PIRANHA SOLUTION

(CAS #: Sulfuric Acid: 7664-93-9, Ammonium Hydroxide: 1336-21-6,
Hydrogen Peroxide: 7722-84-1)

NOTE: Refer to Appendix 1 (page 7) for Piranha SOP-training Knowledge Form
Refer to Appendix 2 (page 8) for Sign to be posted on FH when working with PS
Refer to Appendix 3 (page 9) for SDS (Safety Data Sheets) for Piranha Solution SDS

Hazards:

- **May intensify fire; oxidizer**
- **May be corrosive to metals**
- **Causes severe skin burns and eye damage**
- **Piranha solutions may result in explosion if not handled with extreme care**
- **Vapor is highly corrosive, and can damage lungs; if inhaled, remove to fresh air & call 911 for immediate medical attention**

WARNING: Piranha and aqua regia solutions are extremely concentrated and dangerous. Failure to follow proper preparation and disposal procedures may result in explosions, violent boiling and splashing, and severe injury!!

NOTICE: Piranha solution should only be used when less aggressive cleaning methods fail. Piranha solution will remove trace organic and carbon residues from glassware and hydroxylate the glass surface, as well as thoroughly clean fritted glass.

1. Purpose*: to provide step by step guidance on how to work with Piranha solution.*

2. Scope: *applies to all students, staff, faculty, and employees needing to handle Piranha solution. Individuals are responsible for knowing the details of this SOP as well as being familiar with the hazards posed by Piranha solution.*

3. Prerequisites: *Locate the spill kit closest to your lab, spill kits occupy communal spaces in hallways. WHIMIS, EHS101, LMSST (hands on chemistry onboarding training). You must be trained by an experienced person in your lab on the use of Piranha solution.*

4. Responsibilities: *It is the responsibility of all Faculty, staff and students to follow the procedures described in the SOP. Faculty members are required to provide all PPE and ensure safety training.*

5. Personal Protective Equipment (PPE):

Neoprene or butyl rubber

Neoprene apron

6. Handling/Storage Procedure:

1. **All work involving piranha solution should be conducted inside a chemical fume hood.**

2. **Piranha solution should be contained in glass or Pyrex containers. Piranha solution is not compatible with plastic.**

3. **Do not seal containers containing Piranha solution**

4. Individuals working with Piranha solution must utilize a “buddy system” – i.e. a second individual must be:

    a. Informed of the start and finish of use of the Piranha solution;
    b. Capable of receiving instant communication from the Piranha solution user; and

    c. No more than 2 minutes walking distance from the lab in which the Piranha solution is being used.

5. Always add hydrogen peroxide to sulfuric acid slowly. Never vice versa.
6. The hydrogen peroxide component should typically be kept to below 30%,never to exceed 50%.

7. Prepare the minimum volume of solutions to be used up for each application. Do not store Piranha solution in stock.

8. Do not mix Piranha solution with incompatible materials such as organic acids, bases and organic solvents

9. Ensure containers and substrates are rinsed and dried before coming into contact with Piranha solution

7. Piranha Solution Preparation: work inside the Fume hood:

1. **Before** you start preparing Piranha Solution place sign on Fume Hood (appendix 2) and assemble ingredients inside the fume hood:
    a. Concentrated sulfuric acid
    b. 30% w/w hydrogen peroxide solution

    Note: It is extremely important that the concentration of hydrogen peroxide is lower than 50% w/w; otherwise, an explosion may occur.

2. **Slowly** add the 30% hydrogen peroxide to the concentrated sulfuric acid **(NEVER the other way around)** to form a 3:1 ratio solution of three parts sulfuric acid, and one part hydrogen peroxide. Stirring with a magnetic stir bar and stir plate is recommended.

3. This reaction is very exothermic; the solution may bubble and heat up to 120°C. Allow for the solution to react for a few minutes and reach a high temperature before immersing glassware to be cleaned.

4. Allow glassware to be immersed in piranha for five to ten minutes. Stirring or manual scrubbing **is not** required.

5. Carefully remove the glassware from the piranha solution, and rinse thoroughly with distilled water. (inside the fume hood)

8. Waste Management Procedure:

Piranha Solution Disposal:

1. Once cool, slowly add sodium hydroxide solution or sodium bicarbonate to the used piranha solution to neutralize.
    a. Note: Sodium bicarbonate will cause rapid gas release and bubbling as it reacts with the sulfuric acid. Ensure that it is added slowly to control gas formation, and that the glass container is large enough to prevent overflowing.
    b. Alternatively, piranha solution may also be diluted, or neutralized and diluted in combination to a final pH of ~5, at which point it is suitable to be disposed of.
2. Allow for the solution to cool overnight in the fume hood in an open container.
3. Once the solution has cooled, transfer it to a **clean** empty glass bottle and **place the cap on loosely**. <u>This is especially important, as the solution still contains an unknown amount of reactive peroxides. A tightly sealed cap may cause build-up of pressure and an explosion</u>.
    a. **Note: Neutralized piranha solution should not be mixed with other aqueous waste**; it should be placed into an empty glass bottle and labelled accordingly (follow CHEM -SOP- 07, Hazardous Waste Management).
    b. Alternatively, vented bottle caps or vented glass tubing may also be used.
4. Dispose of neutralized solution with the usual departmental waste collection as per CHEM -SOP- 07

9. Emergency Procedure:

In the event of personal exposure:

1. Flush body area for a minimum of 15 minutes:
    a. Contaminated skin should be washed with copious amounts of soap and water; and
    b. Contaminated eyes and mucous membranes should be irrigated using normal saline or water
2. Notify the supervisor, if immediately available. Supervisor to fill out and submit an online incident/accident/occupational disease form. The online form and detailed instructions can be found HERE.
3. <u>**Seek medical attention**. Call 911 for assistance if appropriate</u>.

4. If in doubt, call EHS Occupational Hygiene & Safety at 416-978-4467 to determine further steps

10. Emergency Spill Procedure:

Follow the online chemical spills SOP HERE for more detailed instructions

In the event of a small spill:

Only employees trained in the handling of Piranha should clean up spills. Determine if it is a small spill (as defined by the Spill SOP) and if you can handle the spill.

If so:
1. Eliminate all sources of ignition
2. Notify personnel from the immediate area to stay away from area
3. Notify supervisor
4. Wear appropriate PPE to clean spill
5. Use acid neutralizing material to neutralize piranha solution. Test with litmus paper or colour-indicating solution until the spilled material is within the neutral range of pH 6-8.
6. Clean the area with absorbent materials (available in the spill kit). The area should be soaked with detergent, the rinsed with water. Discard contaminated materials in hazardous waste glass vented bottles and label the bottles with the appropriate waste tag.
7. If in doubt, call EHS Environmental Protection Services at 416-978-7000

In the event of a large spill:

1. Eliminate all sources of ignition
2. Evacuate people from the immediate area and notify supervisor
3. During business hours, call EHS Environmental Protection Services at 416- 978- 7000 and inform the DOTS (grace.flock@utoronto.ca)
4. During off-hours, contact the Campus Police (8-2222).

