



410 Ammonium Persulfate

MG Chemicals UK Limited

Version No: A-1.02

Safety Data Sheet (Conforms to Regulation (EU) No 2015/830)

Issue Date: 14/03/2019

Revision Date: 16/03/2020

L.REACH.GBR.EN

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

1.1. Product Identifier

Product name	410
Synonyms	SDS Code: 410; 410-1KG, 410-25KG
Other means of identification	Ammonium Persulfate

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

Relevant identified uses	etchant
Uses advised against	Not Applicable

1.3. Details of the supplier of the safety data sheet

Registered company name	MG Chemicals UK Limited	MG Chemicals (Head office)
Address	Heame House, 23 Bilston Street, Sedgely Dudley DY3 1JA United Kingdom	9347 - 193 Street Surrey V4N 4E7 British Columbia Canada
Telephone	+(44) 1663 362888	+(1) 800-201-8822
Fax	Not Available	+(1) 800-708-9888
Website	Not Available	www.mgchemicals.com
Email	sales@mgchemicals.com	Info@mgchemicals.com

1.4. Emergency telephone number

Association / Organisation	Verisk 3E (Access code: 335388)	Not Available
Emergency telephone numbers	+(44) 20 35147487	Not Available
Other emergency telephone numbers	+(0) 800 680 0425	Not Available

SECTION 2 HAZARDS IDENTIFICATION

2.1.

Classification of the substance or mixture

Classification according to regulation (EC) No 1272/2008 [CLP] ^[1]	H272 - Oxidizing Solid Category 3, H302 - Acute Toxicity (Oral) Category 4, H315 - Skin Corrosion/Irritation Category 2, H319 - Eye Irritation Category 2, H317 - Skin Sensitizer Category 1, H334 - Respiratory Sensitizer Category 1, H335 - Specific target organ toxicity - single exposure Category 3 (respiratory tract irritation)
Legend:	1. Classified by Chemwatch; 2. Classification drawn from Regulation (EU) No 1272/2008 - Annex VI

2.2. Label elements

Hazard pictogram(s)	
SIGNAL WORD	DANGER

Hazard statement(s)

H272	May intensify fire; oxidiser.
H302	Harmful if swallowed.
H315	Causes skin irritation.
H319	Causes serious eye irritation.
H317	May cause an allergic skin reaction.
H334	May cause allergy or asthma symptoms or breathing difficulties if inhaled.
H335	May cause respiratory irritation.

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Supplementary statement(s)

Not Applicable

Precautionary statement(s) Prevention

P210	Keep away from heat, hot surfaces, sparks, open flames and other ignition sources. No smoking.
P261	Avoid breathing dust/fumes.
P271	Use only outdoors or in a well-ventilated area.
P280	Wear protective gloves/protective clothing/eye protection/face protection.
P284	[In case of inadequate ventilation] wear respiratory protection.
P220	Keep away from clothing and other combustible materials.
P270	Do not eat, drink or smoke when using this product.
P272	Contaminated work clothing should not be allowed out of the workplace.

Precautionary statement(s) Response

P304+P340	IF INHALED: Remove person to fresh air and keep comfortable for breathing.
P342+P311	If experiencing respiratory symptoms: Call a POISON CENTER/doctor/physician/first aider.
P370+P378	In case of fire: Use water jets to extinguish.
P302+P352	IF ON SKIN: Wash with plenty of water and soap.
P305+P351+P338	IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing.
P333+P313	If skin irritation or rash occurs: Get medical advice/attention.
P337+P313	If eye irritation persists: Get medical advice/attention.
P362+P364	Take off contaminated clothing and wash it before reuse.
P301+P312	IF SWALLOWED: Call a POISON CENTER/doctor/physician/first aider/if you feel unwell.
P330	Rinse mouth.

Precautionary statement(s) Storage

P405	Store locked up.
P403+P233	Store in a well-ventilated place. Keep container tightly closed.

Precautionary statement(s) Disposal

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

RECh - Art.57-59: The mixture does not contain Substances of Very High Concern (SVHC) at the SDS print date.

SECTION 3 COMPOSITION / INFORMATION ON INGREDIENTS

3.1. Substances

See 'Composition on ingredients' in Section 3.2

3.2. Mixtures

1.CAS No 2.EC No 3.Index No 4.REACH No	%[weight]	Name	Classification according to regulation (EC) No 1272/2008 [CLP]
1.7727-54-0 2.231-786-5 3.016-060-00-6 4.01-2119495973-19-XXXX	>99	<u>ammonium persulfate</u>	Oxidizing Solid Category 3, Acute Toxicity (Oral) Category 4, Eye Irritation Category 2, Skin Sensitizer Category 1, Skin Corrosion/Irritation Category 2, Respiratory Sensitizer Category 1, Specific target organ toxicity - single exposure Category 3 (respiratory tract irritation); H272, H302, H319, H317, H315, H334, H335 [2]

