment needed

No data available.

SECTION 5. FIRE-FIGHTING MEASURES**5.1 Extinguishing media**

Select extinguishing media appropriate to the surrounding area. Compatible media for extinguishing fire are water spray, alcohol-resistant foam, dry chemical or carbon dioxide. For this substance/mixture no limitations of extinguishing agents are given.

5.2 Special hazards arising from the substance or mixture

Nitrogen oxides (NO_x).

Combustible.

Vapors are heavier than air and may spread along floors.

Forms explosive mixtures with air at elevated temperatures.

Development of hazardous combustion gases or vapours possible in the event of fire.

5.3 Advice for firefighters

Product is highly flammable, potentially explosive when under fire conditions. Wear self-contained breathing equipment. Use water spray to cool any unopened containers near the fire/source.

5.4 Further information

Remove container from danger zone and cool with water. Suppress (knock down) gases/vapors/mists with a water spray jet. Prevent fire extinguishing water from contaminating surface water or the ground water system.

SECTION 6. ACCIDENTAL RELEASE MEASURES**6.1 Personal precautions, protective equipment and emergency procedures**

Advice for non-emergency personnel: Do not breathe vapors, aerosols. Avoid substance contact. Ensure adequate ventilation. Keep away from heat and sources of ignition. Evacuate the danger area, observe emergency procedures, and consult an expert.

6.2 Environmental Precautions

Prevent any further leakage or spillage, if safe to do so. Do not let the product enter the drainage system, as discharge into the environment must be avoided due to the potential environmental damage. Risk of explosion.

6.3 Methods and material for containment and cleaning up

Cover drains. Collect, bind, and pump off spills. Observe possible material restrictions. Take up carefully with liquid-absorbent material (e.g. Chemisorb®). Dispose of properly. Clean up affected area.

6.4 Reference to other sections

For more information on disposal of this product see section 13.

SECTION 7. HANDLING AND STORAGE

7.1 Precautions for safe handling

Advice on safe handling

Work under hood. Do not inhale substance/mixture. Avoid generation of vapours/aerosols.

Advice on protection against fire and explosion

Keep away from open flames, hot surfaces and sources of ignition. Take precautionary measures against static discharge.

Hygiene measures

Immediately change contaminated clothing. Apply preventive skin protection. Wash hands and face after working with substance.

7.2 Conditions for safe storage, including any incompatibilities

Store in a secure, cool, dry and well ventilated cabinet. Opened containers must be re-sealed securely and kept upright to prevent leakage. If available, store within nitrogen filled glove box. Do not store in direct sunlight. Keep locked up or in an area accessible only to qualified or authorized persons.

7.3 Specific end uses

No data available.

SECTION 8. EXPOSURE CONTROLS/PERSONAL PROTECTION

8.1 Control parameters Components with workplace control parameters

Component	CAS-No.	Value	Control parameters	Basis
Hydrazine	302-01-2	STEL	0.1 ppm 0.13 mg/m ³	UK. EH40 WEL- Workplace Exposure Limits.
	Remarks	Can be absorbed through the skin. The assigned substances are those for which there are concerns that dermal absorption will lead to systemic toxicity. Capable of causing cancer and/or heritable genetic damage		
		TWA	0.02 ppm 0.03 mg/m ³	UK. EH40 WEL- Workplace Exposure Limits.
	Remarks	Can be absorbed through the skin. The assigned substances are those for which there are concerns that dermal absorption will lead to systemic toxicity. Capable of causing cancer and/or heritable genetic damage		
		TWA	0.01 ppm 0.013 mg/m ³	Europe. Directive 2004/37/EC on the protection of workers from the risks related to exposure to carcinogens or mutagens at work
		Skin Carcinogens or mutagens		

8.2 Exposure controls

Appropriate engineering controls

Wear PPE, wash hands before after handling the product, and avoid contact with skin. If available handle within a nitrogen filled glove box.

Personal Protective Equipment

Eye / face protection

Wear Safety goggles/glasses with side-shields. These must conform to government standards such as NIOSH (US) or EN166 (EU).

Skin protection

This recommendation applies only to the product stated in the safety data sheet, supplied by us and for the designated use. When dissolving in or mixing with other substances and under conditions deviating from those stated in EN374 please contact the supplier of CE-approved gloves.

Full contact

Material: butyl-rubber

Minimum layer thickness: 0.7 mm

Break through time: 480 min

Material tested: Butoject® (KCL 898)

This recommendation applies only to the product stated in the safety data sheet, supplied by us and for the designated use. When dissolving in or mixing with other substances and under conditions deviating from those stated in EN374 please contact the supplier of CE-approved gloves.

Splash contact

Material: Nitrile rubber

Minimum layer thickness: 0.4 mm

Break through time: 240 min

Material tested: Camatril® (KCL 730 / Aldrich Z677442, Size M)

Body Protection

Flame retardant antistatic protective clothing.

Respiratory protection

Required when vapours/aerosols are generated.

Our recommendations on filtering respiratory protection are based on the following standards: DIN EN 143, DIN 14387 and other accompanying standards relating to the used respiratory protection system.

Recommended Filter type: Filter type ABEK

The entrepreneur has to ensure that maintenance, cleaning and testing of respiratory protective devices are carried out according to the instructions of the producer.

These measures have to be properly documented.

Control of environmental exposure

Do not let product enter drains. Risk of explosion.

SECTION 9. PHYSICAL AND CHEMICAL PROPERTIES

9.1 Information on basic physical and chemical properties

Appearance	Form: oily
	Colour: Colourless
Odour	Strong – Ammonia like
Odour threshold	No data available
pH	No data available
Freezing/Melting Point	2 °C
Initial boiling point and boiling range	113.5 °C at 1,013 hPa
Flash Point	38 °C – closed cup
Evaporation rate	No data available
Flammability	High
Upper/lower flammability or explosive limits	Upper explosion limit: 99.99 %(V) Lower explosion limit: 4.7 %(V)
Vapour Pressure	19.2 hPa at 25.0 °C

Vapour density	1.11 – (Air = 1.0)
Relative Density	1 g/cm ³ at 25 °C
Solubility in water	completely miscible
Partition coefficient	log Pow: -0.16 at 25 °C - Bioaccumulation is not expected
Autoignition temperature	24°C at 1,013 hPa
Decomposition temperature	No data available
Viscosity	Viscosity, kinematic: No data available
Viscosity, dynamic: 0.91 mPa.s at 25 °C	
Explosive properties	No data available
Oxidising properties	No data available

9.2 Other information

Dissociation constant	6.05 at 25 °C
Relative vapor density	1.11 - (Air = 1.0)

SECTION 10. STABILITY AND REACTIVITY

10.1 Reactivity

Vapor/air-mixtures are explosive at intense warming.

10.2 Chemical stability

The product is chemically stable under standard ambient conditions (room temperature).

10.3 Possibility of hazardous reactions

Risk of explosion with:

alkali compounds
 perchlorates
 barium oxide
 nitrites
 Calcium
 amides
 Calcium oxide
 chromates/perchromates
 chromium(VI) oxide
 Fluorine
 Salts of hydrazine
 azides
 Potassium
 potassium dichromate
 potassium permanganate
 copper compounds
 nitrates
 Raney-nickel
 metal catalysts
 sodium
 Organic Substances
 mercury compounds
 mercury(II) nitrate
 mercury oxide
 Nitric acid
 Mild steel
 nitrogen oxides
 Tetryl (N-Methyl-N-2,4,6-tetranitroaniline)
 hydrogen peroxide
 zinc diethyl
 tin (II) chloride

halogen oxides
Wood/Sawdust
metallic oxides
Steam
organic nitro compounds
metallic salts
Sulfides
phosphorus halides
silver compounds
Oxygen
liquid
silver
with
Catalyst
Nitromethane
with
Methanol
Ammonia
with
Alkali metals
Sodium hydroxide
with
Air
Methanol
with
Nitromethane
absorbents, filter materials, wiping cloths and protective clothing
with
Heavy metals
Risk of ignition or formation of inflammable gases or vapours with:
Chlorine
nitrogen dioxide
Rust
Air
Oxidizing agents
Exothermic reaction with:
chlorates
halogens
Acids
metals
metallic chlorides
Oxygen
Phosgene

10.4 Conditions to Avoid

Sources of ignition, high temperatures, above 150 °C, Moisture.

10.5 Incompatible materials

Oxidizing agents, Oxygen, Iron, Mild steel, Copper, Nickel, Lead, silver, metal alloys, glass, rubber

10.6 Hazardous decomposition products

No data available.

SECTION 11. TOXICOLOGICAL INFORMATION

11.1 Information on toxicological effects

Acute toxicity

LD50 Oral - Rat - male - 262 mg/kg

(OECD Test Guideline 401)

LC50 Inhalation - Rat - male - 4 h - 0.76 mg/l

Remarks: (ECHA)

Acute toxicity estimate Dermal - Not tested on animals - 300.1 mg/kg

Remarks: Expert judgment

Skin corrosion/irritation

Skin - Rabbit

Result: Corrosive - 4 h

(OECD Test Guideline 404)

Remarks: (55% solution)

(Regulation (EC) No 1272/2008, Annex VI)

Serious eye damage/irritation

Causes serious eye damage.

Respiratory or skin sensitisation

(Regulation (EC) No 1272/2008, Annex VI)

Germ cell mutagenicity

No data available

Carcinogenicity

This is or contains a component that has been reported to be carcinogenic based on its IARC, OSHA, ACGIH, NTP or EPA classification.

Possible human carcinogen.

IARC: 2B – Group 2B: Possible carcinogenic to humans (Hydrazine).

Reproductive toxicity

No data available

STOT-single exposure

No data available

STOT-repeated exposure

No data available

Aspiration hazard.

No data available

Potential Health Hazards**Inhalation** May be fatal if inhaled. Material is extremely destructive to the tissue of the mucous membranes and upper respiratory tract.**Ingestion** Toxic if swallowed. Causes burns.**Skin** May be fatal if absorbed through skin. Causes skin burns.**Eyes** Causes eye burns.**Signs and symptoms of exposure**

Spasm, inflammation and edema of the larynx, spasm, inflammation and edema of the bronchi, pneumonitis, pulmonary edema, burning sensation, coughing, wheezing, laryngitis, shortness of breath, headache, nausea, vomiting.

Additional Information

RTECS: MU7175000

spasm, inflammation and edema of the larynx, 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

Toxicity to fish static test LC50 - *Poecilia reticulata* (guppy) - 0.61 mg/l - 96 h Remarks: (ECHA)

Toxicity to daphnia and semi-static test EC50 - *Daphnia pulex* (Water flea) - 0.16 mg/l - 48 h

Other aquatic invertebrates (US-EPA)

Remarks: (in analogy to similar products)

Toxicity to algae static test ErC50 - *Desmodesmus subspicatus* (green algae) - 0.017 mg/l - 48 h

(Regulation (EC) No. 440/2008, Annex, C.3)

Toxicity to bacteria static test EC50 - activated sludge - 5.5 mg/l - 3 h

(OECD Test Guideline 209)

12.2 Persistence and degradability

Biodegradability Biotic/Aerobic – Exposure time 20d

Result: 28% - Not readily biodegradable.

