Laemmli Sample Buffer

sc-286962

Material Safety Data Sheet

Hazard Alert Code Key: EXTREME HIGH MODERATE LOW

Section 1 - CHEMICAL PRODUCT AND COMPANY IDENTIFICATION

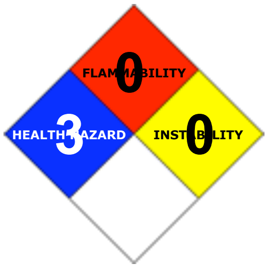
PRODUCT NAME

Laemmli Sample Buffer

STATEMENT OF HAZARDOUS NATURE

CONSIDERED A HAZARDOUS SUBSTANCE ACCORDING TO OSHA 29 CFR 1910.1200.

NFPA



SUPPLIER

Company: Santa Cruz Biotechnology, Inc.
Address:
2145 Delaware Ave
Santa Cruz, CA 95060
Telephone: 800.457.3801 or 831.457.3800
Emergency Tel: CHEMWATCH: From within the US and Canada: 877-715-9305
Emergency Tel: From outside the US and Canada: +800 2436 2255 (1-800-CHEMCALL) or call +613 9573 3112

PRODUCT USE

- Used according to manufacturer's directions. For R&D use only. Not for drug, household or other uses.

Section 2 - HAZARDS IDENTIFICATION

CANADIAN WHMIS SYMBOLS

EMERGENCY OVERVIEW

RISK

Harmful if swallowed.
Toxic in contact with skin.
Irritating to respiratory system.
Risk of serious damage to eyes.
May cause SENSITIZATION by skin contact.
Toxic to aquatic organisms, may cause long-term adverse effects in the aquatic environment.

POTENTIAL HEALTH EFFECTS

ACUTE HEALTH EFFECTS

SWALLOWED

• Accidental ingestion of the material may be harmful; animal experiments indicate that ingestion of less than 150 gram may be fatal or may produce serious damage to the health of the individual.

• Thioglycolate salts may produce decreased blood sugar levels, central nervous system depression, labored breathing, and convulsions.

• In rats poisoned by oral administration, of 2-mercaptoethanol, pharmacotoxic signs included hypoactivity, ruffed fur, rapid breathing, muscular weakness, tremors, convulsions, prostration and cyanosis. Higher doses exerted a toxic effect within minutes, characteristic of central nervous system stimulation. Doses in the lethal range elicited marked depression

Doses of less than 480 mg/kg in mice produced slow and deepened respiration, retarded stimuli response, coma, and death in 1- 3 days. Doses exceeding 480 mg/kg produced intermittent tremors, reduced muscular coordination, long duration clonic convulsions, salivation, urination and death in 1-2 hours.

Prolonged exposure can cause central nervous system stimulation.

EYE

• If applied to the eyes, this material causes severe eye damage.

SKIN

• Skin contact with the material may produce toxic effects; systemic effectsmay result following absorption.

• Entry into the blood-stream, through, for example, cuts, abrasions or lesions, may produce systemic injury with harmful effects. Examine the skin prior to the use of the material and ensure that any external damage is suitably protected.

• Pharmacotoxic signs in rabbits poisoned following skin absorption of 2-mercaptoethanol include depression, anorexia, salivation, tremors and laboured breathing.

INHALED

• The material can cause respiratory irritation in some persons. The body's response to such irritation can cause further lung damage.

• Not normally a hazard due to non-volatile nature of product.

CHRONIC HEALTH EFFECTS

• Skin contact with the material is more likely to cause a sensitization reaction in some persons compared to the general population.

Chronic occupational exposure to thioglycolate salts has produced allergic reactions such as, collection of fluid under the skin, burning of the skin, reddening and hemorrhage under skin surface, eczema like dermatitis of the scalp or hands and bleeding under the skin.

Rats exposed by inhalation to 2-mercaptoethanol for 6-months to 3 ppm showed neuromuscular depression, lymphopenia, neutrophilia and decreased oxygen consumption in the third month. In the fifth month, variations of weight, arterial blood pressure, liver function and protein metabolism were found.

Section 3 - COMPOSITION / INFORMATION ON INGREDIENTS

HAZARD RATINGS

		Min	Max
Flammability:	0		
Toxicity:	3		
Body Contact:	3		
Reactivity:	0		
Chronic:	2		

Min/Nil=0
Low=1
Moderate=2
High=3
Extreme=4

NAME	CAS RN	%
glycerol	56-81-5	<20
2-mercaptoethanol	60-24-2	<10
sodium lauryl sulfate	151-21-3	<4
tris(hydroxymethyl)aminomethane hydrochloride	1185-53-1	<1.51
bromophenol blue	115-39-9	<0.004
water	7732-18-5	64.486

Section 4 - FIRST AID MEASURES

SWALLOWED

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- IF SWALLOWED, REFER FOR MEDICAL ATTENTION, WHERE POSSIBLE, WITHOUT DELAY.
- Where Medical attention is not immediately available or where the patient is more than 15 minutes from a hospital or unless instructed otherwise:
- For advice, contact a Poisons Information Center or a doctor.
- Urgent hospital treatment is likely to be needed.
- If conscious, give water to drink.
- INDUCE vomiting with fingers down the back of the throat, ONLY IF CONSCIOUS. Lean patient forward or place on left side (head-down

position, if possible) to maintain open airway and prevent aspiration.

NOTE: Wear a protective glove when inducing vomiting by mechanical means.

- In the mean time, qualified first-aid personnel should treat the patient following observation and employing supportive measures as indicated by the patient's condition.
- If the services of a medical officer or medical doctor are readily available, the patient should be placed in his/her care and a copy of the MSDS should be provided. Further action will be the responsibility of the medical specialist.
- If medical attention is not available on the worksite or surroundings send the patient to a hospital together with a copy of the MSDS.

EYE

• If this product comes in contact with the eyes:

- Immediately hold eyelids apart and flush the eye continuously with running water.
- Ensure complete irrigation of the eye by keeping eyelids apart and away from eye and moving the eyelids by occasionally lifting the upper and lower lids.
- Continue flushing until advised to stop by the Poisons Information Center or a doctor, or for at least 15 minutes.
- Transport to hospital or doctor without delay.
- Removal of contact lenses after an eye injury should only be undertaken by skilled personnel.

SKIN

• If skin or hair contact occurs:

- Quickly but gently, wipe material off skin with a dry, clean cloth.
- Immediately remove all contaminated clothing, including footwear.
- Wash skin and hair with running water. Continue flushing with water until advised to stop by the Poisons Information Center.
- Transport to hospital, or doctor.

INHALED

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- If fumes or combustion products are inhaled remove from contaminated area.
- Lay patient down. Keep warm and rested.
- Prostheses such as false teeth, which may block airway, should be removed, where possible, prior to initiating first aid procedures.
- Apply artificial respiration if not breathing, preferably with a demand valve resuscitator, bag-valve mask device, or pocket mask as trained. Perform CPR if necessary.
- Transport to hospital, or doctor, without delay.

NOTES TO PHYSICIAN

• Treat symptomatically.

Section 5 - FIRE FIGHTING MEASURES

Vapour Pressure (mmHG):	Not Available
Upper Explosive Limit (%):	Not Applicable
Specific Gravity (water=1):	Not Available
Lower Explosive Limit (%):	Not Applicable

EXTINGUISHING MEDIA

• The product contains a substantial proportion of water, therefore there are no restrictions on the type of extinguishing media which may be used. Choice of extinguishing media should take into account surrounding areas.

Though the material is non-combustible, evaporation of water from the mixture, caused by the heat of nearby fire, may produce floating layers of combustible substances.

In such an event consider:

- foam.
- dry chemical powder.
- carbon dioxide.

FIRE FIGHTING

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- Alert Emergency Responders and tell them location and nature of hazard.
- Wear breathing apparatus plus protective gloves for fire only.
- Prevent, by any means available, spillage from entering drains or water course.
- Use fire fighting procedures suitable for surrounding area.
- Do not approach containers suspected to be hot.
- Cool fire exposed containers with water spray from a protected location.
- If safe to do so, remove containers from path of fire.
- Equipment should be thoroughly decontaminated after use.

GENERAL FIRE HAZARDS/HAZARDOUS COMBUSTIBLE PRODUCTS

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- The material is not readily combustible under normal conditions.
- However, it will breakdown under fire conditions and the organic component may burn.
- Not considered to be a significant fire risk.
- Heat may cause expansion or decomposition with violent rupture of containers
- Decomposes on heating and may produce toxic fumes of carbon monoxide (CO).
- May emit acrid smoke.

Decomposes on heating and produces toxic fumes of: carbon dioxide (CO_2), acrolein, sulfur oxides (SO_x), other pyrolysis products typical of burning organic material.

FIRE INCOMPATIBILITY

- None known.