REPORT ALL SPILLS TO THE DOTS (grace.flock@utoronto.ca)

Resource; Chemwatch SDS Online Access

References:

1. Princeton University, EHS Procedure on Aqua Regia Solutions: https://ehs.princeton.edu/book/export/html/508
2. Princeton University, EHS Procedure on Piranha Solutions: https://ehs.princeton.edu/book/export/html/513
3. University of Illinois, DRS Procedure on Piranha Solutions: https://www.drs.illinois.edu/SafetyLibrary/PiranhaSolutions
4. Yale University, EHS Procedure on Aqua Regia Solutions: https://ehs.yale.edu/sites/default/files/files/aqua-regia-sop.pdf

Appendix 1: Piranha Worker Form

This form is to be completed by the employee/student intending to work with piranha.

Work Conditions

I have read the “Working with Piranha Procedure”. I understand the hazards of working with piranha and how to minimize the risks by following the safe work procedures.

☐ YES ☐ NO

Describe the capacity in which you will be working with piranha

____

____

____

____

Appendix 2

WARNING!!
PIRANHA SOLUTIONS IN USE
EXTREMELY CORROSIVE

Appendix 3:
Safety Data Sheet

Piranha Solution

ChemWatch Review SDS

Chemwatch Hazard Alert Code: **4**

Chemwatch: **4895-10**
Version No: **3.1.1.1**
Safety Data Sheet according to WHS and ADG requirements

Issue Date: **03/13/2019**
Print Date: **08/01/2019**
L.GHS.AUS.EN

SECTION 1 IDENTIFICATION OF THE SUBSTANCE / MIXTURE AND OF THE COMPANY / UNDERTAKING

Product Identifier

Product name	Piranha Solution
Synonyms	Not Available
Proper shipping name	CORROSIVE LIQUID, OXIDISING, N.O.S. (contains hydrogen peroxide and sulfuric acid)
Other means of identification	Not Available

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

Relevant identified uses	Used to remove organic residues from substrates, particularly in microfabrication labs.

Details of the supplier of the safety data sheet

Registered company name	**ChemWatch**
Address	Australia
Telephone	Not Available
Fax	Not Available
Website	Not Available
Email	Not Available

Emergency telephone number

Association / Organisation	**Not Available**
Emergency telephone numbers	Not Available
Other emergency telephone numbers	Not Available

SECTION 2 HAZARDS IDENTIFICATION

Classification of the substance or mixture

Poisons Schedule	S6
Classification [1]	Oxidizing Liquid Category 3, Metal Corrosion Category 1, Skin Corrosion/Irritation Category 1A, Serious Eye Damage Category 1, Carcinogenicity Category 1A
Legend:	*1. Classified by Chemwatch; 2. Classification drawn from HCIS; 3. Classification drawn from Regulation (EU) No 1272/2008 - Annex VI*

Label elements

Hazard pictogram(s)	
SIGNAL WORD	DANGER

Continued...

Hazard statement(s)

H272	May intensify fire; oxidiser.
H290	May be corrosive to metals.
H314	Causes severe skin burns and eye damage.
H350	May cause cancer.

Precautionary statement(s) Prevention

P201	Obtain special instructions before use.
P210	Keep away from heat/sparks/open flames/hot surfaces. - No smoking.
P221	Take any precaution to avoid mixing with combustibles/organic material.
P260	Do not breathe dust/fume/gas/mist/vapours/spray.
P280	Wear protective gloves/protective clothing/eye protection/face protection.
P281	Use personal protective equipment as required.
P220	Keep/Store away from clothing/organic material/combustible materials.
P234	Keep only in original container.

Precautionary statement(s) Response

P301+P330+P331	IF SWALLOWED: Rinse mouth. Do NOT induce vomiting.
P303+P361+P353	IF ON SKIN (or hair): Remove/Take off immediately all contaminated clothing. Rinse skin with water/shower.
P305+P351+P338	IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing.
P308+P313	IF exposed or concerned: Get medical advice/attention.
P310	Immediately call a POISON CENTER or doctor/physician.
P321	Specific treatment (see advice on this label).
P370+P378	In case of fire: Use alcohol resistant foam or fine spray/water fog for extinction.
P363	Wash contaminated clothing before reuse.
P390	Absorb spillage to prevent material damage.
P304+P340	IF INHALED: Remove victim to fresh air and keep at rest in a position comfortable for breathing.

Precautionary statement(s) Storage

P405	Store locked up.

Precautionary statement(s) Disposal

P501	Dispose of contents/container in accordance with local regulations.

SECTION 3 COMPOSITION / INFORMATION ON INGREDIENTS

Substances

See section below for composition of Mixtures

Mixtures

CAS No	%[weight]	Name
7664-93-9	>60	sulfuric acid
7722-84-1	10-15	hydrogen peroxide
7732-18-5	20-30	water

SECTION 4 FIRST AID MEASURES

Description of first aid measures

Eye Contact	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 Centre or a doctor, or for at least 15 minutes.

Continued...

	‣ Transport to hospital or doctor without delay. ‣ Removal of contact lenses after an eye injury should only be undertaken by skilled personnel.
Skin Contact	If skin or hair contact occurs: ‣ Immediately flush body and clothes with large amounts of water, using safety shower if available. ‣ Quickly 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 Centre. ‣ Transport to hospital, or doctor.
Inhalation	‣ 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. ‣ Inhalation of vapours or aerosols (mists, fumes) may cause lung oedema. ‣ Corrosive substances may cause lung damage (e.g. lung oedema, fluid in the lungs). ‣ As this reaction may be delayed up to 24 hours after exposure, affected individuals need complete rest (preferably in semi-recumbent posture) and must be kept under medical observation even if no symptoms are (yet) manifested. ‣ Before any such manifestation, the administration of a spray containing a dexamethasone derivative or beclomethasone derivative may be considered. **This must definitely be left to a doctor or person authorised by him/her.** (ICSC13719)
Ingestion	‣ For advice, contact a Poisons Information Centre or a doctor at once. ‣ Urgent hospital treatment is likely to be needed. ‣ If swallowed do **NOT** induce vomiting. ‣ If vomiting occurs, lean patient forward or place on left side (head-down position, if possible) to maintain open airway and prevent aspiration. ‣ Observe the patient carefully. ‣ Never give liquid to a person showing signs of being sleepy or with reduced awareness; i.e. becoming unconscious. ‣ Give water to rinse out mouth, then provide liquid slowly and as much as casualty can comfortably drink. ‣ Transport to hospital or doctor without delay.