12.3 Bioaccumulative potential

No data available

12.4. Mobility in soil

No data available

12.5. Results of PBT and vPvB assessment

This substance/mixture contains no components considered to be either persistent, bioaccumulative and toxic (PBT), or very persistent and very bioaccumulative (vPvB) at levels of 0.1% or higher.

12.6. Other adverse effects

Very toxic to aquatic life with long lasting effects.

SECTION 13. DISPOSAL CONSIDERATIONS

13.1 Waste treatment methods

Product

Waste material must be disposed of in accordance with the national and local No mixing with other waste. Handle uncleaned containers like the product See www.retrologistik.com for processes regarding the return of chemicals and containers, or contact us there if you have further questions. Notice Directive on waste 2008/98/EC.

Contaminated packaging

Dispose as chemical contaminated solid waste.

SECTION 14. TRANSPORT INFORMATION

14.1 UN Number

ADR/RID: 2029

IMDG: 2029

IATA: 2029

14.2 UN Proper Shipping Name

ADR/RID: HYDRAZINE, ANHYDROUS

IMDG: HYDRAZINE, ANHYDROUS

IATA: Hydrazine, anhydrous

Passenger aircraft: Not permitted for transport.

Special Provisions: "Keep away from heat" label required.

14.3 Transport hazard class(es)

ADR/RID: 8 (3, 6.1) IMDG: 8 (3, 6.1) IATA: 8 (3)(6.1)

14.4 Packing group

ADR/RID: I IMDG: I IATA: I

14.5 Environmental hazards

ADR/RID: yes IMDG Marine pollutant: yes IATA: no

14.6 Special precautions for user

No data available

SECTION 15. REGULATORY INFORMATION

This safety data sheet complies with the requirements of Regulation (EC) No. 1907/2006.

15.1 Safety, health and environmental regulations/legislation specific for the substance or mixture**Authorisations and/or restrictions on use**

REACH - Candidate List of Substances of Very High Concern for Authorisation (Article 59). : Hydrazine

REACH - Restrictions on the manufacture, placing on the market and use of certain dangerous substances, preparations and articles (Annex XVII) :

REACH - Restrictions on the manufacture, placing on the market and use of certain dangerous substances, preparations and articles (Annex XVII) :

REACH - Restrictions on the manufacture, placing on the market and use of certain dangerous substances, preparations and articles (Annex XVII) : Hydrazine

National legislation

Seveso III: Directive 2012/18/EU of the European Parliament and of the Council on the control of major-accident hazards involving dangerous substances.

H2 ACUTE TOXIC
E1 ENVIRONMENTAL HAZARDS
33 Carcinogenic substances
P5c FLAMMABLE LIQUIDS

Other regulations

Observe work restrictions regarding maternity protection in accordance to Dir 92/85/EEC or stricter national regulations where applicable.

Take note of Dir 94/33/EC on the protection of young people at work.

15.2 Chemical Safety Assessment

No data available

Please note that the label elements that used to go in Section 15 are now in Section 2.

SECTION 16. OTHER INFORMATION

The advice offered is derived from the current available information on the hazardous materials in this product and its component(s). Consideration has been made regarding the quantities offered in the pre-dispensed container. The advice offered is, therefore, not all-inclusive nor should it be taken as the descriptive of the compound generally.

SAFETY DATA SHEET

Version: 1.1

 Date written: 25th April 2012

 Date reviewed: 8th Feb 2021

SECTION 1. IDENTIFICATION OF THE SUBSTANCE/PREPARATION AND OF THE COMPANY

/ UNDERTAKING

Product Name **Sodium Bicarbonate**
Product Catalogue Name **LL-BICARB-01**
CAS-No. **144-55-8**
Company: Ludger Ltd
 Culham Science Centre
 Abingdon
 Oxfordshire
 OX14 3EB
Telephone: 01865 408554
Emergency Telephone: 01865 408554
Email: info@ludger.com

SECTION 2. HAZARDS IDENTIFICATION

2.1 Classification of the substance or mixture according to Regulation (EC) No 1272/2008 [EU-GHS/CLP]

Not a hazardous substance according to Regulation (EC) No. 1272/2008

2.2 Label elements

The substance does not require any labelling in accordance with EC directives or respective national laws.

Signal Word: None required

Hazard Statement(s)

None required

Precautionary Statement(s)

None required

2.3 Other hazard information:

This substance/mixture contains no components considered to be either persistent, bioaccumulative and toxic (PBT), or very persistent and very bioaccumulative (vPvB) at levels of 0.1% or higher.

SECTION 3. COMPOSITION/INFORMATION ON INGREDIENTS

3.1 Substances

Synonyms: Sodium hydrogen carbonate
Formula: CHNaO₃
Molecular weight: 84.01 g/mol

Component		Concentration
Name	Sodium Bicarbonate	-
CAS-No.	144-5-8	
EC-No.	205-633-8	

SECTION 4. FIRST AID MEASURES

4.1 Description of first aid measures

General Advice

Consult a physician if exposure causes ill effects and if in any doubt. Show this safety data sheet to the physician/ first responder in attendance.

If Ingested

Rinse mouth well with water.

If skin is exposed

Wash the exposed area(s) well with plenty of soap and water.

If eyes are exposed

Flush eyes with water as a precaution.

If inhaled

Remove effected person(s) to a source of fresh air. If person is not breathing give artificial respiration.

4.2 Most important symptoms and effects, both acute and delayed

The most important known symptoms and effects are described in the labelling (see section 2.2) and/or in section 11.

4.3 Indication of immediate medical attention and special treatment needed

No data available

SECTION 5. FIRE-FIGHTING MEASURES

5.1 Extinguishing media

Water spray, dry chemical, carbon dioxide or foam, are appropriate media for extinguishing fire. Choose the most appropriate for the surrounding fire and materials.

5.2 Special hazards arising from the substance or mixture

Carbon oxides, Sodium oxides

5.3 Advice for fire-fighters

Fire fighters to wear self-contained breathing apparatus, if deemed necessary. The product itself does not burn.

SECTION 6. ACCIDENTAL RELEASE MEASURES

6.1 Personal precautions, protective equipment and emergency procedures

Avoid dust formation. Avoid breathing vapours, mist or gas. Wear laboratory gloves and protective clothing, such as a laboratory coat.

6.4 Environmental Precautions

No special environmental precautions required.

6.5 Methods and material for containment and cleaning up

Collect the spillage by sweeping with a damp brush / paper towel or cloth to minimise the creation of dust. Collect and store the spillage/waste material in an appropriately labelled container, arrange collection for disposal. Wash spillage area with water.

6.4 Reference to other sections

More information on disposal of the product is in Section 13.

SECTION 7. HANDLING AND STORAGE

7.1 Precautions for safe handling

Avoid contact with skin, inhalation of dust, mists and/or vapours associated with the material. Work with the material in a fume hood. Wear laboratory gloves, coat and glasses, in accordance with good laboratory practice and wash hands before and after handling the material.

7.2 Conditions for safe storage, including any incompatibilities

Store in a dry, cool and well ventilated place. The material is to be stored in original packaging or similar tightly closing packaging.

7.3 Specific end uses

No data available

SECTION 8. EXPOSURE CONTROLS/PERSONAL PROTECTION

8.1 Control parameters

This product has no substances with occupational exposure limits values.

8.3 Exposure controls

Appropriate engineering controls

User to wear personal protective equipment e.g. Laboratory gloves, glasses and coats. Wash hands and avoid contact with skin.

Personal Protective Equipment

Eye / face protection

Use Safety glasses or goggles, which have been tested and approved under appropriate government standards, such as NIOSH (US) or EN 166 (EU).

Skin protection

Handle with gloves. Wearer should check for holes/tears before use. Proper glove removal technique should be used, to avoid potential contact with skin. Gloves must satisfy the specifications of Regulation (EU)

2016/425 and the standard EN 374 derived from it. Wash and dry hands after handling the material.

Full contact

Material: Nitrile rubber

Minimum layer thickness: 0.11 mm

Break through time: 480 min

Material tested: Dermatrill® (KCL 740 / Aldrich Z677272, Size M)

Splash contact

Material: Nitrile rubber

Minimum layer thickness: 0.11 mm

Break through time: 480 min

Material tested: Dermatrill® (KCL 740 / Aldrich Z677272, Size M)

data source: KCL GmbH, D-36124 Eichenzell, phone +49 (0)6659 87300, e-mail sales@kcl.de, test method: EN374

If used in solution, or mixed with other substances, and under conditions which differ from EN 374, contact the supplier of the CE approved gloves. This recommendation is advisory only and must be evaluated by an industrial hygienist and safety officer familiar with the specific situation of anticipated use by our customers. It should not be construed as offering an approval for any specific use scenario.

Body Protection

Wear laboratory coat or similar coverings.

Respiratory protection

Respiratory protection is not required. Where protection from nuisance levels of dusts are desired, use type N95 (US) or type P1 (EN 143) dust masks. Use respirators and components tested and approved under appropriate government standards such as NIOSH (US) or CEN (EU).

Thermal hazards

No data available

SECTION 9. PHYSICAL AND CHEMICAL PROPERTIES

9.1 Information on basic physical and chemical properties

Appearance	Form: White powder
Odour	None
Odour threshold	No data available
pH	No data available
Freezing/Melting Point	300°C
Initial boiling point and boiling range	No data available
Flash Point	No data available
Evaporation rate	No data available
Flammability	No data available
Upper/lower flammability or explosive limits	No data available
Vapour Pressure	No data available
Relative Density	2.160 g/cm ³
Solubility in water and solvents	50 g/l
Partition coefficient	No data available
Autoignition temperature	No data available
Decomposition temperature	No data available
Viscosity	No data available
Explosive properties	No data available
Oxidising properties	No data available

9.2 Other information

No data available

SECTION 10. STABILITY AND REACTIVITY

10.1 Reactivity

No data available

10.2 Chemical stability

Stable under recommended storage conditions.

10.3 Possibility of hazardous reactions

No data available

10.4 Conditions to Avoid

Exposure to moisture.

10.5 Incompatible materials

Strong acids, Strong oxidizing agents.

10.6 Hazardous decomposition products

Hazardous decomposition products formed under fire conditions. - Carbon oxides, Sodium oxides.
Other decomposition products - No data available.

SECTION 11. TOXICOLOGICAL INFORMATION

11.1 Information on toxicological effects

Acute toxicity

LD50 Oral – Rat – 4,220 mg/kg

Skin corrosion/irritation

Skin – Human – Mils skin irritation – 3 d

Serious eye damage/irritation

Eyes – Rabbit – Mild eye irritation – 30 s

Respiratory or skin sensitisation

No data available

Germ cell mutagenicity

No data available

Carcinogenicity

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

Reproductive toxicity

No data available

STOT-single exposure

No data available

STOT-repeated exposure

No data available

Aspiration hazard.

No data available

Potential Health Hazards**Inhalation** May be harmful if inhaled. May cause respiratory tract irritation.**Ingestion** May be harmful if swallowed.**Skin** May be harmful if absorbed through skin. May cause skin irritation.**Eyes** May cause eye irritation.**Signs and symptoms of exposure**

Exposure to large amounts can cause: Gastrointestinal disturbance, Heavy or prolonged skin exposure may result in the absorption of harmful amounts of this material.