PERSONAL PROTECTION

Glasses:
Chemical goggles.
Gloves:
PVC chemical resistant type.
Respirator:
Type AB-P Filter of sufficient capacity

Section 6 - ACCIDENTAL RELEASE MEASURES

MINOR SPILLS

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- Clean up all spills immediately.
- Avoid breathing vapors and contact with skin and eyes.
- Control personal contact by using protective equipment.
- Contain and absorb spill with sand, earth, inert material or vermiculite.
- Wipe up.
- Place in a suitable labeled container for waste disposal.

MAJOR SPILLS

- Moderate hazard.
- Clear area of personnel and move upwind.
- Alert Emergency Responders and tell them location and nature of hazard.
- Wear breathing apparatus plus protective gloves.
- Prevent, by any means available, spillage from entering drains or water course.
- Stop leak if safe to do so.
- Contain spill with sand, earth or vermiculite.
- Collect recoverable product into labeled containers for recycling.
- Neutralize/decontaminate residue.
- Collect solid residues and seal in labeled drums for disposal.
- Wash area and prevent runoff into drains.
- After clean up operations, decontaminate and launder all protective clothing and equipment before storing and re-using.
- If contamination of drains or waterways occurs, advise emergency services.

ACUTE EXPOSURE GUIDELINE LEVELS (AEGL) (in ppm)

AEGL 1: The airborne concentration of a substance above which it is predicted that the general population, including susceptible individuals, could experience notable discomfort, irritation, or certain asymptomatic nonsensory effects. However, the effects are not disabling and are transient and reversible upon cessation of exposure.

AEGL 2: The airborne concentration of a substance above which it is predicted that the general population, including susceptible individuals, could experience irreversible or other serious, long-lasting adverse health effects or an impaired ability to escape.

AEGL 3: The airborne concentration of a substance above which it is predicted that the general population, including susceptible individuals, could experience life-threatening health effects or death.

Section 7 - HANDLING AND STORAGE

PROCEDURE FOR HANDLING

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- DO NOT allow clothing wet with material to stay in contact with skin
- Avoid all personal contact, including inhalation.
- Wear protective clothing when risk of exposure occurs.
- Use in a well-ventilated area.
- Prevent concentration in hollows and sumps.
- DO NOT enter confined spaces until atmosphere has been checked.
- DO NOT allow material to contact humans, exposed food or food utensils.
- Avoid contact with incompatible materials.
- When handling, DO NOT eat, drink or smoke.
- Keep containers securely sealed when not in use.
- Avoid physical damage to containers.
- Always wash hands with soap and water after handling.

- Work clothes should be laundered separately.
- Launder contaminated clothing before re-use.
- Use good occupational work practice.
- Observe manufacturer's storing and handling recommendations.
- Atmosphere should be regularly checked against established exposure standards to ensure safe working conditions are maintained.

RECOMMENDED STORAGE METHODS

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- Polyethylene or polypropylene container.
- Packing as recommended by manufacturer
- Check all containers are clearly labeled and free from leaks.

STORAGE REQUIREMENTS

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- Store in original containers.
- Keep containers securely sealed.
- Store in a cool, dry, well-ventilated area.
- Store away from incompatible materials and foodstuff containers.
- Protect containers against physical damage and check regularly for leaks.
- Observe manufacturer's storing and handling recommendations.

SAFE STORAGE WITH OTHER CLASSIFIED CHEMICALS

X X + X X +

X: Must not be stored together
O: May be stored together with specific preventions
+: May be stored together

Section 8 - EXPOSURE CONTROLS / PERSONAL PROTECTION

EXPOSURE CONTROLS

Source	Material	TWA ppm	TWA mg/m³	STEL ppm	STEL mg/m³	Peak ppm	Peak mg/m³	TWA F/CC	Notes
Canada - British Columbia Occupational Exposure Limits	glycerol (Glycerin - mist, Respirable)		3						
Canada - British Columbia Occupational Exposure Limits	glycerol (Glycerin - mist)		10						
US - Minnesota Permissible Exposure Limits (PELs)	glycerol (Glycerin (mist) - Total dust)		10						
Canada - Ontario Occupational Exposure Limits	glycerol (Glycerin mist)		10						
US OSHA Permissible Exposure Levels (PELs) - Table Z1	glycerol (Glycerin (mist) - Respirable fraction)		5						
US OSHA Permissible Exposure Levels (PELs) - Table Z1	glycerol (Glycerin (mist) - Total dust)		15						
Canada - Alberta Occupational Exposure Limits	glycerol (Glycerin mist)		10						
US ACGIH Threshold Limit Values (TLV)	glycerol (Glycerin)		10						Measured as the mist. TLV Basis: upper respiratory tract irritation

US - Minnesota Permissible Exposure Limits (PELs)	glycerol (Glycerin (mist) - Respirable fraction)	5	
US - Vermont Permissible Exposure Limits Table Z-1-A Transitional Limits for Air Contaminants	glycerol (Glycerin (mist) - Respirable fraction)	5	
US - Vermont Permissible Exposure Limits Table Z-1-A Transitional Limits for Air Contaminants	glycerol (Glycerin (mist) - Total dust)	15	
US - Vermont Permissible Exposure Limits Table Z-1-A Final Rule Limits for Air Contaminants	glycerol (Glycerin (mist) - Respirable fraction)	5	
US - Vermont Permissible Exposure Limits Table Z-1-A Final Rule Limits for Air Contaminants	glycerol (Glycerin (mist) - Total dust)	10	
US - Idaho - Limits for Air Contaminants	glycerol (Glycerin (mist) - Respirable fraction)	5	
US - Idaho - Limits for Air Contaminants	glycerol (Glycerin (mist) - Total dust)	15	
US - Tennessee Occupational Exposure Limits - Limits For Air Contaminants	glycerol (Glycerin (mist) Respirable fraction)	5	
US - Tennessee Occupational Exposure Limits - Limits For Air Contaminants	glycerol (Glycerin (mist) Total dust)	10	
Canada - Quebec Permissible Exposure Values for Airborne Contaminants (English)	glycerol (Glycerin (mist))	10	
US - Hawaii Air Contaminant Limits	glycerol (Glycerin (mist) - Respirable fraction)	5	
US - Hawaii Air Contaminant Limits	glycerol (Glycerin (mist) - Total dust)	10	
US - Alaska Limits for Air Contaminants	glycerol (Glycerin (mist) - Respirable fraction)	5	
US - Alaska Limits for Air Contaminants	glycerol (Glycerin (mist) - Total dust)	10	
US - Washington Permissible exposure limits of air contaminants	glycerol (Glycerin mist - Total particulate)	10	20
Canada - Yukon Permissible Concentrations for Airborne Contaminant Substances	glycerol (Glycerin mist)	(See Table 11)	
Canada - Saskatchewan Occupational Health and Safety Regulations - Contamination Limits	glycerol (Glycerin mist)	10	20
US - Washington Permissible exposure limits of air contaminants	glycerol (Glycerin mist - Respirable fraction)	5	10

US - Michigan Exposure Limits for Air Contaminants	glycerol (Glycerin, Respirable mist)		5		
Canada - Prince Edward Island Occupational Exposure Limits	glycerol (Glycerin)		10		Measured as the mist. TLV Basis: upper respiratory tract irritation
Canada - Nova Scotia Occupational Exposure Limits	glycerol (Glycerin)		10		Measured as the mist. TLV Basis: upper respiratory tract irritation
US - Wyoming Toxic and Hazardous Substances Table Z1 Limits for Air Contaminants	glycerol (Glycerin (mist)- Respirable fraction)		5		
US - Wyoming Toxic and Hazardous Substances Table Z1 Limits for Air Contaminants	glycerol (Glycerin (mist)- Total dust)		15		
US - Oregon Permissible Exposure Limits (Z1)	glycerol (Glycerin (mist) Total Dust)		10		*
US - Michigan Exposure Limits for Air Contaminants	glycerol (Glycerin, Total mist)		10		
Canada - Northwest Territories Occupational Exposure Limits (English)	glycerol (Glycerin mist)		10	20	
US - Oregon Permissible Exposure Limits (Z1)	glycerol (Glycerin (mist) Respirable Fraction)		5		*
US AIHA Workplace Environmental Exposure Levels (WEELs)	2-mercaptoethanol (Mercaptoethanol)	0.2			skin
US OSHA Permissible Exposure Levels (PELs) - Table Z3	sodium lauryl sulfate (Inert or Nuisance Dust: (d) Respirable fraction)		5		
US OSHA Permissible Exposure Levels (PELs) - Table Z3	sodium lauryl sulfate (Inert or Nuisance Dust: (d) Total dust)		15		
US - Oregon Permissible Exposure Limits (Z3)	sodium lauryl sulfate (Inert or Nuisance Dust: (d) Respirable fraction)		5		*
US - Oregon Permissible Exposure Limits (Z3)	sodium lauryl sulfate (Inert or Nuisance Dust: (d) Total dust)		10		*
US OSHA Permissible Exposure Levels (PELs) - Table Z3	tris(hydroxymethyl)aminomethane hydrochloride (Inert or Nuisance Dust: (d) Respirable fraction)		5		
US OSHA Permissible Exposure Levels (PELs) - Table Z3	tris(hydroxymethyl)aminomethane hydrochloride (Inert or Nuisance Dust: (d) Total dust)		15		
US - Oregon Permissible Exposure Limits (Z3)	tris(hydroxymethyl)aminomethane hydrochloride (Inert or Nuisance Dust: (d) Respirable fraction)		5		*
US - Oregon Permissible Exposure Limits (Z3)	tris(hydroxymethyl)aminomethane hydrochloride (Inert or Nuisance Dust: (d) Total dust)		10		*