Indication of any immediate medical attention and special treatment needed

For acute or short term repeated exposures to strong acids:

- Airway problems may arise from laryngeal edema and inhalation exposure. Treat with 100% oxygen initially.
- Respiratory distress may require cricothyroidotomy if endotracheal intubation is contraindicated by excessive swelling
- Intravenous lines should be established immediately in all cases where there is evidence of circulatory compromise.
- Strong acids produce a coagulation necrosis characterised by formation of a coagulum (eschar) as a result of the dessicating action of the acid on proteins in specific tissues.

INGESTION:

- Immediate dilution (milk or water) within 30 minutes post ingestion is recommended.
- **DO NOT** attempt to neutralise the acid since exothermic reaction may extend the corrosive injury.
- Be careful to avoid further vomit since re-exposure of the mucosa to the acid is harmful. Limit fluids to one or two glasses in an adult.
- Charcoal has no place in acid management.
- Some authors suggest the use of lavage within 1 hour of ingestion.

SKIN:

- Skin lesions require copious saline irrigation. Treat chemical burns as thermal burns with non-adherent gauze and wrapping.
- Deep second-degree burns may benefit from topical silver sulfadiazine.

EYE:

- Eye injuries require retraction of the eyelids to ensure thorough irrigation of the conjuctival cul-de-sacs. Irrigation should last at least 20-30 minutes. **DO NOT** use neutralising agents or any other additives. Several litres of saline are required.
- Cycloplegic drops, (1% cyclopentolate for short-term use or 5% homatropine for longer term use) antibiotic drops, vasoconstrictive agents or artificial tears may be indicated dependent on the severity of the injury.
- Steroid eye drops should only be administered with the approval of a consulting ophthalmologist).

[Ellenhorn and Barceloux: Medical Toxicology]

SECTION 5 FIREFIGHTING MEASURES

Extinguishing media

FOR **SMALL FIRE:**

- USE FLOODING QUANTITIES OF WATER.
- **DO NOT** use dry chemical, CO2, foam or halogenated-type extinguishers.

FOR **LARGE FIRE**

- Flood fire area with water from a protected position

Special hazards arising from the substrate or mixture

Continued...

Fire Incompatibility	▸ Avoid any contamination of this material as it is very reactive and any contamination is potentially hazardous

Advice for firefighters

Fire Fighting	▸ Alert Fire Brigade and tell them location and nature of hazard. ▸ Wear full body protective clothing with breathing apparatus. ▸ Prevent, by any means available, spillage from entering drains or water course. ▸ Use water delivered as a fine spray to control fire and cool adjacent area. ▸ Avoid spraying water onto liquid pools. ▸ **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.
Fire/Explosion Hazard	▸ Non combustible. ▸ Not considered to be a significant fire risk. ▸ Acids may react with metals to produce hydrogen, a highly flammable and explosive gas. ▸ Heating may cause expansion or decomposition leading to violent rupture of containers. ▸ May emit corrosive, poisonous fumes. May emit acrid smoke. Decomposition may produce toxic fumes of: sulfur oxides (SOx) ▸ The material may provide sufficient oxygen to make the fire fierce and self sustaining. ▸ Smothering action may not be effective for established fire. ▸ Intense heat may cause spontaneous decomposition (detonation). ▸ Due to possibility of reignition, extinguished residues must be thoroughly cooled before approaching.
HAZCHEM	2W

SECTION 6 ACCIDENTAL RELEASE MEASURES

Personal precautions, protective equipment and emergency procedures

See section 8

Environmental precautions

See section 12

Methods and material for containment and cleaning up

Minor Spills	▸ Drains for storage or use areas should have retention basins for pH adjustments and dilution of spills before discharge or disposal of material. ▸ Check regularly for spills and leaks. ▸ Clean up all spills immediately. ▸ Avoid breathing vapours and contact with skin and eyes. ▸ Control personal contact with the substance, by using protective equipment. ▸ Contain and absorb spill with sand, earth, inert material or vermiculite. ▸ Wipe up. ▸ Place in a suitable, labelled container for waste disposal.
Major Spills	▸ Clear area of personnel and move upwind. ▸ Alert Fire Brigade and tell them location and nature of hazard. ▸ May be violently or explosively reactive. ▸ Wear full body protective clothing with breathing apparatus. ▸ Prevent, by any means available, spillage from entering drains or water course. ▸ Consider evacuation (or protect in place). ▸ Stop leak if safe to do so. ▸ Contain spill with sand, earth or vermiculite. ▸ Collect recoverable product into labelled containers for recycling. ▸ Neutralise/decontaminate residue (see Section 13 for specific agent). ▸ Collect solid residues and seal in labelled 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.

Personal Protective Equipment advice is contained in Section 8 of the SDS.

SECTION 7 HANDLING AND STORAGE

Precautions for safe handling

Safe handling	▸ **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.

Continued...

	▸ **WARNING:** To avoid violent reaction, **ALWAYS** add material to water and **NEVER** water to material. ▸ Avoid smoking, naked lights or ignition sources. ▸ 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 storage and handling recommendations contained within this SDS. ▸ Atmosphere should be regularly checked against established exposure standards to ensure safe working conditions are maintained.
Other information	▸ 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 storage and handling recommendations contained within this SDS.