SECTION 12. ECOLOGICAL INFORMATION**12.1 Toxicity**

No data available

12.2 Persistence and degradability

No data available

12.3 Bioaccumulative potential

No data available

12.4. Mobility in soil

No data available

12.5. Results of PBT and vPvB assessment

This substance/mixture contains no components considered to be either persistent, bioaccumulative and toxic (PBT), or very persistent and very bioaccumulative (vPvB) at levels of 0.1% or higher.

12.6. Other adverse effects

SAFETY DATA SHEET

Version: 1.0

 Date written: 7th March 2012

Date reviewed: 03 March 2017

SECTION 1. IDENTIFICATION OF THE SUBSTANCE/PREPARATION AND OF THE COMPANY

/ UNDERTAKING

Product Name	Octanol
Product Catalogue Name	LL-OCTANOL-01
CAS-No.	111-87-5
Company:	Ludger Ltd Culham Science Centre Abingdon Oxfordshire OX14 3EB
Telephone:	01865 408554
Emergency Telephone:	01865 408554
Email:	info@ludger.com

SECTION 2. HAZARDS IDENTIFICATION

2.1 Classification of the substance or mixture

Classification according to Regulation (EC) No. 1272/2008 [EU-GHS/CLP]

Skin irritation (Category 2)

Eye irritation (Category 2)

2.2 Label elements



Signal Word: Warning

Hazard Statement(s)

H315	Causes skin irritation.
H319	Causes serious eye irritation.

Precautionary Statement(s)

P305+P351+P338	IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do so. Continue rinsing.
----------------	-------------------------------------------------------------------------------------------------------------------------------------

2.3 Other hazard information:

None

SECTION 3. COMPOSITION/INFORMATION ON INGREDIENTS

3.1 Substances

Synonyms:	Octan-1-ol
Formula:	C ₈ H ₁₈ O
Molecular weight:	130.23 g/mol

Component	Concentration
Name Octanol	-

CAS-No.	111-87-5	
EC-No.	203-917-6	

SECTION 4. FIRST AID MEASURES

4.1 Description of first aid measures

General Advice

Consult a physician if exposure causes ill effects and if in any doubt. Show this safety data sheet to the physician/ first responder in attendance.

If Ingested

Do NOT induce vomiting. Rinse mouth well with water; do not give anything by mouth if person is unconscious.

If skin is exposed

Remove any clothing that has come into contact with the product. Wash area well with plenty of soap and water.

If eyes are exposed

Rinse thoroughly with water or eye wash solution for at least 15 minutes. If present and safe to do so remove contact lenses and continue rinsing.

If inhaled

Move affected person to a source of fresh air/ ventilation. If not breathing give artificial respiration.

4.2 Most important symptoms and effects, both acute and delayed

Nausea, headache, vomiting, narcosis and central nervous system depression. To the best of our knowledge, the chemical, physical and toxicological properties have not been thoroughly investigated.

4.3 Indication of immediate medical attention and special treatment needed

No data available.

SECTION 5. FIRE-FIGHTING MEASURES

5.1 Extinguishing media

Select an extinguishing media appropriate to surrounding area, such as dry chemical, carbon dioxide or alcohol resistant foam.

5.2 Special hazards arising from the substance or mixture

Carbon oxides.

5.3 Advice for firefighters

Fire fighters to wear self-contained breathing equipment if necessary. Cool any containers near to the source of the fire.

SECTION 6. ACCIDENTAL RELEASE MEASURES

6.1 Personal precautions, protective equipment and emergency procedures

Wear PPE, Personal protective equipment. Avoid breathing in vapours, mist or gas, ensure adequate ventilation. Remove any unnecessary staff from the area. Remove any sources of ignition and be aware that vapours from the product can accumulate in low areas and form explosive concentrations.

6.6 Environmental Precautions

Do not let the product enter the drainage system.

6.7 Methods and material for containment and cleaning up

Prevent further spillage by using a spill mat, vermiculite or another type of inert absorbent material. Collect the contaminated material and store in secure container with a lid. Store in a well-ventilated area and arrange collection for disposal of solid chemical waste.

6.4 Reference to other sections

See section 13 for information on disposal.

SECTION 7. HANDLING AND STORAGE

7.1 Precautions for safe handling

Avoid contact with skin, eyes and breathing in vapour or mist. Keep away from sources of ignition – No smoking. Keep away from sources of electrostatic build up.

7.2 Conditions for safe storage, including any incompatibilities

Store the product in a cool, dry, well-ventilated environment.

7.3 Specific end uses

No data available.

SECTION 8. EXPOSURE CONTROLS/PERSONAL PROTECTION

8.1 Control parameters

This product contains no substances with occupational exposure limits values.

8.4 Exposure controls

Appropriate engineering controls

Wear PPE, Personal protective equipment, wash hands, and avoid contact with skin when handling the product. The product should be handled in accordance with good laboratory and safety practice.

Personal Protective Equipment

Eye / face protection

Wear safety glasses/ goggles with side shields. Safety eye wear should conform to the appropriate government standards such as NIOSH (US) or EN 166(EU).

Skin protection

Handle with gloves, check gloves before using for any tears/ holes. Remove used gloves using the proper glove removal technique, so that the outer side of the glove does not touch the skin, to avoid skin contact with the product. Dispose of used gloves as contaminated waste, see section 13 for information. Gloves must satisfy the specifications of the EU Directive 89/686/EEC and the standard EN 374 derived from it.

Body Protection

Wear laboratory coat or similar covering over outside clothing.

Respiratory protection

Handle the material under an extraction cabinet or fume hood. If respirators are required they should be tested and approved under appropriate government standards such as NIOSH (US) or CEN (EU).

Thermal hazards

No data available.

SECTION 9. PHYSICAL AND CHEMICAL PROPERTIES

9.1 Information on basic physical and chemical properties

Appearance	Form: clear, liquid
	Colour: colourless
Odour	No data available

Odour threshold	No data available
pH	No data available
Freezing/Melting Point	Melting point/range: -15°C
Initial boiling point and boiling range	196°C at 1,013 hPa
Flash Point	80°C – closed cup
Evaporation rate	No data available
Flammability	No data available
Upper/lower flammability or explosive limits	Lower explosion limit: 0.8 %(V)
Vapour Pressure	0.19 hPa at 25°C
Vapour density	4.5 – (Air = 1.0)
Relative Density	0.827 g/cm ³
Solubility in water	No data available
Partition coefficient: n- octanol/water	log Pow: 2.80 – 3.15
Autoignition temperature	No data available
Decomposition temperature	No data available
Viscosity	No data available
Explosive properties	No data available
Oxidising properties	No data available

9.2 Other information

No data available.

SECTION 10. STABILITY AND REACTIVITY

10.1 Reactivity

No data available

10.2 Chemical stability

No data available

10.3 Possibility of hazardous reactions

No data available

10.4 Conditions to Avoid

Heat, flames and sparks.

10.5 Incompatible materials

Acids, Acid chlorides, Oxidizing agents, acids, Acid chlorides, Oxidizing agents.

10.6 Hazardous decomposition products

Other decomposition products – No data available.

SECTION 11. TOXICOLOGICAL INFORMATION

11.1 Information on toxicological effects

Acute toxicity

LD50 Oral – Rat - > 3,200 mg/kg

Skin corrosion/irritation

Skin – Rabbit – Skin irritation.

Serious eye damage/irritation

Eyes – Rabbit – Moderate eye irritation.

Respiratory or skin sensitisation

No data available

Germ cell mutagenicity

Genotoxicity in-vitro – Hamster – Lungs
SLN

Carcinogenicity

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

Reproductive toxicity

No data available

STOT-single exposure

No data available

STOT-repeated exposure

No data available

Aspiration hazard.

No data available

Potential Health Hazards**Inhalation**

May be harmful if inhaled. Causes respiratory tract irritation.

Ingestion

May be harmful if swallowed.

Skin

May be harmful if absorbed through skin. Causes skin irritation.

Eyes

Causes serious eye irritation.

Signs and symptoms of exposure

Nausea, Headache, Vomiting, Narcosis, Central nervous system depression. To the best of our knowledge, the chemical, physical and toxicological properties have not been thoroughly investigated.

Additional Information

RTECS: RH6550000

SECTION 12. ECOLOGICAL INFORMATION**12.1 Toxicity**

Toxicity to Fish	Mortality LOEC – Pimephales promelas (Fathead minnow) – 1.19 mg/l – 7d Mortality NOEC – Pimephales promelas (Fathead minnow) – 1.19 mg/l – 7d LC50 –Oncorhynchus mykiss (Rainbow trout) – 17.7 mg/l – 96h
Toxicity to algae	EC50 – Desmodesmus subspicatus (Green algae) – 6.5 – 14.0 mg/l – 48h

12.2 Persistence and degradability

No data available.

12.3 Bioaccumulative potential

Does not Bioaccumulate.

12.4. Mobility in soil

No data available.

12.5. Results of PBT and vPvB assessment

No data available.

12.6. Other adverse effects

Harmful to aquatic life.

SECTION 13. DISPOSAL CONSIDERATIONS**13.1 Waste treatment methods**

Product or/and collected waste from spillage.

Burn in a chemical incinerator equipped with an afterburner and scrubber. Or to contact a licensed disposal company and arrange disposal, inform the company of the nature of the waste.

Contaminated packaging

Dispose of as the used product, with a licensed disposal company.

SECTION 14. TRANSPORT INFORMATION**14.1 UN Number**

ADR/RID: - IMDG: - IATA: -

14.2 UN Proper Shipping Name

ADR/RID: Not dangerous goods

IMDG: Not dangerous goods

IATA: Not dangerous goods

14.3 Transport hazard class(es)

ADR/RID: - IMDG: - IATA: -

14.4 Packing group

ADR/RID: - IMDG: - IATA: -

14.5 Environmental hazards

ADR/RID: No IMDG Marine pollutant: No IATA: No

14.6 Special precautions for user

No data available.

SECTION 15. REGULATORY INFORMATION

This safety data sheet complies with the requirements of Regulation (EC) No. 1907/2006.

15.1. Safety, health and environmental regulations/legislation specific for the substance or mixture

No data available.

15.2 Chemical Safety Assessment

No data available.

Please note that the label elements that used to go in Section 15 are now in Section 2.

SECTION 16. OTHER INFORMATION

The advice offered is derived from the current available information on the hazardous materials in this product and its component(s). Consideration has been made regarding the quantities offered in the pre-dispensed container. The advice offered is, therefore, not all-inclusive nor should it be taken as the descriptive of the compound generally.