US OSHA Permissible Exposure Levels (PELs) - Table Z3	bromophenol blue (Inert or Nuisance Dust: (d) Respirable fraction)	5			
US OSHA Permissible Exposure Levels (PELs) - Table Z3	bromophenol blue (Inert or Nuisance Dust: (d) Total dust)	15			
US - Oregon Permissible Exposure Limits (Z3)	bromophenol blue (Inert or Nuisance Dust: (d) Respirable fraction)	5			*
US - Oregon Permissible Exposure Limits (Z3)	bromophenol blue (Inert or Nuisance Dust: (d) Total dust)	10			*

The following materials had no OELs on our records

• water: CAS:7732-18-5

MATERIAL DATA

BROMOPHENOL BLUE:
SODIUM LAURYL SULFATE:
TRIS(HYDROXYMETHYL)AMINOMETHANE HYDROCHLORIDE:

• It is the goal of the ACGIH (and other Agencies) to recommend TLVs (or their equivalent) for all substances for which there is evidence of health effects at airborne concentrations encountered in the workplace.

At this time no TLV has been established, even though this material may produce adverse health effects (as evidenced in animal experiments or clinical experience). Airborne concentrations must be maintained as low as is practically possible and occupational exposure must be kept to a minimum.

NOTE: The ACGIH occupational exposure standard for Particles Not Otherwise Specified (P.N.O.S) does NOT apply.

GLYCEROL:
SODIUM LAURYL SULFATE:
TRIS(HYDROXYMETHYL)AMINOMETHANE HYDROCHLORIDE:

• Sensory irritants are chemicals that produce temporary and undesirable side-effects on the eyes, nose or throat. Historically occupational exposure standards for these irritants have been based on observation of workers' responses to various airborne concentrations. Present day expectations require that nearly every individual should be protected against even minor sensory irritation and exposure standards are established using uncertainty factors or safety factors of 5 to 10 or more. On occasion animal no-observable-effect-levels (NOEL) are used to determine these limits where human results are unavailable. An additional approach, typically used by the TLV committee (USA) in determining respiratory standards for this group of chemicals, has been to assign ceiling values (TLV C) to rapidly acting irritants and to assign short-term exposure limits (TLV STELs) when the weight of evidence from irritation, bioaccumulation and other endpoints combine to warrant such a limit. In contrast the MAK Commission (Germany) uses a five-category system based on intensive odour, local irritation, and elimination half-life. However this system is being replaced to be consistent with the European Union (EU) Scientific Committee for Occupational Exposure Limits (SCOEL); this is more closely allied to that of the USA.

OSHA (USA) concluded that exposure to sensory irritants can:

- cause inflammation
- cause increased susceptibility to other irritants and infectious agents
- lead to permanent injury or dysfunction
- permit greater absorption of hazardous substances and
- acclimate the worker to the irritant warning properties of these substances thus increasing the risk of overexposure.

Laemmli Sample Buffer
Not available

GLYCEROL:

The mist is considered to be a nuisance particulate which appears to have little adverse effect on the lung and does not produce significant organic disease or toxic effects. OSHA concluded that the nuisance particulate limit would protect the worker form kidney damage and perhaps, testicular effects.

2-MERCAPTOETHANOL:

• for 2-mercaptoethanol:
CEL TWA: 0.2 ppm; 6 mg/m3 (SKIN) (compare WEEL-TWA)
Threshold Recognition Value: 0.1 to 1.00 ppm

2-mercaptoethanol has a highly offensive odour and is absorbed through the skin. The no-observed-adverse-effect-level (NOAEL) in rats exposed for 6-months to the vapour was 2 ppm (6 mg/m3).

The American Industrial Hygiene Association (AIHA) recommend a Workplace Environmental Exposure Level (WEEL) as providing an adequate margin of safety for employee health and to minimise complaints due to odour.

Odour Threshold Value for hydrogen sulfide: 0.0011 ppm (detection), 0.0045 ppm (recognition)

NOTE: Detector tubes for hydrogen sulfide, measuring in excess of 0.5 ppm are available commercially.

The TLV-TWA is protective against sudden death, eye irritation, neurasthenic symptoms such as fatigue, headache, dizziness, and irritability, or permanent central nervous system effects that may result from acute, subchronic, or acute exposure to hydrogen sulfide. The offensive odour of hydrogen sulfide does not give a reliable warning signal because olfactory fatigue occurs at concentrations of 150 to 200 ppm.

Hydrogen sulfide is probably the leading cause of sudden death in the workplace. Lethal hydrogen sulfide toxicity following inhalation of 1000-2000 ppm paralyses the respiratory centre and causes breathing to stop. At concentrations between 500 to 1000 pm, the carotid bodies are stimulated causing hypernea which is followed by apnea. Low concentrations
(50-1500 ppm) produce eye and respiratory tract irritation. Prolonged exposure to concentrations of the order of 250-500 ppm may produce pulmonary oedema although 50 ppm has also reportedly produced this effect.

Concentrations in excess of 50 ppm produce acute conjunctivitis with pain, lachrymation and photophobia. These acute changes may progress to keratoconjunctivitis and vesiculation of the corneal epithelium.

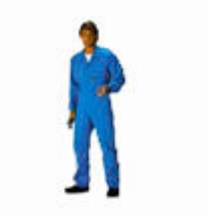
Concentrations between 5 and 30 ppm produce ocular toxicity.

Odour Safety Factor(OSF)

OSF=1.2E3 (HYDROGEN SULFIDE).
Exposure limits with "skin" notation indicate that vapor and liquid may be absorbed through intact skin. Absorption by skin may readily exceed vapor inhalation exposure. Symptoms for skin absorption are the same as for inhalation. Contact with eyes and mucous membranes may also contribute to overall exposure and may also invalidate the exposure standard.
WATER:
• No exposure limits set by NOHSC or ACGIH.

PERSONAL PROTECTION






Consult your EHS staff for recommendations

EYE

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- Safety glasses with side shields.
- Chemical goggles.
- Contact lenses pose a special hazard; soft lenses may absorb irritants and all lenses concentrate them. DO NOT wear contact lenses.

HANDS/FEET

• Wear chemical protective gloves, eg. PVC.
Wear safety footwear or safety gumboots, eg. Rubber.
NOTE: The material may produce skin sensitization in predisposed individuals. Care must be taken, when removing gloves and other protective equipment, to avoid all possible skin contact.
Suitability and durability of glove type is dependent on usage. Important factors in the selection of gloves include: such as:

- frequency and duration of contact,
- chemical resistance of glove material,
- glove thickness and
- dexterity

Select gloves tested to a relevant standard (e.g. Europe EN 374, US F739).

- When prolonged or frequently repeated contact may occur, a glove with a protection class of 5 or higher (breakthrough time greater than 240 minutes according to EN 374) is recommended.
- When only brief contact is expected, a glove with a protection class of 3 or higher (breakthrough time greater than 60 minutes according to EN 374) is recommended.
- Contaminated gloves should be replaced.

Gloves must only be worn on clean hands. After using gloves, hands should be washed and dried thoroughly. Application of a non-perfumed moisturiser is recommended.

OTHER

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- Overalls.
- P.V.C. apron.
- Barrier cream.
- Skin cleansing cream.
- Eye wash unit.

RESPIRATOR

• Selection of the Class and Type of respirator will depend upon the level of breathing zone contaminant and the chemical nature of the contaminant. Protection Factors (defined as the ratio of contaminant outside and inside the mask) may also be important.