Conditions for safe storage, including any incompatibilities

Suitable container	▸ Glass container is suitable for laboratory quantities ▸ **DO NOT** use aluminium or galvanised containers Teflon container.
Storage incompatibility	Sulfuric acid : ▸ is a strong oxidiser ▸ reacts with water or steam ▸ reacts violently with many substances including reducing agents, combustible materials, organic substances, alkalis, ammonium tetraperoxochromate, aniline, 1,2-ethanediamine, ethanolamine, isoprene, mesityl oxide, endo--norbanecarboxylic acid ethyl ester, perchlorates, sodium carbonate, zinc chlorate ▸ reacts, possibly causing ignition or explosion, with many substances, including non-oxidising mineral acids, organic acids, bases, reducing agents, acetic anhydride, acetone cyanohydrin, acetonitrile, acrolein, acrylates, acrylonitrile, alcohols, aldehydes, alkylene oxides, allyl alcohol, allyl chloride, substituted allyls, 2-aminoethanol, ammonium hydroxide, bromine pentafluoride, n-butyraldehyde, caprolactam solution, carbides, caesium acetylene carbide, chlorine trifluoride, chlorates, chlorosulfonic acid, cresols, cuprous nitride, diisobutylene, ethylene cyanohydrin, ethylene diamine, ethylene glycol, ethyleneimine, fulminates, glycols, hydrochloric acid, iodine heptafluoride, iron, isocyanates, ketones, lithium silicide, mercuric nitride, 2-methyllactonitrile, powdered metals, nitric acid, p-nitrotoluene, pentasilver trihydroxydiaminophosphate, perchloric acid, phenols, phosphorus, picrates, potassium chlorate, potassium permanganate, beta-propiolactone, propylene oxide, pyridine, rubidium acetylene, silver permanganate, sodium, sodium chlorate, sodium hydroxide, styrene monomer, zinc phosphide ▸ increases the explosive sensitivity of nitromethane ▸ incompatible with 2-amino-5-nitrothiazole, 2-aminothiazole, ammonia, aliphatic amines, alkanolamines, amides, organic anhydrides, isocyanate, vinyl acetate, alkylene oxides, epichlorohydrin ▸ attacks some plastics, rubber and coatings ▸ reacts with metals to produce flammable hydrogen gas Hydrogen peroxide ▸ is a powerful oxidiser ▸ contamination or heat may cause self accelerating exothermic decomposition with oxygen gas and steam release - this may generate dangerous pressures - steam explosion. ▸ reacts dangerously with rust, dust, dirt, iron, copper, acids, metals and salts, organic material. ▸ is unstable if heated. (e.g): one volume of 70% hydrogen peroxide solution decomposes to produce 300 volumes of oxygen gas. ▸ in presence of a strong initiating source may be explosively reactive ▸ concentrated or pure material can generate heat and decompose spontaneously; can ignite or explode when heated, shocked, contaminated; or if placed in a basic (>7) environment, especially in the presence of metal ions ▸ mixtures with combustible materials may result in spontaneous combustion or may be impact- or heat- sensitive - evaporation or drying on towels or mop may cause a fire. ▸ reacts violently with reducing agents, alcohols, ammonia, carboxylic acids, acetic acid, cobalt oxides, copper(II) chloride, ethers, metal powder, permanganates, acetone, benzenesulfonic anhydride, 1,1-dimethylhydrazine, dimethylphenylphosphine, gadolinium hydroxide, hydrogen selenide, iron oxides, lithium tetrahydroaluminate, magnesium tetrahydroaluminate, manganese(II) oxide, mercury oxide, methyl hydrazine, nickel monoxide, nitrogenous bases, osmium tetraoxide, alpha-phenylselenoketones, phosphorus, phosphorus(V) oxide, quinoline, tetrahydrothiophene, tin(II) chloride, thiodiglycol, thiophane, tin(II) chloride, unsaturated organic compounds, readily oxidisable and combustible materials; avoid contact with combustibles including lubricants and graphite ▸ reacts with cobalt, copper and its alloys, chromium, iridium, iron, lead, manganese, Monel, osmium, palladium, platinum, gold, silver, zinc, and other catalytic metals, metal oxides and salts - avoid metallic bowls and stirrers. ▸ violent catalytic decomposition will occur in contact with certain metals such as iron, copper, chromium, brass, bronze, lead, silver, manganese or their salts. ▸ forms unstable and possible explosive materials with acetic anhydride, aconitic acid, aniline, carboxylic acids, 1,4-diazabicyclo[2,2,2]octane, diphenyl diselenide, ethyl acetate, glycols, ketene, ketones, triethyltin hydroperoxide, 1,3,5-trioxane, vinyl acetate. ▸ is incompatible with mercurous chloride

Continued...

- decomposes in presence of alkalis and even ordinary dust or rust
- decomposes slowly at ordinary temperatures and builds up pressure in a closed container; the rate of decomposition doubles for each 10 deg C rise in temperature and decomposition becomes self-sustaining at 141 deg. C
- contact with rough surfaces can cause decomposition
- attacks and may ignite some plastics, rubber and coatings
- Reacts with mild steel, galvanised steel / zinc producing hydrogen gas which may form an explosive mixture with air.
- Avoid any contamination of this material as it is very reactive and any contamination is potentially hazardous

SECTION 8 EXPOSURE CONTROLS / PERSONAL PROTECTION

Control parameters

OCCUPATIONAL EXPOSURE LIMITS (OEL)

INGREDIENT DATA

Source	Ingredient	Material name	TWA	STEL	Peak	Notes
Australia Exposure Standards	sulfuric acid	Sulphuric acid	1 mg/m3	3 mg/m3	Not Available	Not Available
Australia Exposure Standards	hydrogen peroxide	Hydrogen peroxide	1 ppm / 1.4 mg/m3	Not Available	Not Available	Not Available

EMERGENCY LIMITS

Ingredient	Material name	TEEL-1	TEEL-2	TEEL-3
sulfuric acid	Sulfuric acid	Not Available	Not Available	Not Available
hydrogen peroxide	Hydrogen peroxide	Not Available	Not Available	Not Available

Ingredient	Original IDLH	Revised IDLH
sulfuric acid	15 mg/m3	Not Available
hydrogen peroxide	75 ppm	Not Available
water	Not Available	Not Available

MATERIAL DATA

Exposure controls

Appropriate engineering controls

Use in a well-ventilated area
Engineering controls are used to remove a hazard or place a barrier between the worker and the hazard. Well-designed engineering controls can be highly effective in protecting workers and will typically be independent of worker interactions to provide this high level of protection.
The basic types of engineering controls are:
Process controls which involve changing the way a job activity or process is done to reduce the risk.
Enclosure and/or isolation of emission source which keeps a selected hazard "physically" away from the worker and ventilation that strategically "adds" and "removes" air in the work environment. Ventilation can remove or dilute an air contaminant if designed properly. The design of a ventilation system must match the particular process and chemical or contaminant in use.
Employers may need to use multiple types of controls to prevent employee overexposure.

Local exhaust ventilation usually required. If risk of overexposure exists, wear approved respirator. Correct fit is essential to obtain adequate protection. Supplied-air type respirator may be required in special circumstances. Correct fit is essential to ensure adequate protection.
An approved self contained breathing apparatus (SCBA) may be required in some situations.
Provide adequate ventilation in warehouse or closed storage area. 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, vapours, 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:

Continued...

Lower end of the range	Upper end of the range
1: Room air currents minimal or favourable 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.