Legend: 1. Classified by Chemwatch; 2. Classification drawn from Regulation (EU) No 1272/2008 - Annex VI; 3. Classification drawn from C&L; * EU IOELVs available

SECTION 4 FIRST AID MEASURES

4.1. Description of first aid measures

Eye Contact	<p>If this product comes in contact with the eyes:</p> <ul style="list-style-type: none"> ▶ Wash out immediately with fresh 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. ▶ Seek medical attention without delay; if pain persists or recurs seek medical attention. ▶ Removal of contact lenses after an eye injury should only be undertaken by skilled personnel.
Skin Contact	<p>If skin contact occurs:</p> <ul style="list-style-type: none"> ▶ Immediately remove all contaminated clothing, including footwear. ▶ Flush skin and hair with running water (and soap if available). ▶ Seek medical attention in event of irritation.

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Inhalation	<ul style="list-style-type: none"> ▶ 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.
Ingestion	<ul style="list-style-type: none"> ▶ IF SWALLOWED, REFER FOR MEDICAL ATTENTION, WHERE POSSIBLE, WITHOUT DELAY. ▶ For advice, contact a Poisons Information Centre or a doctor. ▶ Urgent hospital treatment is likely to be needed. ▶ 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 SDS 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 SDS. <p>Where medical attention is not immediately available or where the patient is more than 15 minutes from a hospital or unless instructed otherwise:</p> <ul style="list-style-type: none"> ▶ 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. <p>NOTE: Wear a protective glove when inducing vomiting by mechanical means.</p>

4.2 Most important symptoms and effects, both acute and delayed

See Section 11

4.3. Indication of any immediate medical attention and special treatment needed

Treat symptomatically.

Toxic myocarditis may follow ingestion of oxidizing agents such as peroxides.

BASIC TREATMENT

- ▶ Establish a patent airway with suction where necessary.
- ▶ Watch for signs of respiratory insufficiency and assist ventilation as necessary.
- ▶ Administer oxygen by non-rebreather mask at 10 to 15 l/min.
- ▶ Monitor and treat, where necessary, for pulmonary oedema .
- ▶ Monitor and treat, where necessary, for shock.
- ▶ Anticipate seizures .
- ▶ **DO NOT use emetics.** Where ingestion is suspected rinse mouth and give up to 200 ml water (5 ml/kg recommended) for dilution where patient is able to swallow, has a strong gag reflex and does not drool.
- ▶ **DO NOT attempt neutralisation as exothermic reaction may occur.**
- ▶ Skin burns should be covered with dry, sterile bandages, following decontamination.

ADVANCED TREATMENT

- ▶ Consider orotracheal or nasotracheal intubation for airway control in unconscious patient or where respiratory arrest has occurred.
- ▶ Positive-pressure ventilation using a bag-valve mask might be of use.
- ▶ Monitor and treat, where necessary, for arrhythmias.
- ▶ Start an IV D5W TKO. If signs of hypovolaemia are present use lactated Ringers solution. Fluid overload might create complications.
- ▶ Drug therapy should be considered for pulmonary oedema.
- ▶ Hypotension with signs of hypovolaemia requires the cautious administration of fluids. Fluid overload might create complications.
- ▶ Treat seizures with diazepam.
- ▶ Proparacaine hydrochloride should be used to assist eye irrigation.

BRONSTEIN, A.C. and CURRANCE, P.L.

EMERGENCY CARE FOR HAZARDOUS MATERIALS EXPOSURE: 2nd Ed. 1994

SECTION 5 FIREFIGHTING MEASURES

5.1. 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

5.2. Special hazards arising from the substrate or mixture

Fire Incompatibility	<ul style="list-style-type: none"> ▶ Avoid storage with reducing agents. ▶ Avoid any contamination of this material as it is very reactive and any contamination is potentially hazardous
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5.3. Advice for firefighters

Fire Fighting	<ul style="list-style-type: none"> ▶ Alert Fire Brigade 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 courses. ▶ Fight fire from a safe distance, with adequate cover. ▶ Extinguishers should be used only by trained personnel. ▶ 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. ▶ If fire gets out of control withdraw personnel and warn against entry.
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	<ul style="list-style-type: none"> ▶ Equipment should be thoroughly decontaminated after use.
Fire/Explosion Hazard	<ul style="list-style-type: none"> ▶ Will not burn but increases intensity of fire. ▶ Heating may cause expansion or decomposition leading to violent rupture of containers. ▶ Heat affected containers remain hazardous. ▶ Contact with combustibles such as wood, paper, oil or finely divided metal may produce spontaneous combustion or violent decomposition. ▶ May emit irritating, poisonous or corrosive fumes. <p>Decomposition may produce toxic fumes of: nitrogen oxides (NO_x) sulfur oxides (SO_x)</p>