Breathing Zone Level ppm (volume)	Maximum Protection Factor	Half-face Respirator	Full-Face Respirator
1000	10	AB-1 P	-
1000	50	-	AB-1 P
5000	50	Airline*	-
5000	100	-	AB-2 P
10000	100	-	AB-3 P
	100+		Airline* *

* - Continuous Flow ** - Continuous-flow or positive pressure demand.
The local concentration of material, quantity and conditions of use determine the type of personal protective equipment required.
Use appropriate NIOSH-certified respirator based on informed professional judgement. In conditions where no reasonable estimate of exposure can be made, assume the exposure is in a concentration IDLH and use NIOSH-certified full face pressure demand SCBA with a minimum service life of 30 minutes, or a combination full facepiece pressure demand SAR with auxiliary self-contained air supply. Respirators provided only for escape from IDLH atmospheres shall be NIOSH-certified for escape from the atmosphere in which they will be used.

ENGINEERING CONTROLS

• General exhaust is adequate under normal operating conditions. Local exhaust ventilation may be required in special circumstances. If risk of overexposure exists, wear an approved respirator An approved respirator (supplied air type) may be required in special circumstances. Correct fit is essential to ensure adequate protection. Provide adequate ventilation in warehouses and enclosed storage areas.
Air contaminants generated in the workplace possess varying "escape" velocities which, in turn, determine the "capture velocities" of fresh

circulating air required to effectively remove the contaminant.

Type of Contaminant:	Air Speed:
solvent, vapors, degreasing etc., evaporating from tank (in still air).	0.25-0.5 m/s (50-100 f/min)
aerosols, fumes from pouring operations, intermittent container filling, low speed conveyer transfers, welding, spray drift, plating acid fumes, pickling (released at low velocity into zone of active generation)	0.5-1 m/s (100-200 f/min.)
direct spray, spray painting in shallow booths, drum filling, conveyer loading, crusher dusts, gas discharge (active generation into zone of rapid air motion)	1-2.5 m/s (200-500 f/min.)
grinding, abrasive blasting, tumbling, high speed wheel generated dusts (released at high initial velocity into zone of very high rapid air motion)	2.5-10 m/s (500-2000 f/min.)

Within each range the appropriate value depends on:

Lower end of the range	Upper end of the range
1: Room air currents minimal or favorable to capture	1: Disturbing room air currents
2: Contaminants of low toxicity or of nuisance value only.	2: Contaminants of high toxicity
3: Intermittent, low production.	3: High production, heavy use
4: Large hood or large air mass in motion	4: Small hood-local control only

Simple theory shows that air velocity falls rapidly with distance away from the opening of a simple extraction pipe. Velocity generally decreases with the square of distance from the extraction point (in simple cases). Therefore the air speed at the extraction point should be adjusted, accordingly, after reference to distance from the contaminating source. The air velocity at the extraction fan, for example, should be a minimum of 1-2 m/s (200-400 f/min) for extraction of solvents generated in a tank 2 meters distant from the extraction point. Other mechanical considerations, producing performance deficits within the extraction apparatus, make it essential that theoretical air velocities are multiplied by factors of 10 or more when extraction systems are installed or used.

Section 9 - PHYSICAL AND CHEMICAL PROPERTIES

PHYSICAL PROPERTIES

Liquid.

State	Liquid	Molecular Weight	Not Applicable
Melting Range (°F)	Not Available	Viscosity	Not Available
Boiling Range (°F)	Not Available	Solubility in water (g/L)	Not Available
Flash Point (°F)	Not Available	pH (1% solution)	Not Available
Decomposition Temp (°F)	Not Available	pH (as supplied)	Not Available
Autoignition Temp (°F)	Not Applicable	Vapour Pressure (mmHG)	Not Available
Upper Explosive Limit (%)	Not Applicable	Specific Gravity (water=1)	Not Available
Lower Explosive Limit (%)	Not Applicable	Relative Vapor Density (air=1)	Not Available
Volatile Component (%vol)	Not Available	Evaporation Rate	Not Available

APPEARANCE

Colourless liquid with an unpleasant odour; mixes with water.

Section 10 - CHEMICAL STABILITY

CONDITIONS CONTRIBUTING TO INSTABILITY

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- Presence of incompatible materials.
- Product is considered stable.
- Hazardous polymerization will not occur.

STORAGE INCOMPATIBILITY

• Glycerol:

- reacts violently with strong oxidisers, acetic anhydride, alkali metal hydrides, calcium hypochlorite, calcium oxychloride, chlorine, chromic anhydride, chromium oxides, ethylene oxide, hydrogen peroxide, phosphorous triiodide, potassium chlorate, potassium permanganate, potassium peroxide, silver perchlorate, sodium hydride, sodium peroxide, sodium triiodide, sodium tetrahydroborate,is incompatible with strong acids, caustics, aliphatic amines, isocyanates, uranium fluoride
- is able to polymerise above 145 C

2-Mercaptoethanol

- reacts violently with strong oxidisers
- is incompatible with strong acids, caustics, aliphatic amines. isocyanates

For incompatible materials - refer to Section 7 - Handling and Storage.

Section 11 - TOXICOLOGICAL INFORMATION

Laemmli Sample Buffer

TOXICITY AND IRRITATION

WATER:
TRIS(HYDROXYMETHYL)AMINOMETHANE HYDROCHLORIDE:
- No significant acute toxicological data identified in literature search.

SODIUM LAURYL SULFATE:
TRIS(HYDROXYMETHYL)AMINOMETHANE HYDROCHLORIDE:
2-MERCAPTOETHANOL:
- Asthma-like symptoms may continue for months or even years after exposure to the material ceases. This may be due to a non-allergenic condition known as reactive airways dysfunction syndrome (RADS) which can occur following exposure to high levels of highly irritating compound. Key criteria for the diagnosis of RADS include the absence of preceding respiratory disease, in a non-atopic individual, with abrupt onset of persistent asthma-like symptoms within minutes to hours of a documented exposure to the irritant. A reversible airflow pattern, on spirometry, with the presence of moderate to severe bronchial hyperreactivity on methacholine challenge testing and the lack of minimal lymphocytic inflammation, without eosinophilia, have also been included in the criteria for diagnosis of RADS. RADS (or asthma) following an irritating inhalation is an infrequent disorder with rates related to the concentration of and duration of exposure to the irritating substance. Industrial bronchitis, on the other hand, is a disorder that occurs as result of exposure due to high concentrations of irritating substance (often particulate in nature) and is completely reversible after exposure ceases. The disorder is characterised by dyspnea, cough and mucus production.

2-MERCAPTOETHANOL:
SODIUM LAURYL SULFATE:
TRIS(HYDROXYMETHYL)AMINOMETHANE HYDROCHLORIDE:
GLYCEROL:
- unless otherwise specified data extracted from RTECS - Register of Toxic Effects of Chemical Substances.
- Not available. Refer to individual constituents.

GLYCEROL:

TOXICITY	IRRITATION
Oral (Rat) LD50: 12600 mg/kg	
Oral (Guinea pig) LD50: 7750 mg/kg	
Oral (Human) TDLo: 1428 mg/kg	
Intraperitoneal (Rat) LD50: 4420 mg/kg	
Subcutaneous (Rat) LD50: 100 mg/kg	
Intravenous (Rat) LD50: 5566 mg/kg	
Oral (Mouse) LD50: 4090 mg/kg	
Intraperitoneal (Mouse) LD50: 8700 mg/kg	
Subcutaneous (Mouse) LD50: 91 mg/kg	
Intravenous (Mouse) LD50: 4250 mg/kg	

• For glycerol:

Acute toxicity: Glycerol is of a low order of acute oral and dermal toxicity with LD50 values in excess of 4000 mg/kg bw. At very high dose levels, the signs of toxicity include tremor and hyperaemia of the gastro-intestinal -tract. Skin and eye irritation studies indicate that glycerol has low potential to irritate the skin and the eye. The available human and animal data, together with the very widespread potential for exposure and the absence of case reports of sensitisation, indicate that glycerol is not a skin sensitiser.

Repeat dose toxicity: Repeated oral exposure to glycerol does not induce adverse effects other than local irritation of the gastro-intestinal tract. The overall NOEL after prolonged treatment with glycerol is 10,000 mg/kg bw/day (20% in diet). At this dose level no systemic or local effects were observed. For inhalation exposure to aerosols, the NOAEC for local irritant effects to the upper respiratory tract is 165 mg/m3 and 662 mg/m3 for systemic effects.

Genotoxicity: Glycerol is free from structural alerts, which raise concern for mutagenicity. Glycerol does not induce gene mutations in bacterial strains, chromosomal effects in mammalian cells or primary DNA damage in vitro. Results of a limited gene mutation test in mammalian cells were of uncertain biological relevance. In vivo, glycerol produced no statistically significant effect in a chromosome aberrations and dominant lethal study. However, the limited details provided and the absence of a positive control, prevent any reliable conclusions to be drawn from the in vivo data. Overall, glycerol is not considered to possess genotoxic potential.