Personal protection

Eye and face protection

- Safety glasses with unperforated side shields may be used where continuous eye protection is desirable, as in laboratories; spectacles are not sufficient where complete eye protection is needed such as when handling bulk-quantities, where there is a danger of splashing, or if the material may be under pressure.
- Chemical goggles.whenever there is a danger of the material coming in contact with the eyes; goggles must be properly fitted.
- Full face shield (20 cm, 8 in minimum) may be required for supplementary but never for primary protection of eyes; these afford face protection.
- Alternatively a gas mask may replace splash goggles and face shields.
- Contact lenses may pose a special hazard; soft contact lenses may absorb and concentrate irritants. A written policy document, describing the wearing of lenses or restrictions on use, should be created for each workplace or task. This should include a review of lens absorption and adsorption for the class of chemicals in use and an account of injury experience. Medical and first-aid personnel should be trained in their removal and suitable equipment should be readily available. In the event of chemical exposure, begin eye irrigation immediately and remove contact lens as soon as practicable. Lens should be removed at the first signs of eye redness or irritation - lens should be removed in a clean environment only after workers have washed hands thoroughly. [CDC NIOSH Current Intelligence Bulletin 59], [AS/NZS 1336 or national equivalent]

Skin protection

See Hand protection below

Hands/feet protection

- Elbow length PVC gloves
- When handling corrosive liquids, wear trousers or overalls outside of boots, to avoid spills entering boots.

Body protection

See Other protection below

Other protection

- Overalls.
- PVC Apron.
- PVC protective suit may be required if exposure severe.
- Eyewash unit.
- Ensure there is ready access to a safety shower.

Recommended material(s)

GLOVE SELECTION INDEX

Glove selection is based on a modified presentation of the:

"Forsberg Clothing Performance Index".

The effect(s) of the following substance(s) are taken into account in the ***computer-generated*** selection:

Piranha Solution

Material	CPI
NEOPRENE	A
BUTYL	C
NAT+NEOPR+NITRILE	C
NATURAL RUBBER	C
NATURAL+NEOPRENE	C
NEOPRENE/NATURAL	C
NITRILE	C
PE	C
PVA	C
PVC	C

Respiratory protection

Type BE-P Filter of sufficient capacity. (AS/NZS 1716 & 1715, EN 143:2000 & 149:2001, ANSI Z88 or national equivalent)

Where the concentration of gas/particulates in the breathing zone, approaches or exceeds the "Exposure Standard" (or ES), respiratory protection is required.
Degree of protection varies with both face-piece and Class of filter; the nature of protection varies with Type of filter.

Required Minimum Protection Factor	Half-Face Respirator	Full-Face Respirator	Powered Air Respirator
up to 10 x ES	BE-AUS P2	-	BE-PAPR-AUS / Class 1 P2
up to 50 x ES	-	BE-AUS / Class 1 P2	-
up to 100 x ES	-	BE-2 P2	BE-PAPR-2 P2 ^

^ - Full-face
A(All classes) = Organic vapours, B AUS or B1 = Acid gasses, B2 = Acid gas or hydrogen cyanide(HCN), B3 = Acid gas or hydrogen cyanide(HCN), E = Sulfur dioxide(SO2), G = Agricultural chemicals, K = Ammonia(NH3),

Continued...

SARANEX-23	C
VITON	C

* CPI - Chemwatch Performance Index
A: Best Selection
B: Satisfactory; may degrade after 4 hours continuous immersion
C: Poor to Dangerous Choice for other than short term immersion
NOTE: As a series of factors will influence the actual performance of the glove, a final selection must be based on detailed observation. -
* Where the glove is to be used on a short term, casual or infrequent basis, factors such as "feel" or convenience (e.g. disposability), may dictate a choice of gloves which might otherwise be unsuitable following long-term or frequent use. A qualified practitioner should be consulted.

Hg = Mercury, NO = Oxides of nitrogen, MB = Methyl bromide, AX = Low boiling point organic compounds(below 65 degC)

SECTION 9 PHYSICAL AND CHEMICAL PROPERTIES

Information on basic physical and chemical properties

Appearance	Clear acidic liquid with faint acid odour; mixes with water.

Physical state	Liquid	**Relative density (Water = 1)**	1.81
Odour	Not Available	**Partition coefficient n-octanol / water**	Not Available
Odour threshold	Not Available	**Auto-ignition temperature (°C)**	Not Applicable
pH (as supplied)	<1	**Decomposition temperature**	Not Available
Melting point / freezing point (°C)	Not Available	**Viscosity (cSt)**	Not Available
Initial boiling point and boiling range (°C)	300	**Molecular weight (g/mol)**	Not Applicable
Flash point (°C)	Not Applicable	**Taste**	Not Available
Evaporation rate	Not Available	**Explosive properties**	Not Available
Flammability	Not Applicable	**Oxidising properties**	Not Available
Upper Explosive Limit (%)	Not Applicable	**Surface Tension (dyn/cm or mN/m)**	Not Available
Lower Explosive Limit (%)	Not Applicable	**Volatile Component (%vol)**	Not Available
Vapour pressure (kPa)	Not Available	**Gas group**	Not Available
Solubility in water	Miscible	**pH as a solution (1%)**	Not Available
Vapour density (Air = 1)	>1.0	**VOC g/L**	Not Available

SECTION 10 STABILITY AND REACTIVITY

Reactivity	See section 7
Chemical stability	‣ Contact with alkaline material liberates heat ‣ Unstable in the presence of incompatible materials. ‣ Product is considered stable. ‣ Hazardous polymerisation will not occur.
Possibility of hazardous reactions	See section 7
Conditions to avoid	See section 7
Incompatible materials	See section 7
Hazardous decomposition products	See section 5

SECTION 11 TOXICOLOGICAL INFORMATION

Information on toxicological effects

Inhaled	

Continued...