SECTION 6 ACCIDENTAL RELEASE MEASURES

6.1. Personal precautions, protective equipment and emergency procedures

See section 8

6.2. Environmental precautions

See section 12

6.3. Methods and material for containment and cleaning up

Minor Spills	<ul style="list-style-type: none"> ▶ Clean up all spills immediately. ▶ No smoking, naked lights, ignition sources. ▶ Avoid all contact with any organic matter including fuel, solvents, sawdust, paper or cloth and other incompatible materials, as ignition may result. ▶ Avoid breathing dust or vapours and all contact with skin and eyes. ▶ Control personal contact with the substance, by using protective equipment. ▶ Contain and absorb spill with dry sand, earth, inert material or vermiculite. ▶ DO NOT use sawdust as fire may result. ▶ Scoop up solid residues and seal in labelled drums for disposal. ▶ Neutralise/decontaminate area.
Major Spills	<ul style="list-style-type: none"> ▶ Clear area of personnel and move upwind. ▶ Alert Fire Brigade and tell them location and nature of hazard. ▶ Wear breathing apparatus and protective gloves. ▶ Prevent, by any means available, spillage from entering drains or water courses. ▶ No smoking, flames or ignition sources. ▶ Increase ventilation. ▶ Contain spill with sand, earth or other clean, inert materials. ▶ NEVER USE organic absorbents such as sawdust, paper or cloth. ▶ Use spark-free and explosion-proof equipment. ▶ Collect any recoverable product into labelled containers for possible recycling. ▶ Avoid contamination with organic matter to prevent subsequent fire and explosion. ▶ DO NOT mix fresh with recovered material. ▶ Collect residues and seal in labelled drums for disposal. ▶ Wash area and prevent runoff into drains. ▶ Decontaminate equipment and launder all protective clothing before storage and re-use. ▶ If contamination of drains or waterways occurs advise emergency services.

6.4. Reference to other sections

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

SECTION 7 HANDLING AND STORAGE

7.1. Precautions for safe handling

Safe handling	<ul style="list-style-type: none"> ▶ Avoid personal contact and inhalation of dust, mist or vapours. ▶ Provide adequate ventilation. ▶ Always wear protective equipment and wash off any spillage from clothing. ▶ Keep material away from light, heat, flammables or combustibles. ▶ Keep cool, dry and away from incompatible materials. ▶ Avoid physical damage to containers. ▶ DO NOT repack or return unused portions to original containers. Withdraw only sufficient amounts for immediate use. ▶ Use only minimum quantity required. ▶ Avoid using solutions of peroxides in volatile solvents. Solvent evaporation should be controlled to avoid dangerous concentration of the peroxide. ▶ Do NOT allow peroxides to contact iron or compounds of iron, cobalt, or copper, metal oxide salts, acids or bases. ▶ Do NOT use metal spatulas to handle peroxides ▶ Do NOT use glass containers with screw cap lids or glass stoppers. ▶ Store peroxides at the lowest possible temperature, consistent with their solubility and freezing point. ▶ CAUTION: Do NOT store liquids or solutions of peroxides at a temperature below that at which the peroxide freezes or precipitates. Peroxides in this form are extremely shock and heat-sensitive. Refrigerated storage of peroxides must ONLY be in explosion-proof units. ▶ The hazards and consequences of fires and explosions during synthesis and use of peroxides is widely recognised; spontaneous or induced decomposition may culminate in a variety of ways, ranging from moderate gassing to spontaneous ignition or explosion. The heat released from spontaneous decomposition of an energy-rich compound causes a rise in the surrounding temperature; the temperature will rise until thermal balance is established or until the material heats to decomposition. ▶ The most effective means for minimising the consequences of an accident is to limit quantities to a practical minimum. Even gram-scale explosions can be serious. Once ignited the burning of peroxides cannot be controlled and the area should be evacuated. ▶ Unless there is compelling reason to do otherwise, peroxide concentration should be limited to 10% (or less with vigorous reactants). Peroxide concentration is rarely as high as 1% in the reaction mixture of polymerisation or other free-radical reactions. ▶ Peroxides should be added slowly and cautiously to the reaction medium. This should be completed prior to heating and with good agitation. ▶ Addition of peroxide to the hot monomer is extremely dangerous. A violent reaction (e.g., fire or explosion) can result from inadvertent mixing of promoters (frequently used with peroxides in polymerisation systems) with full-strength peroxide ▶ Organic peroxides are very sensitive to contamination (especially heavy-metal compounds, metal oxide salts, alkaline materials including amines, strong acids, and many varieties of dust and dirt). This can initiate rapid, uncontrolled decomposition of peroxides and possible generation of intense heat, fire or explosion. The consequences of accidental contamination from returning withdrawn material to the storage container can be disastrous.
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	<ul style="list-style-type: none"> ▶ When handling NEVER smoke, eat or drink. ▶ Always wash hands with soap and water after handling. ▶ Use only good occupational work practice. ▶ Observe manufacturer's storage and handling recommendations contained within this SDS.
Fire and explosion protection	See section 5
Other information	<ul style="list-style-type: none"> ▶ Store in original containers. ▶ Keep containers securely sealed as supplied. ▶ Store in a cool, well ventilated area. ▶ Keep dry. ▶ Store under cover and away from sunlight. ▶ Store away from flammable or combustible materials, debris and waste. Contact may cause fire or violent reaction. ▶ Store away from incompatible materials and foodstuff containers. ▶ DO NOT stack on wooden floors or pallets. ▶ Protect containers from physical damage. ▶ Check regularly for leaks. ▶ Observe manufacturer's storage and handling recommendations contained within this SDS. <p>In addition, Goods of Class 5.1, packing group III should be stored in packages and be separated from buildings, tanks, and compounds containing other dangerous goods in tanks, and from property boundaries by a distance of at least 5 metres.</p>