Carcinogenicity: The experimental data from a limited 2 year dietary study in the rat does not provide any basis for concerns in relation to carcinogenicity. Data from non-guideline studies designed to investigate tumour promotion activity in male mice suggest that oral administration of glycerol up to 20 weeks had a weak promotion effect on the incidence of tumour formation.

Reproductive and developmental toxicity: No effects on fertility and reproductive performance were observed in a two generation study with glycerol administered by gavage (NOAEL 2000 mg/kg bw/day). No maternal toxicity or teratogenic effects were seen in the rat, mouse or rabbit at the highest dose levels tested in a guideline comparable teratogenicity study (NOEL 1180 mg/kg bw/day).

TOXICITY	**IRRITATION**
2-MERCAPTOETHANOL:	
Oral (rat) LD50: 244 mg/kg	Skin (rabbit): 10 mg/24h (open)
Inhalation (mouse) LC50: 13200 mg/m³	Eye (rabbit): 1 mg - SEVERE

Dermal (rabbit) LD50: 150 mg/kg

Oral (Rat) LD50: 131 mg/kg *

Dermal (Rabbit) LD50: 251 mg/kg *

Inhalation (Rat) LC50: 2000 mg/m^3/4h *

- Contact allergies quickly manifest themselves as contact eczema, more rarely as urticaria or Quincke's edema. The pathogenesis of contact eczema involves a cell-mediated (T lymphocytes) immune reaction of the delayed type. Other allergic skin reactions, e.g. contact urticaria, involve antibody-mediated immune reactions. The significance of the contact allergen is not simply determined by its sensitization potential: the distribution of the substance and the opportunities for contact with it are equally important. A weakly sensitizing substance which is widely distributed can be a more important allergen than one with stronger sensitizing potential with which few individuals come into contact. From a clinical point of view, substances are noteworthy if they produce an allergic test reaction in more than 1% of the persons tested.

The material may produce severe irritation to the eye causing pronounced inflammation. Repeated or prolonged exposure to irritants may produce conjunctivitis.

Tremors, convulsion, excitement, spasticity, respiratory depression recorded.

Genetic Toxicity: AMES - Negative; Mouse Lymphoma Forward Mutation Assay - Negative; In Vitro Sister Chromatid Exchange - Negative *

*Chevron Philips MSDS

Genetic toxicity: Results from a number of genotoxicity studies with microorganisms, mammalian cell culture and mammals are available. Taking into account all of the information, there is no indication that the substance is genotoxic.

Reproductive toxicity: The results of animal studies gave no indication of a fertility impairing effect.

The results were determined in a Screening test (OECD 421/422).

Developmental toxicity/teratogenicity: A teratogenic potential cannot be excluded. The results were determined in a Screening test (OECD 421/422).

Other information: Skin resorption hazard.

** BASF MSDS

SODIUM LAURYL SULFATE:

Oral (rat) LD50: 1288 mg/kg	Skin (human): 25 mg/24 hr - Mild
	Skin (None) None: rabbit None 50 mg/24 Eye (rabbit) 10: mg-
	Eye (None) None: rabbit None 250 ug Skin (rabbit):25 mg/24 hr-Moderate
	Eye (rabbit):100 mg/24 hr-Moderate

- Alkyl sulfates (AS) anionic surfactants are generally classified according to Comité Européen des Agents de Surface et leurs Intermédiaires Organiques (CESIO) as Irritant (Xi) with the risk phrases R38 (Irritating to skin) and R41 (Risk of serious damage to eyes). An exception has been made for C12 AS which is classified as Harmful (Xn) with the risk phrases R22 (Harmful if swallowed) and R38 and R41 (CESIO 2000). AS are not included in Annex 1 of list of dangerous substances of Council Directive 67/548/EEC.

AS are readily absorbed from the gastrointestinal tract after oral administration. Penetration of AS through intact skin appears to be minimal. AS are extensively metabolized in various species resulting in the formation of several metabolites. The primary metabolite is butyric acid-4-sulfate. The major site of metabolism is the liver. AS and their metabolites are primarily eliminated via the urine and only minor amounts are eliminated via the faeces. In rats about 70-90% of the dose was eliminated via the urine within 48 hours after oral, intravenous or intraperitoneal administration of 1 mg of AS per rat. The acute toxicity of AS in animals is considered to be low after skin contact or oral intake.

For a homologous series of AS (C8 to C16), maximum swelling of stratum corneum (the outermost layer of epidermis) of the skin was produced by the C12 homologue. This is in accordance with the fact that the length of the hydrophobic alkyl chain influences the skin irritation potential. Other studies have shown that especially AS of chain lengths C11, C12 and C13 remove most amino acids and soluble proteins from the skin during washing.

Concentrated samples of AS are skin irritants in rabbits and guinea pigs. AS are non-irritant to laboratory animals at a 0.1% concentration. C12 AS is used in research laboratories as a standard substance to irritate skin and has been shown to induce an irritant eczema. AS were found, by many authors, to be the most irritating of the anionic surfactants, although others have judged the alkyl sulfates only as irritant as laurate (fatty acid soap).

A structure/effect relationship with regard to the length of the alkyl chain can also be observed on mucous membranes. The maximum eye irritation occurs at chain lengths of C10 to C14 . In acute ocular tests, 10% C12 AS caused corneal damage to the rabbit eyes if not irrigated. Another study showed that a 1.0% aqueous C12 AS solution only had a slight effect on rabbit eyes, whereas 5% C12 AS caused temporary conjunctivitis, and 25% C12 AS resulted in corneal damage.

In a 13-week feeding study, rats were fed dietary levels of 0, 40, 200, 1,000 or 5,000 ppm of C12 AS. The only test material related effect observed was an increase in absolute organ weights in the rats fed with the highest concentration which was 5,000 ppm. The organ weights were not further specified and no other abnormalities were found.

In a mutagenicity study, rats were fed 1.13 and 0.56% C12 AS in the diet for 90 days. This treatment did not cause chromosomal aberrations in the bone marrow cells.

Mutagenicity studies with Salmonella typhimurium strains (Ames test) indicate no mutagenic effects of C12 AS). The available long-term studies in experimental animals (rats and mice) are inadequate to evaluate the carcinogenic potential of AS. However, in studies in which animals were administered AS in the diet at levels of up to 4% AS, there was no indication of increased risk of cancer after oral ingestion.

No specific teratogenic effects were observed in rabbits, rats or mice when pregnant animals were dosed with 0.2, 2.0, 300 and 600 mg C12 AS/kg body weight/day by gavage during the most important period of organogenesis (day 6 to 15 of pregnancy for mice and rats and day 6 to 18 of pregnancy for rabbits). Reduced litter size, high incidence of skeletal abnormalities and foetal loss were observed in mice at 600 mg C12 AS/kg/day, a dose level which also caused severe toxic effects in the parent animals in all three species . An aqueous solution of 2% AS was applied (0.1 ml) once daily to the dorsal skin (2 x 3 cm) of pregnant mice from day 1 to day 17 of gestation. A solution of 20% AS was tested likewise from day 1 to day 10 of gestation. The mice were killed on days 11 and 18, respectively. A significant decrease in the number of implantations was observed when mice were treated with 20% AS compared to a control group which was dosed with water. No evidence of teratogenic effects was noted.

When aqueous solutions of 2% and 20% AS (0.1 ml) were applied once per day to the dorsal skin (2 x 3 cm) of pregnant ICR/Jc1 mice from day 12 to day 17 of gestation no effects on pregnancy outcome were detected. Treatment with 20% AS resulted in growth retardation of suckling mice, but this effect disappeared after weaning. A 10% AS solution (0.1 ml) was applied twice daily to the dorsal skin (2 x 3 cm) of pregnant ICR/Jc1 mice during the preimplantation period (days 0-3 of gestation). A significant number of embryos collected on day 3 as severely deformed or remained at the morula stage. The number of embryos in the oviducts was significantly greater for the mice dosed with AS as compared to the control mice. No pathological changes were detected in the major organs of the dams.

NOTE: Substance has been shown to be mutagenic in at least one assay, or belongs to a family of chemicals producing damage or change to cellular DNA.

TRIS(HYDROXYMETHYL)AMINOMETHANE HYDROCHLORIDE:
WATER:

CARCINOGEN

ORGANIC BROMINE COMPOUNDS	US Environmental Defense Scorecard Suspected Carcinogens	Reference(s)	P65-MC

SKIN

2-mercaptoethanol	ND	Notes	skin
tris(hydroxymethyl)aminomethane hydrochloride	ND	Notes	Skin
tris(hydroxymethyl)aminomethane hydrochloride	ND	Notation	Skin
tris(hydroxymethyl)aminomethane hydrochloride	Canada - Alberta Occupational Exposure Limits - Skin	Substance Interaction	1

Section 12 - ECOLOGICAL INFORMATION

Refer to data for ingredients, which follows:
2-MERCAPTOETHANOL:
BROMOPHENOL BLUE:
Laemmli Sample Buffer
- Very toxic to aquatic organisms.