	Acidic corrosives produce respiratory tract irritation with coughing, choking and mucous membrane damage. Symptoms of exposure may include dizziness, headache, nausea and weakness. In more severe exposures, pulmonary oedema may be evident either immediately or after a latent period of 5-72 hours. Symptoms of pulmonary oedema include a tightness in the chest, dyspnoea, frothy sputum and cyanosis. Examination may reveal hypotension, a weak and rapid pulse and moist rates. Death, due to anoxia, may occur several hours after onset of the pulmonary oedema. Exposure to high concentrations causes bronchitis and is characterised by the onset of haemorrhagic pulmonary oedema.
Ingestion	Ingestion of acidic corrosives may produce circumoral burns with a distinct discolouration of the mucous membranes of the mouth, throat and oesophagus. Immediate pain and difficulties in swallowing and speaking may also be evident. Oedema of the epiglottis may produce respiratory distress and possibly, asphyxia. Nausea, vomiting, diarrhoea and a pronounced thirst may occur. More severe exposures may produce a vomitus containing fresh or dark blood and large shreds of mucosa. Shock, with marked hypotension, weak and rapid pulse, shallow respiration and clammy skin may be symptomatic of the exposure. Circulatory collapse may, if left untreated, result in renal failure. Severe cases may show gastric and oesophageal perforation with peritonitis, fever and abdominal rigidity. Stricture of the oesophageal, gastric and pyloric sphincter may occur as within several weeks or may be delayed for years. Death may be rapid and often results from asphyxia, circulatory collapse or aspiration of even minute amounts. Delayed deaths may be due to peritonitis, severe nephritis or pneumonia. Coma and convulsions may be terminal.
Skin Contact	Skin contact with acidic corrosives may result in pain and burns; these may be deep with distinct edges and may heal slowly with the formation of scar tissue. Open cuts, abraded or irritated skin should not be exposed to this material Entry into the blood-stream through, for example, cuts, abrasions, puncture wounds 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.
Eye	Direct eye contact with acid corrosives may produce pain, lachrymation, photophobia and burns. Mild burns of the epithelia generally recover rapidly and completely. Severe burns produce long-lasting and possible irreversible damage. The appearance of the burn may not be apparent for several weeks after the initial contact. The cornea may ultimately become deeply vascularised and opaque resulting in blindness.
Chronic	Repeated or prolonged exposure to acids may result in the erosion of teeth, inflammatory and ulcerative changes in the mouth and necrosis (rarely) of the jaw. Bronchial irritation, with cough, and frequent attacks of bronchial pneumonia may ensue. Gastrointestinal disturbances may also occur. Chronic exposures may result in dermatitis and/or conjunctivitis. The impact of inhaled acidic agents on the respiratory tract depends upon a number of interrelated factors. These include physicochemical characteristics, e.g., gas versus aerosol; particle size (small particles can penetrate deeper into the lung); water solubility (more soluble agents are more likely to be removed in the nose and mouth). Given the general lack of information on the particle size of aerosols involved in occupational exposures to acids, it is difficult to identify their principal deposition site within the respiratory tract. Acid mists containing particIes with a diameter of up to a few micrometers will be deposited in both the upper and lower airways. They are irritating to mucous epithelia, they cause dental erosion, and they produce acute effects in the lungs (symptoms and changes in pulmonary function). AsthmatIcs appear to be at particular risk for pulmonary effects. Occupational exposure to strong inorganic acid mists containing sulfuric acid is designated by IARC to be carcinogenic, increased risk of laryngeal cancer being seen with chronic exposures. Repeated minor exposures to mists can cause erosion of teeth and inflammation of the upper respiratory tract leading to chronic bronchitis. Repeated skin contact with dilute solutions may produce dermatitis. Lungs of sulfuric acid plant workers appear to be less affected than the lungs of workers exposed to "dust". There is evidence that corrosion of tooth enamel occurs at 1 mg/m3 but that acclimated workers could tolerate three to four times that level. Forming room workers in a battery factory exposed to 3 to 16 mg/m3 sulfuric acid mist concentrations exhibited the most serious signs of erosion whilst charging room workers, exposed to 0.08 to 2.5 mg/m3 were affected to a lesser degree. Workers chronically exposed to sulfuric acid mists may show various skin lesions, tracheobronchitis, stomatitis, conjunctivitis and gastritis.

	TOXICITY	IRRITATION
Piranha Solution	Not Available	Not Available
sulfuric acid	Inhalation (guinea pig) LC50: 0.036 mg/l/8H[2]	Eye (rabbit): 1.38 mg SEVERE
	Oral (rat) LD50: 2140 mg/kg[2]	Eye (rabbit): 5 mg/30sec SEVERE
hydrogen peroxide	dermal (rat) LD50: >2000 mg/kg[2]	Not Available
	Inhalation (rat) LC50: 2 mg/l/4H[2]	
	Oral (rat) LD50: >225 mg/kg[2]	
water	Oral (rat) LD50: >90000 mg/kg[2]	Not Available

Legend: *1. Value obtained from Europe ECHA Registered Substances - Acute toxicity 2.* Value obtained from manufacturer's SDS.*

Continued...

Unless otherwise specified data extracted from RTECS - Register of Toxic Effect of chemical Substances

SULFURIC ACID

WARNING: For inhalation exposure ONLY: This substance has been classified by the IARC as Group 1: **CARCINOGENIC TO HUMANS**

Occupational exposures to strong inorganic acid mists of sulfuric acid:

HYDROGEN PEROXIDE

For hydrogen peroxide**:**
Hazard increases with peroxide concentration, high concentrations contain an additive stabiliser.
Pharmacokinetics
Hydrogen peroxide is a normal product of metabolism. It is readily decomposed by catalase in normal cells. In experimental animals exposed to hydrogen peroxide, target organs affected include the lungs, intestine, thymus, liver, and kidney, suggesting its distribution to those sites.
Hydrogen peroxide has been detected in breath.

- Absorption: Hydrogen peroxide is decomposed in the bowel before absorption. When applied to tissue, solutions of hydrogen peroxide have poor penetrability.
- Distribution Hydrogen peroxide is produced metabolically in intact cells and tissues. It is formed by reduction of oxygen either directly in a two-electron transfer reaction, often catalysed by flavoproteins, or by an initial one-electron step to O2 followed by dismutation to hydrogen peroxide.
- Hydrogen peroxide has been detected in serum and in intact liver. based on the results of toxicity studies, the lungs, intestine, thymus, liver, and kidney may be distribution sites. In rabbits and cats that died after intravenous administration of hydrogen peroxide, the lungs were pale and emphysematous. Following intraperitoneal injection of hydrogen peroxide in mice, pyknotic nuclei were induced in the intestine and thymus (IARC 1985). Degeneration of hepatic and renal tubular epithelial tissue was observed following oral administration of hydrogen peroxide to mice.
- Metabolism Glutathione peroxidase, responsible for decomposing hydrogen peroxide, is present in normal human tissues (IARC 1985). When hydrogen peroxide comes in contact with catalase, an enzyme found in blood and most tissues, it rapidly decomposes into oxygen and water.
- Excretion Hydrogen peroxide has been detected in human breath at levels ranging from 1.0+/-.5 g/L to 0.34+/-0.17 g/L.