7.2. Conditions for safe storage, including any incompatibilities

Suitable container	<ul style="list-style-type: none"> ▶ DO NOT repack. Use containers supplied by manufacturer only. <p>For low viscosity materials</p> <ul style="list-style-type: none"> ▶ Drums and jerricans must be of the non-removable head type. ▶ Where a can is to be used as an inner package, the can must have a screwed enclosure. <p>For materials with a viscosity of at least 2680 cSt. (23 deg. C) and solids:</p> <ul style="list-style-type: none"> ▶ Removable head packaging and ▶ cans with friction closures may be used. <p>-</p> <p>Where combination packages are used, and the inner packages are of glass, there must be sufficient inert cushioning material in contact with inner and outer packages *.</p> <p>-</p> <p>In addition, where inner packagings are glass and contain liquids of packing group I and II there must be sufficient inert absorbent to absorb any spillage *.</p> <p>-</p> <p>* unless the outer packaging is a close fitting moulded plastic box and the substances are not incompatible with the plastic.</p>
Storage incompatibility	<ul style="list-style-type: none"> ▶ Inorganic peroxy compounds are potent oxidisers that pose fire or explosive hazards when in contact with ordinary combustible materials. ▶ Inorganic peroxides react with organic compounds to generate organic peroxide and hydroperoxide products that react violently with reducing agents. ▶ Inorganic oxidising agents can react with reducing agents to generate heat and products that may be gaseous (causing pressurization of closed containers). The products may themselves be capable of further reactions (such as combustion in the air). ▶ Organic compounds in general have some reducing power and can in principle react with compounds in this class. Actual reactivity varies greatly with the identity of the organic compound. ▶ Inorganic oxidising agents can react violently with active metals, cyanides, esters, and thiocyanates. ▶ Peroxides, in contact with inorganic cobalt and copper compounds, iron and iron compounds, acetone, metal oxide salts and acids and bases can react with rapid, uncontrolled decomposition, leading to fires and explosions. ▶ Inorganic reducing agents react with oxidizing agents to generate heat and products that may be flammable, combustible, or otherwise reactive. Their reactions with oxidizing agents may be violent. ▶ Incidents involving interaction of active oxidants and reducing agents, either by design or accident, are usually very energetic and examples of so-called redox reactions. <p>For persulfate salts:</p> <ul style="list-style-type: none"> ▶ Segregate from organics and other readily oxidisable materials. ▶ Segregate from powdered metals, phosphorous, hydrides, halogens, acids and alkalis. ▶ Avoid contact with combustibles, organic matter. ▶ Avoid reaction with acids, alkalis, halides, heavy metals and combustible material (wood, cloth). ▶ Contact with metals such as lead, silver, copper, magnesium, zinc, cadmium, nickel, iron and cobalt can lead to catalytic decomposition. ▶ An explosion hazard when mixed with finely powdered organic matter, metal powders such as aluminium, or reducing agents. ▶ Avoid reaction with alkaline hydroxide and water. ▶ Reacts vigorously with hydrazine. ▶ Dry material may decomposes rapidly above 100 deg C liberating oxygen. ▶ Wet material may decomposes at 50 deg C with decomposition. ▶ Liberates oxygen on decomposition. <p>A vigorous self-sustaining fire resulted from the contact of two flakes of moist potassium hydroxide with potassium persulfate. The fire was extinguished with water but not CO2 or dry powder.</p> <ul style="list-style-type: none"> ▶ Avoid any contamination of this material as it is very reactive and any contamination is potentially hazardous ▶ Avoid storage with reducing agents. ▶ Many of the salts of peroxyacids are unstable or explosive and are capable of initiation by heat, friction or impact, and all are powerful oxidants. <p>BREThERICK L.: Handbook of Reactive Chemical Hazards</p>

7.3. Specific end use(s)

See section 1.2

SECTION 8 EXPOSURE CONTROLS / PERSONAL PROTECTION

8.1. Control parameters

DERIVED NO EFFECT LEVEL (DNEL)

Not Available

PREDICTED NO EFFECT LEVEL (PNEC)

Not Available

OCCUPATIONAL EXPOSURE LIMITS (OEL)

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INGREDIENT DATA

Source	Ingredient	Material name	TWA	STEL	Peak	Notes
Not Available	Not Available	Not Available	Not Available	Not Available	Not Available	Not Available

EMERGENCY LIMITS


Ingredient	Material name	TEEL-1	TEEL-2	TEEL-3
ammonium persulfate	Ammonium peroxydisulfate	0.3 mg/m ³	22 mg/m ³	130 mg/m ³

Ingredient	Original IDLH	Revised IDLH
ammonium persulfate	Not Available	Not Available

MATERIAL DATA

Persulfates produce irritation of the respiratory tract.