SODIUM LAURYL SULFATE:
BROMOPHENOL BLUE:
2-MERCAPTOETHANOL:
- Do NOT allow product to come in contact with surface waters or to intertidal areas below the mean high water mark. Do not contaminate water when cleaning equipment or disposing of equipment wash-waters.

Wastes resulting from use of the product must be disposed of on site or at approved waste sites.
GLYCEROL:
2-MERCAPTOETHANOL:
SODIUM LAURYL SULFATE:
TRIS(HYDROXYMETHYL)AMINOMETHANE HYDROCHLORIDE:
BROMOPHENOL BLUE:
Laemmli Sample Buffer
- DO NOT discharge into sewer or waterways.

Laemmli Sample Buffer
/53
GLYCEROL:

• Algae IC50 (72hr.) (mg/l):	2900- 10000
• log Kow (Sangster 1997):	- 1.76
• log Pow (Verschueren 1983):	1.07692307
• BOD5:	51%
• COD:	95%
• ThOD:	93%

- For glycerol

log Kow : -2.66- -2.47
BOD 5: 0.617-0.87,31-51%
COD : 1.16,82-95%

ThOD : 1.217-1.56
Completely biodegradable.
Environmental fate:
Based on the relevant physical-chemical properties and the fact that glycerol is readily biodegradable, glycerol will partition primarily to water.
Biodegradability: Glycerol is considered to be readily biodegradable in the aquatic environment. Pre-adapted microorganisms can degrade glycerol rapidly under both aerobic and anaerobic conditions.
Bioaccumulation: Based on Log Kow -1.76, glycerol will have a low bioaccumulation potential and is not expected to bioaccumulate.
Photodegradation: The calculated half-life for the photo-oxidation (reaction with hydroxyl radicals) of glycerol in air is 6.8 hours (EPIWIN vs 3.04).
Stability in Water: Glycerol does not contain functional groups that are expected to react with water.
Transport between Environmental Compartments: From the EQC model (Mackay level III), it can be deduced that 100% of glycerol will end up in the water phase. Negligible amounts will be distributed towards soil, air and sediment
Ecotoxicity:
Fish LC50: >5000 mg/l
Algae IC50: >2900 mg/l
Bacteria EC50: .10000 mg/l (Pseudomonas putida)
The weight of evidence indicates that glycerol is of low toxicity to aquatic organisms and this conclusion is supported by QSAR predictions. The lowest LC50 for fish is a 24-h LC50 of >5000 mg/l for Carassius auratus (Goldfish) and for aquatic invertebrates, a 24 h EC50 of >10000 mg/l for Daphnia magna is the lowest EC50. Several tests on algae are available, which suggest very low toxicity to a range of species, however their validity is uncertain. A QSAR prediction for the 96h EC50 to algae was 78000 mg/l. No toxicity towards the microorganism Pseudomonas putida was observed at 10000 mg/l after exposure for 16 hours. No long-term aquatic toxicity data is available. Screening studies are available on frog and carp embryos which indicate some effects on growth and hatching rates respectively at very high concentrations of glycerol, >7000 mg/l. However, their ecological relevance is not clear.
2-MERCAPTOETHANOL:
- For 2-mercaptoethanol:

Environmental fate:
When released into the soil, this material is expected to leach into groundwater or to evaporate quickly. This material has a log octanol-water partition coefficient of less than 3.0. This material has an estimated bioconcentration factor (BCF) of less than 100. Volatilisation, adsorption and bioconcentration are not expected to be important environmental fate processes.
Air: When released into the air, this material is expected to be readily degraded by reaction with photochemically produced hydroxyl radicals. The material is expected to exist in the aerosol phase with a short half-life and to be readily removed from the atmosphere by wet deposition.
Biodegradability (28 d): <10% (OECD 301 A, aerobic DOC reduction)
COD 1894 mg/g
The material is not readily biodegradable.
Ecotoxicity:
Highly toxic to aquatic organisms
Fish LC50 (96 h): fresh water (Leuciscus idus) 37 mg/l
Daphnia magna EC50 (48 h): 0.4 -0.89 mg/l
Alga EC50 (72 h): Scenedesmus subspicatus 18.6 mg/l The material may hydrolyse - degradation products may be toxic)
Bacterium EC50 (17 h): 125 mg/l.

- The lower molecular weight mercaptans exhibit high vapour pressure and therefore surface transport (by volatilisation) to the atmosphere is expected to be an important fate process. Volatilisation is expected to be an important transport process for these mercaptans in water. Alkyl mercaptans are expected to exist primarily in the vapour-phase in where readily degrade readily in the atmosphere due to reaction with photochemically produced hydroxyl radicals.

Sorption to is though to be low; the extent of sorption however may be directly correlated to the level of organic material within different soil types Biodegradation processes involving methanogenic bacteria may occur.
The mercaptans exhibit high to moderate toxicities towards aquatic species; there is little evidence of bioconcentration or biomagnification through the food chain.

- For hydrogen sulfide:

Environmental fate:
Since hydrogen sulfide exists as a gas at atmospheric pressure, partitioning to the air is likely to occur after environmental releases. However, the compound is also soluble in oil and water, and therefore, may partition as well to surface water, groundwater, or moist soil. In addition, sorption of hydrogen sulfide from air onto soil and plant foliage occurs. Hydrogen sulfide's solubility in pure water varies with temperature from 5.3 g/L at 10 °C to 3.2 g/L at 30 C. Once hydrogen sulfide is dissolved in water, it will dissociate into bisulfide ion (HS-) and sulfide ion (S2-); the ratio of the concentrations of these various ions will depend on the pH of the solution. Hydrogen sulfide can also form insoluble sulfide salts with various metals (i.e., copper, zinc, nickel, and iron) that may be present in soils or environmental waters .
Hydrogen sulfide evaporates easily from water, and the rate of evaporation depends on factors such as temperature, humidity, pKa, pH, and the concentration of certain metal ions. Hydrogen sulfide will cross the air-water interface with kinetics similar to other unreactive gases, such as oxygen (O2), nitrogen (N2), and carbon dioxide (CO2), at pHs <=6. At higher pHs, such as seawater, which has a pH of 8 or greater, hydrogen sulfide escape is enhanced due to an ionic species gradient in the water close to the surface. Complexation of bisulfide and sulfide ions to trace metal ions (i.e., Zn2+, Co2+, and Ni2+) found in seawater will also have an effect on the transport of hydrogen sulfide across the air-water interface.
Clay or organic matter may sorb hydrogen sulfide. Under natural conditions, it is likely that some of the hydrogen sulfide would be oxidized to sulfate, which may be removed by leaching or taken up by plants. This, in turn, may make gas sorption sites available for additional sorption. Several species of soil, aquatic, and marine microorganisms oxidize hydrogen sulfide to elemental sulfur, and its half-time in these environments usually ranges from 1 hour to several hours .Food chain bioconcentration and biomagnification are unlikely.
In the atmosphere, hydrogen sulfide may be oxidized by oxygen (O2) and ozone (O3) to give sulfur dioxide (SO2), and ultimately sulfate compounds. Sulfur dioxide and sulfates are eventually removed from the atmosphere through absorption by plants, deposition on and sorption by soils, or through precipitation. A residence time of approximately 1.7 days at an ozone concentration of 0.05 mg/m3 has been calculated for hydrogen sulfide. The effective life-times for hydrogen sulfide based on summer daytime and yearly average hydroxyl radical concentrations have been estimated to be 0.23 and 2.3 days, respectively, based a measured rate constant of 4.8x10-12 cm3/molecule second. Life-times in air ranging from approximately 1 day in the summer to 42 days in the winter have been estimated for hydrogen sulfide. Hydrogen sulfide is not expected to be decomposed by direct absorption of ultraviolet radiation and the reaction with ozone is not expected to be a significant environmental fate.

In aqueous solution, hydrogen sulfide is a weak acid, exhibiting two acid dissociation constants. The first dissociation yields bisulfide ion (HS–), and the second yields sulfide ion (S2–), with pKa values for each of these dissociations of 7.04 and 11.96, respectively. At a pH of 7.0, the ratio of the concentration of aqueous hydrogen sulfide to bisulfate ion is approximately 1-to-1. As the pH increases above 7.0, the ratio of the concentration of bisulfide ion to aqueous hydrogen sulfide increases. At a pH of 8, the ratio of the concentration of bisulfide ion to the concentration of aqueous hydrogen sulfide is approximately 10-to-1. The relative concentration of sulfide ion does not begin to increase until a pH of 11 is exceeded; only above pH 12 will the concentration of sulfide ion become significant (>50%). Hydrogen sulfide oxidation by O2 readily occurs in surface waters. At 25 °C and pH 8, half-times of 50 and 26 hours were reported for hydrogen sulfide in water and seawater, respectively. Above pH 8, however, the rate of oxidation was independent of pH.