Carcinogenicity
Gastric and duodenal lesions including adenomas, carcinomas, and adenocarcinomas have been observed in mice treated orally with hydrogen peroxide. Marked strain differences in the incidence of tumors have been observed. Papilloma development has been observed in mice treated by dermal application.
Genotoxicity
Hydrogen peroxide induced DNA damage, sister chromatid exchanges and chromosomal aberrations in mammalian cells *in vitro* . Hydrogen peroxide induced DNA damage in bacteria (*E. coli*), and was mutagenic to bacteria (*Salmonella typhimurium)* and the fungi, *Neurospora crassa* and *Aspergillis chevallieri*, but not to *Streptomyces griseoflavus*. It was not mutagenic to *Drosophila melanogaster* or to mammalian cells *in vitro*.
Developmental Toxicity
Malformations have been observed in chicken embryos treated with hydrogen peroxide, but experiments with mice and rats have been negative.
Female rats that received 0.45% hydrogen peroxide (equivalent to approximately 630 mg/kg/day)7 as the sole drinking fluid for five weeks produced normal litters when mated with untreated males.
Doses of 1.4 to 11 mol/egg hydrogen peroxide (purity 30%) dissolved in water were injected into the airspace of groups of 20-30 white leghorn chicken eggs on day 3 of incubation.
Embryos were examined on day 14. The incidence of embryonic deaths and malformations was dose-related and detected at doses of 2.8 mol/egg and above. The combined ED50 was 2.7 mol/egg.
Reproductive Toxicity
A 1% solution of hydrogen peroxide (equivalent to 1900 mg/kg/day) given as the sole drinking fluid to three-month-old male mice for 7-28 days did not cause infertility.
The substance is classified by IARC as Group 3:
NOT classifiable as to its carcinogenicity to humans.
Evidence of carcinogenicity may be inadequate or limited in animal testing.

SULFURIC ACID & HYDROGEN PEROXIDE

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.

HYDROGEN PEROXIDE & WATER

No significant acute toxicological data identified in literature search.

Acute Toxicity	✗	**Carcinogenicity**	✓
Skin Irritation/Corrosion	✓	**Reproductivity**	✗

Continued...

Serious Eye Damage/Irritation	✓	**STOT - Single Exposure**	✗
Respiratory or Skin sensitisation	✗	**STOT - Repeated Exposure**	✗
Mutagenicity	✗	**Aspiration Hazard**	✗

Legend: ✗ *– Data either not available or does not fill the criteria for classification*
✓ *– Data available to make classification*

SECTION 12 ECOLOGICAL INFORMATION

Toxicity

Piranha Solution

ENDPOINT	TEST DURATION (HR)	SPECIES	VALUE	SOURCE
Not Available	Not Available	Not Available	Not Available	Not Available

sulfuric acid

ENDPOINT	TEST DURATION (HR)	SPECIES	VALUE	SOURCE
LC50	96	Fish	=8mg/L	1
EC50	48	Crustacea	=42.5mg/L	1
EC50	72	Algae or other aquatic plants	>100mg/L	2
NOEC	Not Available	Crustacea	0.15mg/L	2

hydrogen peroxide

ENDPOINT	TEST DURATION (HR)	SPECIES	VALUE	SOURCE
LC50	96	Fish	0.020mg/L	3
EC50	48	Crustacea	2mg/L	2
EC50	72	Algae or other aquatic plants	0.71mg/L	4
EC0	24	Crustacea	1.1mg/L	2
NOEC	192	Fish	0.028mg/L	4

water

ENDPOINT	TEST DURATION (HR)	SPECIES	VALUE	SOURCE
LC50	96	Fish	897.520mg/L	3
EC50	96	Algae or other aquatic plants	8768.874mg/L	3

Legend: *Extracted from 1. IUCLID Toxicity Data 2. Europe ECHA Registered Substances - Ecotoxicological Information - Aquatic Toxicity 3. EPIWIN Suite V3.12 (QSAR) - Aquatic Toxicity Data (Estimated) 4. US EPA, Ecotox database - Aquatic Toxicity Data 5. ECETOC Aquatic Hazard Assessment Data 6. NITE (Japan) - Bioconcentration Data 7. METI (Japan) - Bioconcentration Data 8. Vendor Data*

Ecotoxicity:
The tolerance of water organisms towards pH margin and variation is diverse. Recommended pH values for test species listed in OECD guidelines are between 6.0 and almost 9. Acute testing with fish showed 96h-LC50 at about pH 3.5
Sulfuric acid is soluble in water and remains indefinitely in the environment as sulfate.
Large discharges may contribute to the acidification of water and be fatal to aquatic life and soil micro-organisms. Large discharges may also contribute to the acidification of effluent treatment systems and injure sewage treatment organisms.
In water, sulfuric acid dissociates, and the sulfate anion may combine with other cations. In soil, the ions from sulfuric acid can adsorb to soil particles or leach into surface water and groundwater. Sulfates can be taken up by plants and be incorporated into the parenchyma of the plant.
The ions (sulfate, hydrogen) can adsorb to soil particles or be converted to gases. Anaerobic bacteria in sediments and soil can reduce sulfate to sulfur and hydrogen sulfide.
Sulfates, including sulfuric acid, are removed from the air by both dry and wet deposition processes. Wet deposition processes including rain-out (a process that occurs within the clouds) and washout (removal by precipitation below the clouds) contribute to the removal of sulfate from the atmosphere.
In the stratosphere, sulfuric acid aerosols have lifetimes of about 14 and 2.4 days at altitudes of 15 and 20 km, respectively. At cloud level, the residence time is about 6 days, with shorter residence times in surface air.
Prevent, by any means available, spillage from entering drains or water courses.
DO NOT discharge into sewer or waterways.

Persistence and degradability

Ingredient	Persistence: Water/Soil	Persistence: Air
hydrogen peroxide	LOW	LOW
water	LOW	LOW

Bioaccumulative potential

Ingredient	Bioaccumulation

Continued...

hydrogen peroxide	LOW (LogKOW = -1.571)
water	LOW (LogKOW = -1.38)

Mobility in soil

Ingredient	Mobility
hydrogen peroxide	LOW (KOC = 14.3)
water	LOW (KOC = 14.3)

SECTION 13 DISPOSAL CONSIDERATIONS

Waste treatment methods

Product / Packaging disposal	‣ Recycle wherever possible. ‣ Consult manufacturer for recycling options or consult local or regional waste management authority for disposal if no suitable treatment or disposal facility can be identified. ‣ Treat and neutralise at an approved treatment plant. Treatment should involve: Neutralisation with soda-ash or soda-lime followed by: burial in a land-fill specifically licensed to accept chemical and / or pharmaceutical wastes or Incineration in a licensed apparatus (after admixture with suitable combustible material). ‣ Decontaminate empty containers with 5% aqueous sodium hydroxide or soda ash, followed by water. Observe all label safeguards until containers are cleaned and destroyed.

SECTION 14 TRANSPORT INFORMATION

Labels Required

	 
Marine Pollutant	NO
HAZCHEM	2W

Land transport (ADG)

UN number	3093
UN proper shipping name	CORROSIVE LIQUID, OXIDISING, N.O.S. (contains hydrogen peroxide and sulfuric acid)
Transport hazard class(es)	Class 8 Subrisk 5.1
Packing group	II
Environmental hazard	Not Applicable
Special precautions for user	Special provisions 274 Limited quantity 1 L

Air transport (ICAO-IATA / DGR)

UN number	3093
UN proper shipping name	Corrosive liquid, oxidizing, n.o.s. * (contains hydrogen peroxide and sulfuric acid)
Transport hazard class(es)	ICAO/IATA Class 8 ICAO / IATA Subrisk 5.1 ERG Code 8X
Packing group	II
Environmental hazard	Not Applicable

Continued...