8.2. Exposure controls

<p>8.2.1. Appropriate engineering controls</p>	<p>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:</p> <p>Process controls which involve changing the way a job activity or process is done to reduce the risk.</p> <p>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.</p> <p>Employers may need to use multiple types of controls to prevent employee overexposure.</p> <p>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.</p> <table border="1" data-bbox="391 943 1485 1196"> <thead> <tr> <th>Type of Contaminant:</th> <th>Air Speed:</th> </tr> </thead> <tbody> <tr> <td>solvent, vapours, degreasing etc., evaporating from tank (in still air).</td> <td>0.25-0.5 m/s (50-100 f/min.)</td> </tr> <tr> <td>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)</td> <td>0.5-1 m/s (100-200 f/min.)</td> </tr> <tr> <td>direct spray, spray painting in shallow booths, drum filling, conveyer loading, crusher dusts, gas discharge (active generation into zone of rapid air motion)</td> <td>1-2.5 m/s (200-500 f/min.)</td> </tr> <tr> <td>grinding, abrasive blasting, tumbling, high speed wheel generated dusts (released at high initial velocity into zone of very high rapid air motion).</td> <td>2.5-10 m/s (500-2000 f/min.)</td> </tr> </tbody> </table> <p>Within each range the appropriate value depends on:</p> <table border="1" data-bbox="391 1252 1485 1420"> <thead> <tr> <th>Lower end of the range</th> <th>Upper end of the range</th> </tr> </thead> <tbody> <tr> <td>1: Room air currents minimal or favourable to capture</td> <td>1: Disturbing room air currents</td> </tr> <tr> <td>2: Contaminants of low toxicity or of nuisance value only.</td> <td>2: Contaminants of high toxicity</td> </tr> <tr> <td>3: Intermittent, low production.</td> <td>3: High production, heavy use</td> </tr> <tr> <td>4: Large hood or large air mass in motion</td> <td>4: Small hood-local control only</td> </tr> </tbody> </table> <p>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.</p>	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.)	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<p>8.2.2. Personal protection</p>																					
<p>Eye and face protection</p>	<ul style="list-style-type: none"> ▶ Chemical goggles. ▶ Full face shield may be required for supplementary but never for primary protection of eyes. ▶ 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] 																				
<p>Skin protection</p>	<p>See Hand protection below</p>																				
<p>Hands/feet protection</p>	<ul style="list-style-type: none"> ▶ Wear chemical protective gloves, e.g. PVC. ▶ Wear safety footwear or safety gumboots, e.g. Rubber <p>NOTE:</p> <ul style="list-style-type: none"> ▶ The material may produce skin sensitisation in predisposed individuals. Care must be taken, when removing gloves and other protective equipment, to avoid all possible skin contact. ▶ Contaminated leather items, such as shoes, belts and watch-bands should be removed and destroyed. <p>The selection of suitable gloves does not only depend on the material, but also on further marks of quality which vary from manufacturer to manufacturer. Where the chemical is a preparation of several substances, the resistance of the glove material can not be calculated in advance and has therefore to be checked prior to the application.</p>																				