Hydrogen sulfide in waste water may be controlled by addition of oxidizing chemicals, which react to form less toxic byproducts. In warm, damp environments (such as manholes and gravity sewers), hydrogen sulfide may be oxidized by autotrophic bacteria to sulfuric acid . Chemical oxidation of hydrogen sulfide dissolved in sewage water produces sulfur at pH 6–7, while sulfur, polysulfides, thiosulfates, and ultimately sulfate are formed at pHs of 7–9.

Hydrogen sulfide is one of the principal components in the natural sulfur cycle. Bacteria, fungi, and actinomycetes (a fungus-like bacteria) release hydrogen sulfide during the decomposition of sulfur containing proteins and by the direct reduction of sulfate (SO42-). Hydrogen sulfide is also consumed by bacteria found in soil and water that oxidize hydrogen sulfide to elemental sulfur. Photosynthetic bacteria can oxidize hydrogen sulfide to sulfur and sulfate in the presence of light and the absence of oxygen.

A number of microorganisms have been found to degrade hydrogen sulfide to elemental sulfur or sulfate. Among these are a heterotrophic bacterium of the genus Xanthomonas isolated from dimethyl disulfide-acclimated peat, heterotrophic fungi, and a marine isopod. Soils may sorb considerable amounts of hydrogen sulfide from the air, retaining most of it in the form of elemental sulfur. Manganese compound found in these soils appeared to catalyze the oxidation of hydrogen sulfide to elemental sulfur

Ecotoxicity:

Fish LC50 (96 h): 075->0.4 mg/l.

SODIUM LAURYL SULFATE:

- Toxic to aquatic organisms.
- Octanol/ water partition coefficients cannot easily be determined for surfactants because one part of the molecule is hydrophilic and the other part is hydrophobic. Consequently they tend to accumulate at the interface and are not extracted into one or other of the liquid phases. As a result surfactants are expected to transfer slowly, for example, from water into the flesh of fish. During this process, readily biodegradable surfactants are expected to be metabolized rapidly during the process of bioaccumulation. This was emphasized by the OECD Expert Group stating that chemicals are not to be considered to show bioaccumulation potential if they are readily biodegradable. Several anionic and nonionic surfactants have been investigated to evaluate their potential to bioconcentrate in fish. BCF values (BCF - bioconcentration factor) ranging from 1 to 350 were found. These are absolute maximum values resulting from the radio labeling technique used. In all these studies, substantial oxidative metabolism was found resulting in the highest radioactivity in the gall bladder. This indicates liver transformation of the parent compound and biliary excretion of the metabolized compounds, so that "real" bioconcentration is overstated. After correction it can be expected that "real" parent BCF values are one order of magnitude less than those indicated above, i.e. "real" BCF is <100. Therefore the usual data used for classification by EU Directives to determine whether a substance is "Dangerous to the Environment" has little bearing on whether the use of the surfactant is environmentally acceptable.
- For alkyl sulfate (AS surfactants)

For sodium lauryl sulfate:

log Kow: 1.6

Environmental fate:

The biological degradation of AS is initiated by a hydrolytic cleavage of the sulfate ester bond catalysed by alkylsulfatases. The cleavage leaves inorganic sulfate and fatty alcohol which undergo oxidation by dehydrogenases to produce fatty acids via fatty aldehydes. The fatty acids are degraded by beta-oxidation and finally totally mineralised or incorporated into biomass. The biodegradation pathway for secondary AS differs from that of the primary AS by the formation of a ketone instead of an aldehyde. The biological degradation of AS is initiated by a hydrolytic cleavage of the sulfate ester bond catalysed by alkylsulfatases. The cleavage leaves inorganic sulfate and fatty alcohol which undergo oxidation by dehydrogenases to produce fatty acids via fatty aldehydes. The fatty acids are degraded by beta-oxidation and finally totally mineralised or incorporated into biomass. The biodegradation pathway for secondary AS differs from that of the primary AS by the formation of a ketone instead of an aldehyde. Biodegradation under anoxic conditions is anticipated to follow the same pathway as for the aerobic degradation.

Primary and secondary AS generally undergo complete primary biodegradation within a few days followed by a rapid ultimate biodegradation. Branched AS are also degraded quite rapidly, but multiple branchings of the alkyl chain considerably reduce the rate and extent of primary biodegradation. There are numerous studies confirming the aerobic biodegradability of AS, and linear primary AS exceeds all other anionic surfactants in the rate of primary and ultimate biodegradation. Also secondary AS are normally readily biodegradable as, e.g., the oxygen uptake from biodegradation of a linear secondary C10-13 AS corresponded to 77% ThOD in 22 days. Some highly branched AS being poorly primary biodegradable may also resist ultimate biodegradation.

Both linear and 2-alkyl-branched primary AS are degraded to a high extent under anaerobic conditions.

AS are generally considered to have a low potential for bioconcentration in aquatic organisms.

Ecotoxicity:

Fish LC50 (96 h): fathead minnow - fry 10.2 mg/l; juvenile 17 mg/l; adult 22.5 mg/l; rainbow trout 4.6 mg/l (static)

The aquatic toxicity of AS seems to increase with increasing alkyl chain length. This has been shown for daphnids and for some fish species. An overall comparison of the acute toxicity between the primary and secondary AS shows only minor differences in the toxicity, although only a few studies for comparison are available.

The available data describing the toxicity of AS towards algae indicate that the lowest EC50 values range between 1 and 10 mg/l for C12 AS

The toxicity of AS towards invertebrates has mainly been examined in tests with Daphnia magna. The acute toxicity of AS to Daphnia magna increased with increasing alkyl chain length. It has been shown that during degradation of C12 AS, the toxicity first increased to a maximum after 30 hours and then fell to almost a negligible value. The increase in toxicity was explained by the formation of the more toxic dodecanoic acid which is rapidly transformed to other and less toxic metabolites.

The toxicity of AS to fish has been demonstrated to increase with increasing alkyl chain length as also seen in studies with Daphnia magna.

Studies showed that the 24 h-LC50 values for killifish in distilled water decreased by a factor of about 10 when the alkyl chain was increased by two carbon atoms. C16 was 10 times more toxic than C14, which was about 10 times more toxic than C12 AS.

Whereas most correlations between AS structure and toxicity show an increasing toxicity with increasing alkyl chain length, the budding in Hydra attenuata was apparently more affected by C10 AS than by C12, C14, and C16 AS. The authors suggested that the decrease in toxicity with increasing alkyl chain length was attributable to reduced solubility in water.

Environmental and Health Assessment of Substances in Household Detergents and Cosmetic Detergent Products, Environment Project, 615,

2001. Torben Madsen et al: Miljoministeriet (Danish Environmental Protection Agency).
TRIS(HYDROXYMETHYL)AMINOMETHANE HYDROCHLORIDE:
BROMOPHENOL BLUE:
• Bromide ion may be introduced to the environment after the dissociation of various salts and complexes or the degradation of organobromide compounds.
Although not a significant toxin in mammalian or avian systems it is highly toxic to rainbow trout and Daphnia magna. Bromides may also affect the growth of micro-organisms and have been used for this purpose in industry.
Bromides in drinking water are occasionally subject to disinfection processes involving ozone of chlorine. Bromide may be oxidised to produce hypobromous acid which in turn may react with natural organic matter to form brominated compounds. The formation of bromoform has been well documented, as has the formation of bromoacetic acids, bromopicrin, cyanogen bromide, and bromoacetone. Bromates may also be formed following ozonation or chlorination if pH is relatively high. Bromates may be animal carcinogens.
WATER:

Ecotoxicity

Ingredient	Persistence: Water/Soil	Persistence: Air	Bioaccumulation	Mobility
glycerol	LOW		LOW	HIGH
2-mercaptoethanol	LOW		LOW	HIGH
sodium lauryl sulfate	HIGH		LOW	LOW
bromophenol blue	HIGH		LOW	LOW
water	LOW		LOW	HIGH

Section 13 - DISPOSAL CONSIDERATIONS

Disposal Instructions

All waste must be handled in accordance with local, state and federal regulations.
• Legislation addressing waste disposal requirements may differ by country, state and/ or territory. Each user must refer to laws operating in their area. In some areas, certain wastes must be tracked.
A Hierarchy of Controls seems to be common - the user should investigate:

- Reduction
- Reuse
- Recycling
- Disposal (if all else fails)

This material may be recycled if unused, or if it has not been contaminated so as to make it unsuitable for its intended use. If it has been contaminated, it may be possible to reclaim the product by filtration, distillation or some other means. Shelf life considerations should also be applied in making decisions of this type. Note that properties of a material may change in use, and recycling or reuse may not always be appropriate.
DO NOT allow wash water from cleaning equipment to enter drains. Collect all wash water for treatment before disposal.