SAFETY DATA SHEET

Version: 2.0

 Date written: 30th March 2012

 Date reviewed: 5th February 2021

SECTION 1. IDENTIFICATION OF THE SUBSTANCE/PREPARATION AND OF THE COMPANY

/ UNDERTAKING

Product Name	Acetic Anhydride
Product Catalogue Name	LL-ACETANHYD-01
CAS-No.	108-24-7
Company:	Ludger Ltd Culham Science Centre Abingdon Oxfordshire OX14 3EB
Telephone:	01865 408554
Emergency Telephone:	01865 408554
Email:	info@ludger.com

SECTION 2. HAZARDS IDENTIFICATION

2.1 Classification of the substance or mixture

Classification according to Regulation (EC) No 1272/2008 [EU-GHS/CLP]

Flammable liquids (Category 3)

Acute toxicity, Inhalation (Category 4)

Acute toxicity, Oral (Category 4)

Skin corrosion (Category 1B)

Serious eye damage (Category 1)

2.2 Label elements



Signal Word: Danger

Hazard Statement(s)

H226	Flammable liquid and vapour
H302	Harmful if swallowed.
H314	Causes severe skin burns and eye damage.
H332	Harmful if inhaled.
H318	Serious eye damage

Precautionary Statement(s)

P280	Wear protective gloves/ protective clothing/ eye protection/ face protection.
P303 + P361 + P353	IF ON SKIN (or hair): Take off immediately all contaminated clothing. Rinse skin with water.
P304 + P340 + P310	IF INHALED: Remove person to fresh air and keep comfortable for breathing. Immediately call a POISON CENTER/ doctor.
P305+P351+P338	IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses if present and safe to do so. Continue rinsing.

2.3 Other hazard information:

Lachrymator. Reacts violently with water.

SECTION 3. COMPOSITION/INFORMATION ON INGREDIENTS

3.1 Substances

Synonyms: None
 Formula: $C_4H_6O_3$
 Molecular weight: 102.09 g/mol

Component		Classification	Concentration
Name	Acetic Anhydride	Flam. Liq. 3; Acute Tox. 4; Skin	100%
CAS-No.	108-24-7	Corr. 1B; Eye Dam. 1; H226,	
EC-No.	203-564-8	H302, H332, H314, H318	
Index-No.	607-008-00-9		

SECTION 4. FIRST AID MEASURES

4.1 Description of first aid measures

General Advice

Consult a physician if exposure causes ill effects and if in any doubt. Show this safety data sheet to the physician/ first responder in attendance.

If Ingested

After swallowing: make victim drink water (two glasses at most), avoid vomiting (risk of perforation). Call a physician immediately. Do not attempt to neutralise. Never give anything by mouth if the person is unconscious.

If skin is exposed

Remove immediately any contaminated clothing, shoes. Wash the area well with plenty of water. Take the affected person to hospital, along with a copy of this SDS.

If eyes are exposed

Rinse thoroughly with water for at least 15 minutes, remove contact lenses if present and continue rinsing. Immediately call in ophthalmologist.

If inhaled

Move affected person into a source of fresh air/ ventilation. If not breathing give artificial respiration. Call in physician.

4.2 Most important symptoms and effects, both acute and delayed

Problems breathing, shortness of breath, coughing, wheezing, burning sensation, irritation of the airways, causing inflammation and potential swelling. Material is destructive to eyes, skin and the tissue of the mucous membranes and upper respiratory tract. Consult a physician if exposure causes ill effects and if in any doubt. Show this safety data sheet to the physician/ first responder in attendance.

4.3 Indication of immediate medical attention and special treatment needed

No data available.

SECTION 5. FIRE-FIGHTING MEASURES

5.1 Extinguishing media

Select extinguishing media appropriate to surrounding area. Types of media that are compatible, water spray, alcohol-resistant foam, dry chemical or carbon dioxide.

5.2 Special hazards arising from the substance or mixture

Carbon oxides.

5.3 Advice for firefighters

Fire fighters are to wear self-contained breathing equipment and to use water spray to cool unopened containers near to the source of the fire.

SECTION 6. ACCIDENTAL RELEASE MEASURES

6.1 Personal precautions, protective equipment and emergency procedures

Ensure adequate ventilation to avoid breathing vapours, gas or mist, wear respiratory protection. Avoid substance contact. Keep away from heat and remove all sources of ignition, move non-essential personnel away from the area.

For personal protection see section 8.

6.8 Environmental Precautions

Prevent further spillage, if safe to do so. Do not let the product enter the drainage system.

6.9 Methods and material for containment and cleaning up

Contain the spillage by using a spill mat or inert material to soak up the spilt product, such as vermiculite. Carefully collect the contaminated material and carefully put it into a suitable container with a lid and arrange collection for disposal.

6.4 Reference to other sections

For more information of disposal see Section 13.

SECTION 7. HANDLING AND STORAGE

7.1 Precautions for safe handling

Wear PPE when handling the product. Avoid contact with skin, eyes and inhalation of vapour or mist. Keep away from sources of ignition – No smoking. Take measures to prevent the build-up of electrostatic charge.

7.2 Conditions for safe storage, including any incompatibilities

Store in a dry, cool place. Reacts violently to water.

7.3 Specific end uses

Apart from the uses mentioned in section 1.2 no other specific uses are stipulated

SECTION 8. EXPOSURE CONTROLS/PERSONAL PROTECTION

8.1 Control parameters

Components with workplace control parameters.

Component	CAS-No.	Value	Control parameters	Basis
Name Acetic Anhydride	108-24-7	STEL	2 ppm 10 mg/m ³	UK. EH40 WEL – Workplace Exposure Limits.
		TWA	0.5 ppm 2.5 mg/m ³	UK. EH40 WEL – Workplace Exposure Limits.

8.5 Exposure controls

Appropriate engineering controls

When handling the product wear PPE, wash hands before and after handling the product and avoid contact with skin, eyes and clothing.

Personal Protective Equipment

Eye / face protection

Wear fitted safety glasses/goggles. Use eye protection that has been tested and approved under appropriate government standards such as NIOSH (US) or EN 166 (EU).

Skin protection

Handle the product wearing gloves. Gloves are to be checked for tears/holes before use. Remove gloves using the proper glove removal technique, so that the outside of the gloves do not touch the skin when being removed. The removed gloves are to be disposed of as contaminated solid waste, see Section 13 for more information.

The gloves used should satisfy the specifications of EU Direction 2016/425 and standard EN 374 derived from it.

Body Protection

A Laboratory coat or similar covering over the handlers clothing, is to be worn when handling the product.

Respiratory protection

Handle the product under extraction, in a fume hood. Use equipment that has been tested and approved of under the appropriate government standards such as NIOSH (US) or CEN (EU).

Control of environmental exposure

Do not let product enter drains. Risk of explosion.

Thermal hazards

No data available.

SECTION 9. PHYSICAL AND CHEMICAL PROPERTIES

9.1 Information on basic physical and chemical properties

Appearance	Form: Liquid
	Colour: colourless
Odour	Pungent
Odour threshold	No data available
pH	No data available
Freezing/Melting Point	Melting point/range: -73°C – lit.
Initial boiling point and boiling range	138 - 140°C – lit.
Flash Point	49°C – closed cup
Evaporation rate	No data available
Flammability	No data available
Upper/lower flammability or explosive limits	Upper explosion limit: 10.3% (V) Lower explosion limit: 2.7% (V)
Vapour Pressure	5 hPa at 20°C 13 hPa at 36°C 6.69 hPa
Vapour Density	3.52 – (Air = 1.0)
Relative Density	1.08 g/cm ³
Solubility in water	Slightly soluble
Partition coefficient n-octanol/water	log Pow: ca.-0.5 - Bioaccumulation is not expected.
Autoignition temperature	316 °C at 1,013.25 hPa
Decomposition temperature	No data available
Viscosity	Viscosity, kinematic: No data available Viscosity, dynamic: 0.84 mPa.s at 25 °C
Explosive properties	No data available
Oxidising properties	No data available

9.2 Other information

Surface tension	31.93 mN/m at 25°C
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SECTION 10. STABILITY AND REACTIVITY

10.1 Reactivity

Can violently decompose at elevated temperatures Vapor/air-mixtures are explosive at intense warming.

10.2 Chemical stability

Decomposes when moist. The product is chemically stable under standard ambient conditions (room temperature)

10.3 Possibility of hazardous reactions

Exothermic reaction with: Ammonia Potassium hydroxide nitrates Sodium hydroxide Acetic acid, diluted Violent reactions possible with: Water Possible formation of: acetic acid

10.4 Conditions to Avoid

Do not allow water to enter container due to the violent reaction from the product. Heat, flames and sparks.

10.5 Incompatible materials

Acids, Alcohols, Bases, Oxidizing agents, Reducing agents, Powdered metals.

10.6 Hazardous decomposition products

Other decomposition products – No data available.

SECTION 11. TOXICOLOGICAL INFORMATION**11.1 Information on toxicological effects****Acute toxicity**

LD50 Oral – Rat – male and female-6300 mg/kg

Remarks: (ECHA)

LC50 Inhalation – Rat – 4,200 mg/m³

LD50 Dermal – Rabbit – 4,320 mg/kg

Skin corrosion/irritation

Skin – in vitro test

Result: Causes burns. - 4 h

Remarks: (ECHA)

Serious eye damage/irritation

Eyes - Rat

Result: Corrosive - 24 h

Remarks: (ECHA)

Respiratory or skin sensitisation

No data available.

Germ cell mutagenicity

In vitro mammalian cell gene mutation test

mouse lymphoma cells

Result: negative

Ames test

Salmonella typhimurium

Result: negative

Chromosome aberration test in vitro

Chinese hamster ovary cells

Result: negative

OECD Test Guideline 474

Rat - male and female - Bone marrow

Result: negative

Carcinogenicity

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

Reproductive toxicity

No data available.

STOT-single exposure

No data available.

STOT-repeated exposure

No data available.

Aspiration hazard.

No data available.

Potential Health Hazards

Inhalation Toxic if inhaled. Material is extremely destructive to the tissue of the mucous membranes and

upper respiratory tract.

Ingestion Harmful if swallowed. Causes burns.

Skin May be harmful if absorbed through skin. Causes skin burns.

Eyes Causes eye burns.

Signs and symptoms of exposure

Problems breathing, shortness of breath, coughing, wheezing, burning sensation, irritation of the airways, causing inflammation and potential swelling. Material is destructive to eyes, skin and the tissue of the mucous membranes and upper respiratory tract.

Additional Information

RTECS: AK1925000

SECTION 12. ECOLOGICAL INFORMATION**12.1 Toxicity**

Toxicity to Fish

semi-static test LC50 - *Oncorhynchus mykiss* (rainbow trout) - >300.82 mg/l - 96 h
(OECD Test Guideline 203)

Remarks: (in analogy to similar products)

Toxicity to daphnia and other aquatic invertebrates

static test EC50 - *Daphnia magna* (Water flea) - > 1,000 mg/l - 48 h
(OECD Test Guideline 202)

Toxicity to algae

static test ErC50 - *Skeletonema costatum* - > 300.82 mg/l - 72 h
(ISO 10253)

Toxicity to bacteria

static test NOEC - *Pseudomonas putida* - 1,150 mg/l - 16 h
Remarks: (ECHA)

12.2 Persistence and degradability

Biodegradability Zahn-Wellens Test - Exposure time 5 d Result: > 95 % - Readily biodegradable.
(OECD Test Guideline 302B)

12.3 Bioaccumulative potential

No bioaccumulation is to be expected (log Pow <= 4).