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	<p>The exact break through time for substances has to be obtained from the manufacturer of the protective gloves and has to be observed when making a final choice.</p> <p>Personal hygiene is a key element of effective hand care. 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.</p> <p>Suitability and durability of glove type is dependent on usage. Important factors in the selection of gloves include:</p> <ul style="list-style-type: none"> frequency and duration of contact, chemical resistance of glove material, glove thickness and dexterity <p>Select gloves tested to a relevant standard (e.g. Europe EN 374, US F739, AS/NZS 2161.1 or national equivalent).</p> <ul style="list-style-type: none"> 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, AS/NZS 2161.10.1 or national equivalent) 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, AS/NZS 2161.10.1 or national equivalent) is recommended. Some glove polymer types are less affected by movement and this should be taken into account when considering gloves for long-term use. Contaminated gloves should be replaced. <p>As defined in ASTM F-739-96 in any application, gloves are rated as:</p> <ul style="list-style-type: none"> Excellent when breakthrough time > 480 min Good when breakthrough time > 20 min Fair when breakthrough time < 20 min Poor when glove material degrades <p>For general applications, gloves with a thickness typically greater than 0.35 mm, are recommended.</p> <p>It should be emphasised that glove thickness is not necessarily a good predictor of glove resistance to a specific chemical, as the permeation efficiency of the glove will be dependent on the exact composition of the glove material. Therefore, glove selection should also be based on consideration of the task requirements and knowledge of breakthrough times.</p> <p>Glove thickness may also vary depending on the glove manufacturer, the glove type and the glove model. Therefore, the manufacturers' technical data should always be taken into account to ensure selection of the most appropriate glove for the task.</p> <p>Note: Depending on the activity being conducted, gloves of varying thickness may be required for specific tasks. For example:</p> <ul style="list-style-type: none"> Thinner gloves (down to 0.1 mm or less) may be required where a high degree of manual dexterity is needed. However, these gloves are only likely to give short duration protection and would normally be just for single use applications, then disposed of. Thicker gloves (up to 3 mm or more) may be required where there is a mechanical (as well as a chemical) risk i.e. where there is abrasion or puncture potential <p>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.</p> <ul style="list-style-type: none"> DO NOT wear cotton or cotton-backed gloves. DO NOT wear leather gloves. Promptly hose all spills off leather shoes or boots or ensure that such footwear is protected with PVC over-shoes.
Body protection	See Other protection below
Other protection	<ul style="list-style-type: none"> Overalls. PVC Apron. PVC protective suit may be required if exposure severe. Eyewash unit. Ensure there is ready access to a safety shower. Some plastic personal protective equipment (PPE) (e.g. gloves, aprons, overshoes) are not recommended as they may produce static electricity. For large scale or continuous use wear tight-weave non-static clothing (no metallic fasteners, cuffs or pockets). Non sparking safety or conductive footwear should be considered. Conductive footwear describes a boot or shoe with a sole made from a conductive compound chemically bound to the bottom components, for permanent control to electrically ground the foot and shall dissipate static electricity from the body to reduce the possibility of ignition of volatile compounds. Electrical resistance must range between 0 to 500,000 ohms. Conductive shoes should be stored in lockers close to the room in which they are worn. Personnel who have been issued conductive footwear should not wear them from their place of work to their homes and return.

Respiratory protection

Particulate. (AS/NZS 1716 & 1715, EN 143:2000 & 149:001, ANSI Z88 or national equivalent)

Required Minimum Protection Factor	Half-Face Respirator	Full-Face Respirator	Powered Air Respirator
up to 10 x ES	P1 Air-line*	-	PAPR-P1 -
up to 50 x ES	Air-line**	P2	PAPR-P2
up to 100 x ES	-	P3	-
100+ x ES	-	Air-line* Air-line**	- PAPR-P3

* - Negative pressure demand ** - Continuous flow

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

- Respirators may be necessary when engineering and administrative controls do not adequately prevent exposures.
- The decision to use respiratory protection should be based on professional judgment that takes into account toxicity information, exposure measurement data, and frequency and likelihood of the worker's exposure - ensure users are not subject to high thermal loads which may result in heat stress or distress due to personal protective equipment (powered, positive flow, full face apparatus may be an option).
- Published occupational exposure limits, where they exist, will assist in determining the adequacy of the selected respiratory protection. These may be government mandated or vendor recommended.
- Certified respirators will be useful for protecting workers from inhalation of particulates when properly selected and fit tested as part of a complete respiratory protection program.
- Use approved positive flow mask if significant quantities of dust becomes airborne.
- Try to avoid creating dust conditions.

8.2.3. Environmental exposure controls

See section 12

SECTION 9 PHYSICAL AND CHEMICAL PROPERTIES

Continued...

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9.1. Information on basic physical and chemical properties

Appearance	powder		
Physical state	Divided Solid Powder	Relative density (Water = 1)	1.98
Odour	Not Available	Partition coefficient n-octanol / water	Not Available
Odour threshold	Not Available	Auto-ignition temperature (°C)	Not Available
pH (as supplied)	Not Available	Decomposition temperature	>120
Melting point / freezing point (°C)	Not Available	Viscosity (cSt)	Not Available
Initial boiling point and boiling range (°C)	Not Available	Molecular weight (g/mol)	Not Available
Flash point (°C)	Not Available	Taste	Not Available
Evaporation rate	Not Available	Explosive properties	Not Available
Flammability	Not Available	Oxidising properties	Not Available
Upper Explosive Limit (%)	Not Available	Surface Tension (dyn/cm or mN/m)	Not Applicable
Lower Explosive Limit (%)	Not Available	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	VOC g/L	Not Available