Special precautions for user	Special provisions	Not Applicable
	Cargo Only Packing Instructions	855
	Cargo Only Maximum Qty / Pack	30 L
	Passenger and Cargo Packing Instructions	851
	Passenger and Cargo Maximum Qty / Pack	1 L
	Passenger and Cargo Limited Quantity Packing Instructions	Y840
	Passenger and Cargo Limited Maximum Qty / Pack	0.5 L

Sea transport (IMDG-Code / GGVSee)

UN number	3093	
UN proper shipping name	CORROSIVE LIQUID, OXIDIZING, N.O.S. (contains hydrogen peroxide and sulfuric acid)	
Transport hazard class(es)	IMDG Class	8
	IMDG Subrisk	5.1
Packing group	II	
Environmental hazard	Not Applicable	
Special precautions for user	EMS Number	F-A , S-Q
	Special provisions	274
	Limited Quantities	1 L

Transport in bulk according to Annex II of MARPOL and the IBC code

Not Applicable

SECTION 15 REGULATORY INFORMATION

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

SULFURIC ACID(7664-93-9) IS FOUND ON THE FOLLOWING REGULATORY LISTS

- Australia Dangerous Goods Code (ADG Code) - Dangerous Goods List
- Australia Dangerous Goods Code (ADG Code) - List of Emergency Action Codes
- Australia Exposure Standards
- Australia Hazardous Chemical Information System (HCIS) - Hazardous Chemicals
- Australia Inventory of Chemical Substances (AICS)
- Australia Standard for the Uniform Scheduling of Medicines and Poisons (SUSMP) - Appendix E (Part 2)
- Australia Standard for the Uniform Scheduling of Medicines and Poisons (SUSMP) - Appendix F (Part 3)
- Australia Standard for the Uniform Scheduling of Medicines and Poisons (SUSMP) - Schedule 6
- GESAMP/EHS Composite List - GESAMP Hazard Profiles
- IMO IBC Code Chapter 17: Summary of minimum requirements
- IMO MARPOL (Annex II) - List of Noxious Liquid Substances Carried in Bulk
- International Agency for Research on Cancer (IARC) - Agents Classified by the IARC Monographs
- International Air Transport Association (IATA) Dangerous Goods Regulations
- International Air Transport Association (IATA) Dangerous Goods Regulations - Prohibited List Passenger and Cargo Aircraft
- International Maritime Dangerous Goods Requirements (IMDG Code)
- United Nations Recommendations on the Transport of Dangerous Goods Model Regulations

HYDROGEN PEROXIDE(7722-84-1) IS FOUND ON THE FOLLOWING REGULATORY LISTS

Continued...

Australia Dangerous Goods Code (ADG Code) - Dangerous Goods List	Australia Standard for the Uniform Scheduling of Medicines and Poisons (SUSMP) - Schedule 5
Australia Dangerous Goods Code (ADG Code) - Goods Too Dangerous To Be Transported	Australia Standard for the Uniform Scheduling of Medicines and Poisons (SUSMP) - Schedule 6
Australia Dangerous Goods Code (ADG Code) - List of Emergency Action Codes	GESAMP/EHS Composite List - GESAMP Hazard Profiles
Australia Exposure Standards	IMO IBC Code Chapter 17: Summary of minimum requirements
Australia Hazardous Chemical Information System (HCIS) - Hazardous Chemicals	IMO MARPOL (Annex II) - List of Noxious Liquid Substances Carried in Bulk
Australia Inventory of Chemical Substances (AICS)	International Agency for Research on Cancer (IARC) - Agents Classified by the IARC Monographs
Australia Standard for the Uniform Scheduling of Medicines and Poisons (SUSMP) - Appendix E (Part 2)	International Air Transport Association (IATA) Dangerous Goods Regulations
Australia Standard for the Uniform Scheduling of Medicines and Poisons (SUSMP) - Appendix F (Part 3)	International Air Transport Association (IATA) Dangerous Goods Regulations - Prohibited List Passenger and Cargo Aircraft
Australia Standard for the Uniform Scheduling of Medicines and Poisons (SUSMP) - Index	International Maritime Dangerous Goods Requirements (IMDG Code)
Australia Standard for the Uniform Scheduling of Medicines and Poisons (SUSMP) - Schedule 10 / Appendix C	United Nations Recommendations on the Transport of Dangerous Goods Model Regulations

WATER(7732-18-5) IS FOUND ON THE FOLLOWING REGULATORY LISTS

Australia Inventory of Chemical Substances (AICS)	IMO IBC Code Chapter 18: List of products to which the Code does not apply

National Inventory Status

National Inventory	Status
Australia - AICS	Yes
Canada - DSL	Yes
Canada - NDSL	No (hydrogen peroxide; water; sulfuric acid)
China - IECSC	Yes
Europe - EINEC / ELINCS / NLP	Yes
Japan - ENCS	Yes
Korea - KECI	Yes
New Zealand - NZIoC	Yes
Philippines - PICCS	Yes
USA - TSCA	Yes
Taiwan - TCSI	Yes
Mexico - INSQ	Yes
Vietnam - NCI	Yes
Russia - ARIPS	Yes
Thailand - TECI	Yes
Legend:	*Yes = All CAS declared ingredients are on the inventory* *No = One or more of the CAS listed ingredients are not on the inventory and are not exempt from listing(see specific ingredients in brackets)*

SECTION 16 OTHER INFORMATION

Revision Date	03/13/2019
Initial Date	04/10/2014

SDS Version Summary

Version	Issue Date	Sections Updated
3.1.1.1	03/13/2019	Expiration. Review and Update

Other information

Classification of the preparation 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.

The 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

Continued...

available engineering controls must be considered.

Definitions and abbreviations

PC－TWA: Permissible Concentration-Time Weighted Average
PC－STEL: Permissible Concentration-Short Term Exposure Limit
IARC: International Agency for Research on Cancer
ACGIH: American Conference of Governmental Industrial Hygienists
STEL: Short Term Exposure Limit
TEEL: Temporary Emergency Exposure Limit。
IDLH: Immediately Dangerous to Life or Health Concentrations
OSF: Odour Safety Factor
NOAEL :No Observed Adverse Effect Level
LOAEL: Lowest Observed Adverse Effect Level
TLV: Threshold Limit Value
LOD: Limit Of Detection
OTV: Odour Threshold Value
BCF: BioConcentration Factors
BEI: Biological Exposure Index