12.4. Mobility in soil

No data available.

12.5. Results of PBT and vPvB assessment

This substance/mixture contains no components considered to be either persistent, bioaccumulative and toxic (PBT), or very persistent and very bioaccumulative (vPvB) at levels of 0.1% or higher.

12.6. Other adverse effects

No data available.

SECTION 13. DISPOSAL CONSIDERATIONS

13.1 Waste treatment methods

Dispose of liquid and solid waste by contacting a professional licensed chemical waste disposal company. The product can be disposed of by using a chemical incinerator fitted with an afterburner and scrubber, but extra is to be taken as the product is flammable.

Contaminated packaging

Dispose of as unused product.

SECTION 14. TRANSPORT INFORMATION

14.1 UN Number

ADR/RID: 1715	IMDG: 1715	IATA: 1715
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14.2 UN Proper Shipping Name

ADR/RID: ACETIC ANHYDRIDE
IMDG: ACETIC ANHYDRIDE
IATA: Acetic Anhydride

14.3 Transport hazard class(es)

ADR/RID: 8 (3)	IMDG: 8 (3)	IATA: 8 (3)
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14.4 Packing group

ADR/RID: II	IMDG: II	IATA: II
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14.5 Environmental hazards

ADR/RID: No	IMDG Marine pollutant: No	IATA: No
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14.6 Special precautions for user

No data available

SECTION 15. REGULATORY INFORMATION

This safety data sheet complies with the requirements of Regulation (EC) No. 1907/2006.

15.1. Safety, health and environmental regulations/legislation specific for the substance or mixture

No data available

15.2 Chemical Safety Assessment

No data available

Please note that the label elements that used to go in Section 15 are now in Section 2.

SECTION 16. OTHER INFORMATION

The advice offered is derived from the current available information on the hazardous materials in this product and its component(s). Consideration has been made regarding the quantities offered in the pre-dispensed container. The advice offered is, therefore, not all-inclusive nor should it be taken as the descriptive of the compound generally.

SAFETY DATA SHEET

Version: 2.0

Date written: 9th March 2012

Date reviewed: 3rd February 2021

SECTION 1. IDENTIFICATION OF THE SUBSTANCE/PREPARATION AND OF THE COMPANY

/ UNDERTAKING

Product Name **Trifluoroacetic acid, 5%, aqu.**

Product Catalogue Name **LL-TFA-5PC-01**

Company: Ludger Ltd
 Culham Science Centre
 Abingdon
 Oxfordshire
 OX14 3EB

Telephone: 01865 408554

Emergency Telephone: 01865 408554

Email: info@ludger.com

SECTION 2. HAZARDS IDENTIFICATION

2.1 Classification of the substance or mixture

Classification according to Regulation (EC) No. 1272/2008 [EU-GHS/CLP]

Skin corrosion (Category 1A)
 Chronic aquatic toxicity (Category 3)
 Serious eye damage (Category 1)

2.2 Label elements



Signal Word: Danger

Hazard Statement(s)

H314 Causes severe skin burns and eye damage.
 H332 Harmful if inhaled
 H412 Harmful to aquatic life with long lasting effects.

Precautionary Statement(s)

P273 Avoid release to the environment.
 P280 Wear protective gloves/ protective clothing/ eye protection/
 face
 protection.
 P303 + P361 + P353 IF ON SKIN (or hair): Take off immediately all contaminated
 clothing.
 Rinse skin with water.
 P304 + P340 + P310 IF INHALED: Remove person to fresh air and keep
 comfortable for
 breathing. Immediately call a POISON CENTER/ doctor
 P305+P351+P338 IF IN EYES: Rinse cautiously with water for several minutes.
 Remove
 contact lenses, if present and easy to do so. Continue rinsing.

2.3 Other hazard information:

None available.

SECTION 3. COMPOSITION/INFORMATION ON INGREDIENTS

3.1 Substances

Synonyms: TFA

Formula: TFA: C₂HO₂F₃

Water: H₂OH₂O

Molecular weight: TFA: 114.02 g/mol

Water: 18.02 g/mol

Component		Classification	Concentration
Name	Trifluoroacetic acid	Skin Corr.1A; Aquqatic Chronic	5%
CAS-No.	76-05-1	3; Acute Tox. 4; Eye Dam. 1	
EC-No.	200-929-3	H314, H412, H332	
Index-No	607-091-00-1		
2 nd Name	Water	-	95%
CAS-No.	7732-18-5		
EC-No.	231-791-2		

For the full text of the H-Statements and R-Phrases mentioned in this Section please see Section 3 and 16.

SECTION 4. FIRST AID MEASURES

4.1 Description of first aid measures

General Advice

Consult a physician if exposure causes ill effects and if in any doubt. Show this safety data sheet to the physician/ first responder in attendance.

If Ingested

Do NOT induce vomiting. Rinse mouth well with water. Never give anything to a person if unconscious.

If skin is exposed

Remove contaminated clothing and shoes. Wash the affected area well with plenty of soap and water.

If eyes are exposed

Rinse thoroughly for at least 15 minutes with plenty of water/ eye wash solution. Remove contacts if safe to do so and continue rinsing.

If inhaled

Move affected person to a source of ventilation/ fresh air. If not breathing, give artificial respiration.

4.2 Most important symptoms and effects, both acute and delayed

The product can be destructive to tissue of the mucous membranes, upper respiratory tract, eyes and skin.

4.3 Indication of immediate medical attention and special treatment needed

No data available.

SECTION 5. FIRE-FIGHTING MEASURES

5.1 Extinguishing media

Select extinguishing media appropriate to surrounding area, compatible extinguishing material for the product are Water spray, alcohol-resistant foam, dry chemical and carbon dioxide.

5.2 Special hazards arising from the substance or mixture

Carbon dioxides, Hydrogen fluoride.

5.3 Advice for firefighters

If necessary, wear self-contained breathing equipment.

SECTION 6. ACCIDENTAL RELEASE MEASURES

6.1 Personal precautions, protective equipment and emergency procedures

Advice for non-emergency personnel: avoid breathing in vapours, mist or gas by ensuring adequate ventilation. Avoid substance contact. Move any unnecessary staff away from the spill.

For personal protection see section 8.

6.10 Environmental Precautions

Contain the spillage; prevent any product from entering the drainage system as discharge into the environment is to be avoided.

6.11 Methods and material for containment and cleaning up

Contain the spillage with a spill mat or inert material such as vermiculite. Carefully collect the contaminated material into a suitable container with a lid; arrange collection and disposal of the hazardous solid waste.

6.4 Reference to other sections

See Section 13 for more information on disposal.

SECTION 7. HANDLING AND STORAGE

7.1 Precautions for safe handling

Work under hood. Do not inhale substance/mixture. Avoid generation of vapours/aerosols.

Hygiene measures

Immediately change contaminated clothing. Apply preventive skin protection. Wash hands and face after working with substance.

For precautions see section 2.2.

7.2 Conditions for safe storage, including any incompatibilities

Store the product in a cool, dry, well ventilated place.

7.3 Specific end uses

Apart from the uses mentioned in section 1.2 no other specific uses are stipulated..

SECTION 8. EXPOSURE CONTROLS/PERSONAL PROTECTION

8.1 Control parameters

This product contains no substances with occupational exposure limits values.

8.6 Exposure controls

Appropriate engineering controls

Handle the product using good laboratory and safety practice, wearing gloves, safety glasses and laboratory coat. Wash and dry hands before and after handling the product, even with wearing gloves.

Personal Protective Equipment

Eye / face protection

Wear laboratory glasses or safety goggles. Use equipment for eye protection tested and approved under appropriate standards such as NIOSH (US) or EN 166 (EU).

Skin protection

Handle with gloves, check gloves before using for any tears/ holes. Remove used gloves using the proper glove removal technique, so that the outer side of the glove does not touch the skin, to avoid skin contact with the product. Dispose of used gloves as contaminated waste, see section 13 for information. Gloves must satisfy the specifications of the EU Directive 2016/425 and the standard EN 374 derived from it.

Body Protection

Wear laboratory coat or similar covering over outside clothing.

Respiratory protection

Handle the material under an extraction cabinet or fume hood, as part of the kit. If respirators are required they should be tested and approved under appropriate government standards such as NIOSH (US) or CEN (EU).

Thermal hazards

No data available.

SECTION 9. PHYSICAL AND CHEMICAL PROPERTIES

9.1 Information on basic physical and chemical properties

Appearance	Form: Clear, liquid Colour: Colourless
Odour	Slight
Odour threshold	No data available
pH	No data available
Freezing/Melting Point	No data available
Initial boiling point and boiling range	No data available
Flash Point	No data available
Evaporation rate	No data available
Flammability	Not Flammable
Upper/lower flammability or explosive limits	No data available
Vapour Pressure	No data available
Relative Density	No data available
Solubility in water and solvents	Yes
Partition coefficient	No data available
Autoignition temperature	No data available
Decomposition temperature	No data available
Viscosity	No data available
Explosive properties	None
Oxidising properties	No data available

9.2 Other information

No data available

SECTION 10. STABILITY AND REACTIVITY

10.1 Reactivity

No data available

10.2 Chemical stability

The product is chemically stable under standard ambient conditions (room temperature)

10.3 Possibility of hazardous reactions

Risk of explosion with: lithium aluminium hydride
Exothermic reaction with: alkalines
Generates dangerous gases or fumes in contact with: acids

10.4 Conditions to Avoid

No data available

10.5 Incompatible materials

Strong bases, Metals, Oxidizing agents, Alcohols, Epoxides, Steel (all types and surface treatments), Aluminium, Reacts violently with Alkali metals.

10.6 Hazardous decomposition products

Other decomposition products – In the event of fire: see section 5

SECTION 11. TOXICOLOGICAL INFORMATION

11.1 Information on toxicological effects

Acute toxicity

No data available

Skin corrosion/irritation

No data available

Serious eye damage/irritation

Cause serious eye damage

Respiratory or skin sensitisation

No data available

Germ cell mutagenicity

No data available

Carcinogenicity

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

Reproductive toxicity

No data available

STOT-single exposure

No data available

STOT-repeated exposure

No data available

Aspiration hazard.

No data available

Potential Health Hazards

Inhalation

the

May be harmful if inhaled. Material can be destructive to the tissue of

mucous membranes and the upper respiratory tract.

Ingestion

May be harmful if swallowed. Causes burns.

Skin

May be harmful if absorbed through skin. Causes burns.

Eyes

Causes burns to the eyes.

Signs and symptoms of exposure

The product can be destructive to tissue of the mucous membranes, upper respiratory tract, eyes and skin.

11.2 Further information

Components: Trifluoroacetic acid

Acute inhalation toxicity	LC50 rat: 10 mg/l; 4 h
Skin irritation rabbit	Result: Causes burns.
Germ cell mutagenicity:	
Ames test	
Salmonella typhimurium	
Result: negative	
In vitro mammalian cell gene mutation test	
mouse lymphoma cells	
Result: negative	
Chromosome aberration test in vitro	

Material is extremely destructive to tissue of the mucous membranes and upper respiratory tract, eyes, and skin., spasm, inflammation and edema of the larynx, 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.