9.2. Other information

Not Available

SECTION 10 STABILITY AND REACTIVITY

10.1.Reactivity	See section 7.2
10.2. Chemical stability	<ul style="list-style-type: none"> ▶ Unstable in the presence of incompatible materials. ▶ Product is considered stable under normal handling conditions. ▶ Prolonged exposure to heat. ▶ Hazardous polymerisation will not occur. ▶ Many of the salts of peroxoacids are unstable or explosive and are capable of initiation by heat, friction or impact, and all are powerful oxidants. BREThERICK L.: Handbook of Reactive Chemical Hazards
10.3. Possibility of hazardous reactions	See section 7.2
10.4. Conditions to avoid	See section 7.2
10.5. Incompatible materials	See section 7.2
10.6. Hazardous decomposition products	See section 5.3

SECTION 11 TOXICOLOGICAL INFORMATION

11.1. Information on toxicological effects

Inhaled	<p>Evidence shows, or practical experience predicts, that the material produces irritation of the respiratory system, in a substantial number of individuals, following inhalation. In contrast to most organs, the lung is able to respond to a chemical insult by first removing or neutralising the irritant and then repairing the damage. The repair process, which initially evolved to protect mammalian lungs from foreign matter and antigens, may however, produce further lung damage resulting in the impairment of gas exchange, the primary function of the lungs. Respiratory tract irritation often results in an inflammatory response involving the recruitment and activation of many cell types, mainly derived from the vascular system.</p> <p>Clinical signs in persulfate salt inhalation studies include ocular and nasal discharge and respiratory distress.</p> <p>Persulfates also can be irritating to the respiratory track of occupationally exposed individuals such as hairdressers.</p> <p>Acute dermal, oral, and inhalation toxicity studies are available, but only the latter are remarkable, with gross lesions observed in the lungs, liver, stomach, and spleen. Short-term inhalation toxicity was observed when rats were exposed to aerosolized ammonium persulfate at concentrations of 4 mg/m³ and greater.</p> <p>Persons with impaired respiratory function, airway diseases and conditions such as emphysema or chronic bronchitis, may incur further disability if excessive concentrations of particulate are inhaled.</p> <p>If prior damage to the circulatory or nervous systems has occurred or if kidney damage has been sustained, proper screenings should be conducted on individuals who may be exposed to further risk if handling and use of the material result in excessive exposures.</p>
Ingestion	<p>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.</p> <p>In short-term and subchronic feeding studies the results were mixed; some studies found no evidence of toxicity and others found local damage to the mucous membrane in the gastrointestinal tract, but no other systemic effects.</p> <p>Following ingestion, persulfate salts are likely to decompose to hydrogen peroxide and sulfate. The hydrogen peroxide will be rapidly converted to oxygen and water by various enzymes.</p> <p>Human metabolism allows detoxification of ammonia, however toxic effects appear if this mechanism is overwhelmed by other than small doses.</p> <p>Ingestion of ammonium salts may produce local irritation, nausea, vomiting and diarrhoea. Very large doses of ammonium salts may produce a drop in blood pressure, collapse, central nervous system disorders, spasms, narcosis, respiratory paralysis and haemolysis.</p> <p>Large doses of ammonium salts may be sufficiently absorbed to produce diuresis and systemic ammonia poisoning. Such poisonings have been described after parenteral administration of the salts and produce flaccidity of facial muscles, tremor, generalised discomfort, anxiety and impairment of motor performance, recognition and of critical flicker fusion. Such a clinical picture resembles that found in terminal liver failure - elevated levels of ammonia are found regularly in advanced liver disease.</p>

Continued...