- Recycle wherever possible.
- Consult manufacturer for recycling options or consult Waste Management Authority for disposal if no suitable treatment or disposal facility can be identified.
- Dispose of by: Burial in a licensed land-fill or Incineration in a licensed apparatus (after admixture with suitable combustible material)
- Decontaminate empty containers. Observe all label safeguards until containers are cleaned and destroyed.

Section 14 - TRANSPORTATION INFORMATION

NOT REGULATED FOR TRANSPORT OF DANGEROUS GOODS: DOT, IATA, IMDG

Section 15 - REGULATORY INFORMATION

Regulations for ingredients

glycerol (CAS: 56-81-5) is found on the following regulatory lists;

"Canada - Alberta Occupational Exposure Limits","Canada - British Columbia Occupational Exposure Limits","Canada - Northwest Territories Occupational Exposure Limits (English)","Canada - Nova Scotia Occupational Exposure Limits","Canada - Ontario Occupational Exposure Limits","Canada - Prince Edward Island Occupational Exposure Limits","Canada - Quebec Permissible Exposure Values for Airborne Contaminants (English)","Canada - Saskatchewan Occupational Health and Safety Regulations - Contamination Limits","Canada - Yukon Permissible Concentrations for Airborne Contaminant Substances","Canada Toxicological Index Service - Workplace Hazardous Materials Information System - WHMIS (English)","Canada Toxicological Index Service - Workplace Hazardous Materials Information System - WHMIS (French)","CODEX General Standard for Food Additives (GSFA) - Additives Permitted for Use in Food in General, Unless Otherwise Specified, in Accordance with GMP","GESAMP/EHS Composite List - GESAMP Hazard Profiles","IMO IBC Code Chapter 18: List of products to which the Code does not apply","IMO MARPOL 73/78 (Annex II) - List of Other Liquid Substances","International Council of Chemical Associations (ICCA) - High Production Volume List","OECD Representative List of High Production Volume (HPV) Chemicals","US - Alaska Limits for Air Contaminants","US - Connecticut Hazardous Air Pollutants","US - Hawaii Air Contaminant Limits","US - Idaho - Limits for Air Contaminants","US - Michigan Exposure Limits for Air Contaminants","US - Minnesota Hazardous Substance List","US - Minnesota Permissible Exposure Limits (PELs)","US - Oregon Permissible Exposure Limits (Z1)","US - Pennsylvania - Hazardous Substance List","US - Rhode Island Hazardous Substance List","US - Tennessee Occupational Exposure Limits - Limits For Air Contaminants","US - Vermont Permissible Exposure Limits Table Z-1-A Final Rule Limits for Air Contaminants","US - Vermont Permissible Exposure Limits Table Z-1-A Transitional Limits for Air Contaminants","US - Washington Permissible exposure limits of air contaminants","US - Wyoming Toxic and Hazardous Substances Table Z1 Limits for Air Contaminants","US ACGIH Threshold Limit Values (TLV)","US DOE Temporary Emergency Exposure Limits (TEELs)","US DOT Coast Guard Bulk Hazardous Materials - List of Flammable and Combustible Bulk Liquid Cargoes","US

EPA High Production Volume Program Chemical List","US FDA Direct Food Substances Generally Recognized as Safe","US FDA Indirect Food Additives: Adhesives and Components of Coatings - Substances for Use Only as Components of Adhesives - Adhesives","US Food Additive Database","US OSHA Permissible Exposure Levels (PELs) - Table Z1","US Toxic Substances Control Act (TSCA) - Inventory","US TSCA Section 8 (a) Inventory Update Rule (IUR) - Partial Exemptions"

2-mercaptoethanol (CAS: 60-24-2) is found on the following regulatory lists;

"Canada Domestic Substances List (DSL)","Canada Ingredient Disclosure List (SOR/88-64)","Canada Toxicological Index Service - Workplace Hazardous Materials Information System - WHMIS (English)","Canada Toxicological Index Service - Workplace Hazardous Materials Information System - WHMIS (French)","International Council of Chemical Associations (ICCA) - High Production Volume List","OECD Representative List of High Production Volume (HPV) Chemicals","US - Massachusetts Oil & Hazardous Material List","US - Minnesota Hazardous Substance List","US - Pennsylvania - Hazardous Substance List","US AIHA Workplace Environmental Exposure Levels (WEELs)","US DOE Temporary Emergency Exposure Limits (TEELs)","US EPA High Production Volume Program Chemical List","US Toxic Substances Control Act (TSCA) - Inventory"

sodium lauryl sulfate (CAS: 151-21-3,1335-72-4,3088-31-1,9004-82-4) is found on the following regulatory lists;

"Canada Ingredient Disclosure List (SOR/88-64)","Canada Toxicological Index Service - Workplace Hazardous Materials Information System - WHMIS (English)","Canada Toxicological Index Service - Workplace Hazardous Materials Information System - WHMIS (French)","OECD Representative List of High Production Volume (HPV) Chemicals","US Cosmetic Ingredient Review (CIR) Cosmetic ingredients found safe, with qualifications","US DOE Temporary Emergency Exposure Limits (TEELs)","US EPA High Production Volume Program Chemical List","US EPA Master Testing List - Index I Chemicals Listed","US FDA Indirect Food Additives: Adhesives and Components of Coatings - Substances for Use Only as Components of Adhesives - Adhesives","US Food Additive Database","US Toxic Substances Control Act (TSCA) - Inventory"

tris(hydroxymethyl)aminomethane hydrochloride (CAS: 1185-53-1) is found on the following regulatory lists;

"Canada Domestic Substances List (DSL)","US DOE Temporary Emergency Exposure Limits (TEELs)","US Toxic Substances Control Act (TSCA) - Inventory"

bromophenol blue (CAS: 115-39-9) is found on the following regulatory lists;

"Canada Domestic Substances List (DSL)","Canada Toxicological Index Service - Workplace Hazardous Materials Information System - WHMIS (English)","US - Maine Chemicals of High Concern List","US DOE Temporary Emergency Exposure Limits (TEELs)","US Toxic Substances Control Act (TSCA) - Inventory"

water (CAS: 7732-18-5) is found on the following regulatory lists;

"Canada Domestic Substances List (DSL)","Canada Toxicological Index Service - Workplace Hazardous Materials Information System - WHMIS (English)","Canada Toxicological Index Service - Workplace Hazardous Materials Information System - WHMIS (French)","IMO IBC Code Chapter 18: List of products to which the Code does not apply","OECD Representative List of High Production Volume (HPV) Chemicals","US - Pennsylvania - Hazardous Substance List","US DOE Temporary Emergency Exposure Limits (TEELs)","US NFPA 30B Manufacture and Storage of Aerosol Products - Chemical Heat of Combustion","US Toxic Substances Control Act (TSCA) - Inventory","US TSCA Section 8 (a) Inventory Update Rule (IUR) - Partial Exemptions"

No data for Laemmli Sample Buffer (CW: 1133858)

Section 16 - OTHER INFORMATION

LIMITED EVIDENCE

- Cumulative effects may result following exposure*.
- Possible respiratory sensitizer*.

* (limited evidence).

Denmark Advisory list for selfclassification of dangerous substances

Substance CAS Suggested codes 2- mercaptoethanol 60- 24- 2 sodium lauryl sulfate 151- 21- 3 Xn Mut3; R68 Repr3; R63 sodium lauryl sulfate 3088- 31- 1 Xn Carc3; R40 Mut3; R68 Repr3; R63

Ingredients with multiple CAS Nos

Ingredient Name	CAS
sodium lauryl sulfate	151-21-3, 1335-72-4, 3088-31-1, 9004-82-4

EXPOSURE STANDARD FOR MIXTURES

- "Worst Case" computer-aided prediction of spray/ mist or fume/ dust components and concentration: • Composite Exposure Standard for Mixture (TWA) :100 mg/m³.

Reasonable care has been taken in the preparation of this information, but the author makes no warranty of merchantability or any other warranty, expressed or implied, with respect to this information. The author makes no representations and assumes no liability for any direct, incidental or consequential damages resulting from its use. For additional technical information please call our toxicology department on +800 CHEMCALL.

- Classification of the mixture and its individual components has drawn on official and authoritative sources as well as independent review by the Chemwatch Classification committee using available literature references.

A list of reference resources used to assist the committee may be found at:
www.chemwatch.net/references.

- The (M)SDS is a Hazard Communication tool and should be used to assist in the Risk Assessment. Many factors determine whether the reported Hazards are Risks in the workplace or other settings. Risks may be determined by reference to Exposures Scenarios. Scale of use, frequency of use and current or available engineering controls must be considered.

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