Damage to:

Kidney

Other dangerous properties cannot be excluded.

Handle in accordance with good industrial hygiene and safety practice.

Liver - Irregularities - Based on Human Evidence

SECTION 12. ECOLOGICAL INFORMATION

12.1 Toxicity

No data available.

12.2 Persistence and degradability

No data available.

12.3 Bioaccumulative potential

No data available.

12.4. Mobility in soil

No data available.

12.5. Results of PBT and vPvB assessment

No data available.

12.6. Other adverse effects

Harmful to aquatic life.

Components: trifluoroacetic acid

Toxicity

Toxicity to fish	static test LC50 - Danio rerio (zebra fish) - > 999 mg/l - 96 h (OECD Test Guideline 203)
------------------	----------------------------------------------------------------------------------------------

Toxicity to daphnia and other aquatic	static test EC50 - Daphnia magna (Water flea) - > 999 mg/l - 48 h (OECD Test Guideline 202)
---------------------------------------	------------------------------------------------------------------------------------------------

invertebrates
 Toxicity to algae static test ErC50 - Pseudokirchneriella subcapitata - 237.07 mg/l - 72 h (OECD Test Guideline 201)

Toxicity to bacteria EC50 - activated sludge - > 832 mg/l - 3 h (OECD Test Guideline 209)

Persistence and degradability

Biodegradability aerobic - Exposure time 127 d
 Result: 11 % - Not inherently biodegradable.
 (OECD Test Guideline 301D)

SECTION 13. DISPOSAL CONSIDERATIONS

13.1 Waste treatment methods

Contact waste professional waste disposal company that is licensed to carry such waste material, liquid and solids, for the disposal of waste product. This product cannot go into the drainage systems.

Contaminated packaging

Dispose of as unused product.

SECTION 14. TRANSPORT INFORMATION

14.1 UN Number

ADR/RID: 2699	IMDG: 2699	IATA: 2699
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14.2 UN Proper Shipping Name

ADR/RID: TRIFLUROROACETIC ACID, SOLUTION
 IMDG: TRIFLUROROACETIC ACID, SOLUTION
 IATA: Trifluoroacetic acid, SOLUTION

14.3 Transport hazard class(es)

ADR/RID: 8	IMDG: 8	IATA: 8
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14.4 Packing group

ADR/RID: I	IMDG: I	IATA: I
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14.5 Environmental hazards

ADR/RID: No	IMDG Marine pollutant: No	IATA: No
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14.6 Special precautions for user

No data available.

SECTION 15. REGULATORY INFORMATION

This safety data sheet complies with the requirements of the Regulation (EC) No. 1907/2006.

15.1. Safety, health and environmental regulations/legislation specific for the substance or mixture

No data available.

15.2 Chemical Safety Assessment

No data available.

Please note that the label elements that used to go in Section 15 are now in Section 2.

SECTION 16. OTHER INFORMATION

The advice offered is derived from the current available information on the hazardous materials in this product and its component(s). Consideration has been made regarding the quantities offered in the pre-dispensed container. The advice offered is, therefore, not all-inclusive nor should it be taken as the descriptive of the compound generally.

Text of H-codes and P-phrases mentioned in Section 3.

Acute Tox.	Acute Toxicity.
Aquatic Chronic	Chronic aquatic toxicity.
Skin Corr.	Skin corrosion.
Eye Dam	Serious eye damage
H314	Causes severe skin burns and eye damage.
H332	Harmful if inhaled.
H412	Harmful to aquatic life with long-lasting effects.

SAFETY DATA SHEET

Version: 2.0

Date written: 10th May 2012Date reviewed: 3rd February 2021

SECTION 1. IDENTIFICATION OF THE SUBSTANCE/PREPARATION AND OF THE COMPANY / UNDERTAKING

Product Name **LudgerClean EB20 Wash A solution, Aqueous Solution of 0.1% TFA and 5% Acetonitrile.**

Product Catalogue Name **LC-EB20-WASHA-01**

Company: Ludger Ltd
Culham Science Centre
Abingdon
Oxfordshire
OX14 3EB

Telephone: 01865 408554
Emergency Telephone: 01865 408554
Email: info@ludger.com

SECTION 2. HAZARDS IDENTIFICATION

2.1 Classification of the substance or mixture

Classification according to Regulation (EC) No 1272/2008 [EU-GHS/CLP]

Trifluoroacetic acid 0.1%

Not a hazardous substance or mixture according to Regulation (EC) No 1272/2008.

Acetonitrile

Flammable liquids (Category 2)

Acute toxicity, Inhalation (Category 4)

Acute toxicity, Dermal (Category 4)

Acute toxicity, Oral (Category 4)

Eye Irritation (Category 2)

2.2 Label elements



Signal Word: Warning

Hazard Statement(s)

H302	Harmful if swallowed.
H312	Harmful in contact with skin.
H319	Causes serious eye irritation.
H332	Harmful if inhaled.
H412	Harmful to aquatic life with long lasting effects.

Precautionary Statement(s)

P273	Avoid release to the environment.
P280	Wear protective gloves/protective clothing.

P303 + P361 + P353	IF ON SKIN (or hair): Take off immediately all contaminated clothing. Rinse skin with water.
P304 + P340 + P310	IF INHALED: Remove person to fresh air and keep comfortable for breathing. Immediately call a POISON CENTER/ doctor.
P305+P351+P338	IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do so. Continue rinsing.

2.3 Other hazard information:

This substance/mixture contains no components considered to be either persistent, bioaccumulative and toxic (PBT), or very persistent and very bioaccumulative (vPvB) at levels of 0.1% or higher.

SECTION 3. COMPOSITION/INFORMATION ON INGREDIENTS

3.1 Substances

Synonyms:	Trifluoroacetic acid: TFA Acetonitrile: Methyl cyanide, CAN
Formula:	Trifluoroacetic acid: C ₂ HF ₃ O ₂ Acetonitrile: C ₂ H ₃ N Water: H ₂ OH ₂ O
Molecular Weight:	Trifluoroacetic acid: 114.02 g/mol Acetonitrile: 41.05 g/mol Water: 18.02 g/mol

Component	Concentration
Name Trifluoroacetic Acid	0.1%
CAS-No. 76-05-01	
EC-No. 200-929-3	
Index-No. 607-091-00-1	
2 nd Name Acetonitrile	5%
CAS-No. 75-05-08	
EC-No. 200-835-2	
Index-No. 608-001-00-3	
Name Water	94.9%
CAS-No. 7732-18-5	
EC-No. 231-791-2	

SECTION 4. FIRST AID MEASURES

4.1 Description of first aid measures

General Advice

Consult a physician if exposure causes ill effects and if in any doubt. Show this safety data sheet to the physician/ first responder in attendance.

If Ingested

DO NOT induce vomiting. Immediately make victim drink water (two glasses at most). Consult a physician. Never give anything by mouth if the person is unconscious.

If skin is exposed

Wash the area well with plenty of soap and water.

If eyes are exposed

Rinse thoroughly for at 15 minutes with water or eye wash solution. If present and able to, remove contact lenses and continue rinsing.

If inhaled

Move effected person to a source of fresh air, if not breathing give artificial respiration.

4.2 Most important symptoms and effects, both acute and delayed

Abdominal pain, nausea, vomiting, dizziness, weakness, confusion, drowsiness, unconsciousness, shortness of breath, coughing and wheezing.

4.3 Indication of immediate medical attention and special treatment needed

No data available.

SECTION 5. FIRE-FIGHTING MEASURES**5.1 Extinguishing media**

Select an extinguishing media appropriate to surrounding area; compatible media for this product are water spray, alcohol-resistant foam, dry chemical or carbon dioxide.

5.2 Special hazards arising from the substance or mixture

Carbon dioxides, nitrogen oxides (NO_x), hydrogen cyanide (hydrocyanic acid), hydrogen fluoride. Combustible. Pay attention to flashback. Vapors are heavier than air and may spread along floors. Development of hazardous combustion gases or vapours possible in the event of fire. Forms explosive mixtures with air at ambient temperatures.

5.3 Advice for fire-fighters

Wear self-contained breathing equipment if necessary. Use water spray to cool unopened containers. The product itself does not burn.

SECTION 6. ACCIDENTAL RELEASE MEASURES**6.1 Personal precautions, protective equipment and emergency procedures**

Wear PPE (Personal Protective Equipment). Avoid breathing in vapours, mist or gas by having adequate ventilation, remove any unnecessary staff from the area. Remove any sources of ignition.

6.12 Environmental Precautions

If safe to do so, prevent further leakage/ spillage and DO NOT let the product enter the drainage system.

6.13 Methods and material for containment and cleaning up

Use a spillage mat, vermiculite or similar inert material to contain and soak up the spillage. Collect the contaminated material and store in a suitable contain for transportation and disposal.

6.4 Reference to other sections

See Section 13 for more information on disposal.

SECTION 7. HANDLING AND STORAGE**7.1 Precautions for safe handling**

Avoid contact with skin, eyes and inhalation of vapour/ mist.

7.2 Conditions for safe storage, including any incompatibilities

Store in a well-ventilated, cool and dry environment, away from direct sunlight. Keep the container tightly sealed once opened and up right to prevent any spills.

7.3 Specific end uses

No data available.

SECTION 8. EXPOSURE CONTROLS/PERSONAL PROTECTION

8.1 Control parameters

Components of the mixture with workplace control parameters

Component	CAS-No.	Value	Control parameters	Basis
Acetonitrile	75-05-8	TWA	40 ppm 70 mg/m ³	Europe. Indicative occupational exposure limits values.
	Remarks	Identifies the possibility of significant uptake through the skin. Indicative.		
		STEL	60 ppm 102 mg/m ³	UK. EH40 WEL- Workplace Exposure Limits.
		Can be absorbed through skin. The assigned substances are those for which there are concerns that dermal absorption will lead to systemic toxicity.		
		TWA	40 ppm 68 mg/m ³	UK. EH40 WEL- Workplace Exposure Limits.

8.7 Exposure controls

Appropriate engineering controls

Wear PPE (Personal Protective Equipment), and wash hands before and after handling the product, avoid contact with skin and eyes.

Personal Protective Equipment

Eye / face protection

Wear Safety goggles/glasses with side-shields. These must conform to government standards such as NIOSH (US) or EN166 (EU).

Skin protection

Handle the product wearing gloves. These must be checked before use for tears/ holes. For removal of used gloves, the proper glove removal technique must be employed, to avoid contact with the outside of the glove with skin. Dispose of gloves as solid contaminated waste, wash and dry hands before and after handling the product.

The gloves used must satisfy the specifications of EU Directive 2016/425 and the standard EN 374 derived from it.

Body Protection

Handle the product wearing a laboratory coat or a similar covering over the outside of their clothing.

Respiratory protection

Handle the product under a fume hood or extractor unit. If respiratory protection is required use equipment that is approved under appropriate government standards such as NIOSH (US) or CEN (EU).

Thermal hazards

No data available.

SECTION 9. PHYSICAL AND CHEMICAL PROPERTIES

9.1 Information on basic physical and chemical properties

Appearance	Form: Liquid Colour: Colourless
Odour	None
Odour threshold	No data available

pH	5.0 to 7.0 at 25°C
Freezing/Melting Point	0.0 °C
Initial boiling point and boiling range	100°C
Flash Point	No data available
Evaporation rate	No data available
Flammability	No data available
Upper/lower flammability or explosive limits	No data available
Vapour Pressure	No data available
Relative Density	1.000 g/mL at 3.98°C
Solubility in water	Completely miscible.
Partition coefficient	No data available
Autoignition temperature	No data available
Decomposition temperature	No data available
Viscosity	No data available
Explosive properties	No data available
Oxidising properties	No data available

9.2 Other information

None

SECTION 10. STABILITY AND REACTIVITY

10.1 Reactivity

No data available

10.2 Chemical stability

The product is chemically stable under standard ambient conditions (room temperature)

10.3 Possibility of hazardous reactions

No data available

10.4 Conditions to Avoid

Extremes of temperature and direct sunlight.

10.5 Incompatible materials

Strong bases and acids, Alkali metals, Reducing and oxidizing agents.

10.6 Hazardous decomposition products

Other decomposition products – No data available.

SECTION 11. TOXICOLOGICAL INFORMATION

11.1 Information on toxicological effects

Acute toxicity

Acetonitrile:

LD50 Oral - Mouse - male and female - 617 mg/kg (OECD Test Guideline 401)

LC50 Inhalation - Mouse - male and female - 4 h - 6.022 mg/l (OECD Test Guideline 403)

Acute toxicity estimate Dermal - 1,500 mg/kg (Expert judgment)

Skin corrosion/irritation

Acetonitrile:

Skin - Rabbit Result: No skin irritation - 4 h (OECD Test Guideline 404)

Serious eye damage/irritation

Acetonitrile:

Eyes - Rabbit Result: Causes serious eye irritation. (OECD Test Guideline 405)
Classified according to Regulation (EU) 1272/2008, Annex VI (Table 3.1/3.2)

Respiratory or skin sensitisation

Acetonitrile:

Buehler Test - Guinea pig Result: negative (OECD Test Guideline 406)

Germ cell mutagenicity

Ames test

S. typhimurium Result: negative

Remarks: (ECHA)

In vitro mammalian cell gene mutation test

Chinese hamster ovary cells

Result: negative

Mutagenicity (mammal cell test): chromosome aberration.

Chinese hamster ovary cells

Result: Positive results were obtained in some in vitro tests.

Remarks: (National Toxicology Program)

sister chromatid exchange assay

Chinese hamster ovary cells

Result: negative

Remarks: Sister chromatid exchange

Saccharomyces cerevisiae

Result: positive

Remarks: Cytogenetic analysis (ECHA)

In vitro mammalian cell gene mutation test

Mouse lymphoma test Result: negative

OECD Test Guideline 474

Mouse - male and female

Result: negative

Carcinogenicity

No evidence of carcinogenicity in animal studies.

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

Reproductive toxicity

Acetonitrile: Animal testing did not show any effects on fertility.

STOT-single exposure

The substance or mixture is not classified as specific target organ toxicant, single exposure.

STOT-repeated exposure

The substance or mixture is not classified as specific target organ toxicant, repeated exposure.

Aspiration hazard.

No data available

Potential Health Hazards

Inhalation

May be harmful if inhaled. Causes respiratory tract irritation.

Ingestion

May be harmful if swallowed.

Skin

Harmful if absorbed through skin. Causes skin irritation.

Eyes

Causes eye irritation.

Signs and symptoms of exposure

Abdominal pain, nausea, vomiting, dizziness, weakness, confusion, drowsiness, unconsciousness, shortness of breath, coughing and wheezing.

Additional information

RTECS: AL7700000

RTECS: AJ9625000

RTECS: ZC0110000

SECTION 12. ECOLOGICAL INFORMATION**12.1 Toxicity**

Acetonitrile:

Toxicity to fish

flow-through test LC50 - Pimephales promelas (fathead minnow) - 1,640 mg/l - 96 h

Remarks: (ECHA)

Toxicity to algae

static test NOEC - Phaeodactylum tricornutum - 400 mg/l - 72 h (ISO 10253)

static test ErC50 - Phaeodactylum tricornutum - 9,696 mg/l - 72 h (ISO 10253)

12.2 Persistence and degradability

Acetonitrile:

Biodegradability Result: 70 % - Readily biodegradable. (OECD Test Guideline 310)

12.3 Bioaccumulative potential

No bioaccumulation is to be expected (log Pow <= 4).

12.4. Mobility in soil

No data available

12.5. Results of PBT and vPvB assessment

This substance/mixture contains no components considered to be either persistent, bioaccumulative and toxic (PBT), or very persistent and very bioaccumulative (vPvB) at levels of 0.1% or higher.

12.6. Other adverse effects

Potentially harmful to aquatic life.

Avoid release to the environment.

Acetonitrile: stability in water

DT50 - > 9,999 d pH 7 at 25 °C

Remarks: (calculated) Hydrolyzes slowly

SECTION 13. DISPOSAL CONSIDERATIONS**13.1 Waste treatment methods**

Contact a professional, licensed chemical waste disposal company for disposal of this product.

Contaminated packaging

Dispose as chemical contaminated solid waste.

SECTION 14. TRANSPORT INFORMATION**14.1 UN Number**

Trifluoroacetic acid:

ADR/RID: 2699

IMDG: 2699

IATA: 2699

Acetonitrile:

ADR/RID: 1648

IMDG: 1648

IATA: 1648

14.2 UN Proper Shipping Name

Trifluoroacetic acid:

ADR/RID: TRIFLUOROACETIC ACID
IMDG: TRIFLUOROACETIC ACID
IATA: Trifluoroacetic acid

Acetonitrile:

ADR/RID: ACETONITRILE
IMDG: ACETONITRILE
IATA: Acetonitrile

14.3 Transport hazard class(es)

Trifluoroacetic acid:

ADR/RID: 8 IMDG: 8 IATA: 8

Acetonitrile:

ADR/RID: 3 IMDG: 3 IATA: 3

14.4 Packing group

Trifluoroacetic acid:

ADR/RID: I IMDG: I IATA: I

Acetonitrile:

ADR/RID: II IMDG: II IATA: II

14.5 Environmental hazards

ADR/RID: No IMDG Marine pollutant: No IATA: No

14.6 Special precautions for user

No data available

SECTION 15. REGULATORY INFORMATION

This safety data sheet complies with the requirements of Regulation (EC) No. 1907/2006.

15.1 Safety, health and environmental regulations/legislation specific for the substance or mixture

No data available

15.2 Chemical Safety Assessment

No data available

Please note that the label elements that used to go in Section 15 are now in Section 2.

SECTION 16. OTHER INFORMATION

The advice offered is derived from the current available information on the hazardous materials in this product and its component(s). Consideration has been made regarding the quantities offered in the pre dispensed container. The advice offered is, therefore not all inclusive nor should it be taken as the descriptive of the compound generally.

SAFETY DATA SHEET

Version: 2.0

Date written: 23rd May 2012

Date reviewed: 3rd February 2021

SECTION 1. IDENTIFICATION OF THE SUBSTANCE/PREPARATION AND OF THE COMPANY / UNDERTAKING

Product Name	LudgerClean EB20 Wash B solution, Aqueous Solution of 0.1% TFA and
	50% Acetonitrile.
Product Catalogue Name	LC-EB20-WASHB-01
Company:	Ludger Ltd Culham Science Centre Abingdon Oxfordshire OX14 3EB
Telephone:	01865 408554
Emergency Telephone:	01865 408554
Email:	info@ludger.com

SECTION 2. HAZARDS IDENTIFICATION

2.1 Classification of the substance or mixture

Classification according to Regulation (EC) No 1272/2008 [EU-GHS/CLP]

Trifluoroacetic acid 0.1%

Not a hazardous substance or mixture according to Regulation (EC) No 1272/2008.

Acetonitrile

Flammable liquids (Category 2)

Acute toxicity, Inhalation (Category 4)

Acute toxicity, Dermal (Category 4)

Acute toxicity, Oral (Category 4)

Eye Irritation (Category 2)

2.2 Label elements



Signal Word: Warning

Hazard Statement(s)

H225	Highly flammable liquid and vapour.
H302	Harmful if swallowed.
H312	Harmful in contact with skin.
H319	Causes serious eye irritation.
H332	Harmful if inhaled.
H412	Harmful to aquatic life with long lasting effects.

Precautionary Statement(s)

P210	Keep away from heat/sparks/open flames/hot surfaces – No smoking.
P273	Avoid release to the environment.
P280	Wear protective gloves/protective clothing.

P303 + P361 + P353	IF ON SKIN (or hair): Take off immediately all contaminated clothing. Rinse skin with water.
P304 + P340 + P310	IF INHALED: Remove person to fresh air and keep comfortable for breathing. Immediately call a POISON CENTER/ doctor.
P305+P351+P338	IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do so. Continue rinsing.

2.3 Other hazard information:

This substance/mixture contains no components considered to be either persistent, bioaccumulative and toxic (PBT), or very persistent and very bioaccumulative (vPvB) at levels of 0.1% or higher.

SECTION 3. COMPOSITION/INFORMATION ON INGREDIENTS

3.1 Substances

Synonyms:	Trifluoroacetic acid: TFA Acetonitrile: Methyl cyanide, ACN
Formula:	Trifluoroacetic acid: C ₂ HF ₃ O ₂ Acetonitrile: C ₂ H ₃ N Water: H ₂ OH ₂ O
Molecular Weight:	Trifluoroacetic acid: 114.02 g/mol Acetonitrile: 41.05 g/mol Water: 18.02 g/mol

Component	Classification	Concentration
Name Trifluoroacetic Acid	No components need to be disclosed according to the applicable regulations for this concentration.	0.1%
CAS-No. 76-05-01		
EC-No. 200-929-3		
Index-No. 607-091-00-1		
2 nd Name Acetonitrile	Flam. Liq. 2; Acute Tox. 4; Eye	50%
CAS-No. 75-05-08	Irrit. 2; H225, H302, H332, H312, H319	
EC-No. 200-835-2		
Index-No. 608-001-00-3		
Name Water		49.9%
CAS-No. 7732-18-5		
EC-No. 231-791-2		

SECTION 4. FIRST AID MEASURES

4.1 Description of first aid measures

General Advice

Consult a physician if exposure causes ill effects and if in any doubt. Show this safety data sheet to the physician/ first responder in attendance.

If Ingested

DO NOT induce vomiting. Immediately make victim drink water (two glasses at most). Consult a physician. Never give anything by mouth if the person is unconscious.

If skin is exposed

Take off immediately all contaminated clothing. Rinse skin with water/ shower. Consult a physician.

If eyes are exposed

Rinse thoroughly for at 15 minutes with water or eye wash solution. If present and able to, remove contact lenses and continue rinsing. Call in ophthalmologist.

If inhaled

Move effected person to a source of fresh air, if not breathing give artificial respiration. Oxygen if necessary. Immediately call in physician.

4.2 Most important symptoms and effects, both acute and delayed

Abdominal pain, nausea, vomiting, dizziness, weakness, confusion, drowsiness, unconsciousness, shortness of breath, coughing and wheezing.

4.3 Indication of immediate medical attention and special treatment needed

No data available.

SECTION 5. FIRE-FIGHTING MEASURES**5.1 Extinguishing media**

Select an extinguishing media appropriate to surrounding area; compatible media for this product are water spray, alcohol-resistant foam, dry chemical or carbon dioxide.

5.2 Special hazards arising from the substance or mixture

Carbon dioxides, nitrogen oxides (NO_x), hydrogen cyanide (hydrocyanic acid), hydrogen fluoride. Combustible. Pay attention to flashback. Vapors are heavier than air and may spread along floors. Development of hazardous combustion gases or vapours possible in the event of fire. Forms explosive mixtures with air at ambient temperatures.

5.3 Advice for fire-fighters

Stay in danger area only with self-contained breathing apparatus. Prevent skin contact by keeping a safe distance or by wearing suitable protective clothing.

5.4 Further information

Remove container from danger zone and cool with water. Suppress (knock down) gases/vapors/mists with a water spray jet. Prevent fire extinguishing water from contaminating surface water or the ground water system.

SECTION 6. ACCIDENTAL RELEASE MEASURES**6.1 Personal precautions, protective equipment and emergency procedures**

Wear PPE (Personal Protective Equipment). Avoid breathing in vapours, mist or gas by having adequate ventilation, remove any unnecessary staff from the area. Remove any sources of ignition. For personal protection see section 8.

6.14 Environmental Precautions

If safe to do so, prevent further leakage/ spillage and DO NOT let the product enter the drainage system.

6.15 Methods and material for containment and cleaning up

Use a spillage mat, vermiculite or similar inert material to contain and soak up the spillage. Collect the contaminated material and store in a suitable contain for transportation and disposal.

6.4 Reference to other sections

See Section 13 for more information on disposal.

SECTION 7. HANDLING AND STORAGE**7.1 Precautions for safe handling**

Avoid contact with skin, eyes and inhalation of vapour/ mist.

7.2 Conditions for safe storage, including any incompatibilities

Store in a well-ventilated, cool and dry environment, away from direct sunlight. Keep the container tightly sealed once opened and up right to prevent any spills.

7.3 Specific end uses

No data available.

SECTION 8. EXPOSURE CONTROLS/PERSONAL PROTECTION

8.1 Control parameters

Components of the mixture with workplace control parameters

Component	CAS-No.	Value	Control parameters	Basis
Acetonitrile	75-05-8	TWA	40 ppm 70 mg/m ³	Europe. Indicative occupational exposure limits values.
	Remarks	Identifies the possibility of significant uptake through the skin. Indicative.		
		STEL	60 ppm 102 mg/m ³	UK. EH40 WEL- Workplace Exposure Limits.
		Can be absorbed through skin. The assigned substances are those for which there are concerns that dermal absorption will lead to systemic toxicity.		
		TWA	40 ppm 68 mg/m ³	UK. EH40 WEL- Workplace Exposure Limits.

8.8 Exposure controls

Appropriate engineering controls

Wear PPE (Personal Protective Equipment), and wash hands before and after handling the product, avoid contact with skin and eyes.

Personal Protective Equipment

Eye / face protection

Wear Safety goggles/glasses with side-shields. These must conform to government standards such as NIOSH (US) or EN166 (EU).

Skin protection

Handle the product wearing gloves. These must be checked before use for tears/ holes. For removal of used gloves, the proper glove removal technique must be employed, to avoid contact with the outside of the glove with skin. Dispose of gloves as solid contaminated waste, wash and dry hands before and after handling the product.

The gloves used must satisfy the specifications of EU Directive 2016/425 and the standard EN 374 derived from it.

Body Protection

Handle the product wearing a laboratory coat or a similar covering over the outside of their clothing.

Respiratory protection

Handle the product under a fume hood or extractor unit. If respiratory protection is required use equipment that is approved under appropriate government standards such as NIOSH (US) or CEN (EU).

Control of environmental exposure

Do not let product enter drains. Risk of explosion.

Thermal hazards

No data available.

SECTION 9. PHYSICAL AND CHEMICAL PROPERTIES

9.1 Information on basic physical and chemical properties

Appearance	Form: Liquid
	Colour: Colourless
Odour	None
Odour threshold	No data available
pH	5.0 to 7.0 at 25°C
Freezing/Melting Point	No data available
Initial boiling point and boiling range	No data available
Flash Point	No data available
Evaporation rate	No data available
Flammability	No data available
Upper/lower flammability or explosive limits	No data available
Vapour Pressure	No data available
Relative Density	No data available
Solubility in water	Completely miscible.
Partition coefficient	No data available
Autoignition temperature	No data available
Decomposition temperature	No data available
Viscosity	No data available
Explosive properties	No data available
Oxidising properties	No data available

9.2 Other information

None

SECTION 10. STABILITY AND REACTIVITY

10.1 Reactivity

No data available

10.2 Chemical stability

The product is chemically stable under standard ambient conditions (room temperature)

10.3 Possibility of hazardous reactions

No data available

10.4 Conditions to Avoid

Extremes of temperature and direct sunlight.

10.5 Incompatible materials

Strong bases and acids, Alkali metals, Reducing and oxidizing agents.

10.6 Hazardous decomposition products

Other decomposition products – No data available.

SECTION 11. TOXICOLOGICAL INFORMATION

11.1 Information on toxicological effects

Acute toxicity

Acetonitrile:

LD50 Oral - Mouse - male and female - 617 mg/kg (OECD Test Guideline 401)

LC50 Inhalation - Mouse - male and female - 4 h - 6.022 mg/l (OECD Test Guideline 403)
Acute toxicity estimate Dermal - 1,500 mg/kg (Expert judgment)

Skin corrosion/irritation

Acetonitrile:

Skin - Rabbit Result: No skin irritation - 4 h (OECD Test Guideline 404)

Serious eye damage/irritation

Acetonitrile:

Eyes - Rabbit Result: Causes serious eye irritation. (OECD Test Guideline 405)

Classified according to Regulation (EU) 1272/2008, Annex VI (Table 3.1/3.2)

Respiratory or skin sensitisation

Acetonitrile:

Buehler Test - Guinea pig Result: negative (OECD Test Guideline 406)

Germ cell mutagenicity

Ames test

S. typhimurium Result: negative

Remarks: (ECHA)

In vitro mammalian cell gene mutation test

Chinese hamster ovary cells

Result: negative

Mutagenicity (mammal cell test): chromosome aberration.

Chinese hamster ovary cells

Result: Positive results were obtained in some in vitro tests.

Remarks: (National Toxicology Program)

sister chromatid exchange assay

Chinese hamster ovary cells

Result: negative

Remarks: Sister chromatid exchange

Saccharomyces cerevisiae

Result: positive

Remarks: Cytogenetic analysis (ECHA)

In vitro mammalian cell gene mutation test

Mouse lymphoma test Result: negative

OECD Test Guideline 474

Mouse - male and female

Result: negative

Carcinogenicity

No evidence of carcinogenicity in animal studies.

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

Reproductive toxicity

Acetonitrile: Animal testing did not show any effects on fertility.

STOT-single exposure

The substance or mixture is not classified as specific target organ toxicant, single exposure.

STOT-repeated exposure

The substance or mixture is not classified as specific target organ toxicant, repeated exposure.

Aspiration hazard.

No data available

Potential Health Hazards

Inhalation	May be harmful if inhaled. Causes respiratory tract irritation.
Ingestion	May be harmful if swallowed.
Skin	Harmful if absorbed through skin. Causes skin irritation.
Eyes	Causes eye irritation.

Signs and symptoms of exposure

Abdominal pain, nausea, vomiting, dizziness, weakness, confusion, drowsiness, unconsciousness, shortness of breath, coughing and wheezing.

Additional information

RTECS: AL7700000

RTECS: AJ9625000

RTECS: ZC0110000

SECTION 12. ECOLOGICAL INFORMATION**12.1 Toxicity**

Acetonitrile:

Toxicity to fish

flow-through test LC50 - Pimephales promelas (fathead minnow) - 1,640 mg/l - 96 h

Remarks: (ECHA)

Toxicity to algae

static test NOEC - Phaeodactylum tricornutum - 400 mg/l - 72 h (ISO 10253)

static test ErC50 - Phaeodactylum tricornutum - 9,696 mg/l - 72 h (ISO 10253)

12.2 Persistence and degradability

Acetonitrile:

Biodegradability Result: 70 % - Readily biodegradable. (OECD Test Guideline 310)

12.3 Bioaccumulative potential

No bioaccumulation is to be expected (log Pow <= 4).

12.4. Mobility in soil

No data available

12.5. Results of PBT and vPvB assessment

This substance/mixture contains no components considered to be either persistent, bioaccumulative and toxic (PBT), or very persistent and very bioaccumulative (vPvB) at levels of 0.1% or higher.

12.6. Other adverse effects

Potentially harmful to aquatic life.

Avoid release to the environment.

Acetonitrile: stability in water

DT50 - > 9,999 d pH 7 at 25 °C

Remarks: (calculated) Hydrolyzes slowly

SECTION 13. DISPOSAL CONSIDERATIONS**13.1 Waste treatment methods**

Contact a professional, licensed chemical waste disposal company for disposal of this product.

Contaminated packaging

Dispose as chemical contaminated solid waste.

SECTION 14. TRANSPORT INFORMATION**14.1 UN Number**

Trifluoroacetic acid:
ADR/RID: 2699 IMDG: 2699 IATA: 2699

Acetonitrile:
ADR/RID: 1648 IMDG: 1648 IATA: 1648

14.2 UN Proper Shipping Name

Trifluoroacetic acid:
ADR/RID: TRIFLUOROACETIC ACID
IMDG: TRIFLUOROACETIC ACID
IATA: Trifluoroacetic acid

Acetonitrile:
ADR/RID: ACETONITRILE
IMDG: ACETONITRILE
IATA: Acetonitrile

14.3 Transport hazard class(es)

Trifluoroacetic acid:
ADR/RID: 8 IMDG: 8 IATA: 8

Acetonitrile:
ADR/RID: 3 IMDG: 3 IATA: 3

14.4 Packing group

Trifluoroacetic acid:
ADR/RID: I IMDG: I IATA: I

Acetonitrile:
ADR/RID: II IMDG: II IATA: II

14.5 Environmental hazards

ADR/RID: No IMDG Marine pollutant: No IATA: No

14.6 Special precautions for user

No data available

SECTION 15. REGULATORY INFORMATION

This safety data sheet complies with the requirements of Regulation (EC) No. 1907/2006.

15.1 Safety, health and environmental regulations/legislation specific for the substance or mixture

No data available

15.2 Chemical Safety Assessment

No data available

Please note that the label elements that used to go in Section 15 are now in Section 2.

SECTION 16. OTHER INFORMATION

The advice offered is derived from the current available information on the hazardous materials in this product and its component(s). Consideration has been made regarding the quantities offered in the pre-dispensed container. The advice offered is, therefore, not all-inclusive nor should it be taken as the descriptive of the compound generally.