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Skin Contact	<p>Evidence exists, or practical experience predicts, that the material either produces inflammation of the skin in a substantial number of individuals following direct contact, and/or produces significant inflammation when applied to the healthy intact skin of animals, for up to four hours, such inflammation being present twenty-four hours or more after the end of the exposure period. Skin irritation may also be present after prolonged or repeated exposure; this may result in a form of contact dermatitis (nonallergic). The dermatitis is often characterised by skin redness (erythema) and swelling (oedema) which may progress to blistering (vesiculation), scaling and thickening of the epidermis. At the microscopic level there may be intercellular oedema of the spongy layer of the skin (spongiosis) and intracellular oedema of the epidermis.</p> <p>The material may accentuate any pre-existing dermatitis condition</p> <p>Studies in humans indicate that aqueous solutions of 5% persulfate or higher can cause skin irritation. Persulfates may be irritating to skin of occupationally exposed individuals such as hairdressers.</p> <p>Open cuts, abraded or irritated skin should not be exposed to this material</p> <p>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.</p>
Eye	<p>Evidence exists, or practical experience predicts, that the material may cause eye irritation in a substantial number of individuals and/or may produce significant ocular lesions which are present twenty-four hours or more after instillation into the eye(s) of experimental animals.</p> <p>Repeated or prolonged eye contact may cause inflammation characterised by temporary redness (similar to windburn) of the conjunctiva (conjunctivitis); temporary impairment of vision and/or other transient eye damage/ulceration may occur.</p>
Chronic	<p>Long-term exposure to respiratory irritants may result in disease of the airways involving difficult breathing and related systemic problems.</p> <p>Practical evidence shows that inhalation of the material is capable of inducing a sensitisation reaction in a substantial number of individuals at a greater frequency than would be expected from the response of a normal population.</p> <p>Pulmonary sensitisation, resulting in hyperactive airway dysfunction and pulmonary allergy may be accompanied by fatigue, malaise and aching. Significant symptoms of exposure may persist for extended periods, even after exposure ceases. Symptoms can be activated by a variety of nonspecific environmental stimuli such as automobile exhaust, perfumes and passive smoking.</p> <p>Practical experience shows that skin contact with the material is capable either of inducing a sensitisation reaction in a substantial number of individuals, and/or of producing a positive response in experimental animals.</p> <p>Limited evidence suggests that repeated or long-term occupational exposure may produce cumulative health effects involving organs or biochemical systems.</p> <p>Long term exposure to high dust concentrations may cause changes in lung function (i.e. pneumoconiosis) caused by particles less than 0.5 micron penetrating and remaining in the lung. A prime symptom is breathlessness. Lung shadows show on X-ray.</p> <p>Persulfate allergy is not uncommon and manifests itself in the form of a skin rash, eczema and respiratory conditions such as asthma. Allergy may develop after repeated exposures. Asthmatic complaints ('persulfate asthma') have been described following use of persulfate salts particularly amongst hairdressers. Furthermore the ammonium persulfate contained in bleaching powder is one of the most important contact allergens in the hairdressing profession. It has been suggested that the development of sensitisation is due to an IgE-induced allergic pathomechanism. Wrbitzky R. et al; Int. Arch Occup. Environ. Health (1995) 67; 413-417</p>

410 Ammonium Persulfate	TOXICITY	IRRITATION
	Not Available	Not Available
ammonium persulfate	TOXICITY	IRRITATION
	dermal (rat) LD50: >2000 mg/kg ^[1]	Not Available
	Oral (rat) LD50: =495 mg/kg ^[2]	

Legend: 1. Value obtained from Europe ECHA Registered Substances - Acute toxicity 2. * Value obtained from manufacturer's SDS. Unless otherwise specified data extracted from RTECS - Register of Toxic Effect of chemical Substances

410 Ammonium Persulfate	<p>The persulfates were reported to cause both delayed-type and immediate skin reactions, including irritant dermatitis, allergic eczematous dermatitis, localized contact urticaria, generalized urticaria, rhinitis, asthma, and syncope. The most common causes of allergic dermatitis in hairdressers are the active ingredients in hair dyes, and ammonium persulfate has been identified as a frequent allergen. A sensitisation study that also examined the incidence of urticarial reactions was performed with 17.5% ammonium, potassium, and sodium persulfate under occlusive patches. At this concentration and exposure conditions, a mixture of these persulfates was not sensitizing, and application of ammonium, potassium, and sodium persulfate did not result in an urticarial reaction. In normal use (i.e., not occluded and rinsed off), it was expected that a concentration greater than 17.5% would also be safe. Given the clinical reports of urticarial reactions, however, manufacturers and formulators should be aware of the potential for urticarial reactions at concentrations of persulfates greater than 17.5%.</p> <p>Results of animal skin sensitisation tests (Buehler Test and Maximization Test) were negative when persulfate was applied topically and positive when persulfate was injected intradermally in induction and challenge phases in a non-standard Maximization Test. Numerous dermal challenge tests indicate that some persulfates are dermal and respiratory sensitizers in humans occupationally exposed to persulfates in hairdressing salons and, in one case, in a production facility.</p> <p>In controlled clinical trials with non-occupationally exposed-subjects (NH₄ and Na salts), no sensitization reactions were observed. Pulmonary function tests of workers in a persulfate production plant (cation not identified) indicated that there were no short- or long-term effects on pulmonary function at levels in the plant (0.5 mg/m³).</p> <p>In repeated-dose studies, local effects to the gastro-intestinal tract and the airways were reported. Administration of sodium persulfate to rats in the diet for 13 weeks resulted in a LOAEL of 3000 ppm (225 mg/kg bw/day) based on gastrointestinal lesions and reduced body weights. In a subchronic inhalation study in male and female rats, adverse effects at a high dose of 25 mg/m³ ammonium persulfate aerosol consisted of inflammation of the trachea, bronchi, bronchioles, increased lung weight, decreased body weights, rales and increased respiratory rate. A NOAEL of 10.3 mg/m³ was established.</p> <p>Persulfate salts do not appear to cause gene mutations or chromosomal effects in vitro. In vivo tests on sodium persulfate (micronucleus test and UDS test) were negative.</p> <p>A 51 week dermal study in female mice exposed to 0.2 ml of a 200 mg/ml solution of ammonium persulfate showed that ammonium persulfate is neither a tumour promoter nor a complete carcinogen when applied to the skin.</p> <p>In a developmental/reproduction study with ammonium persulfate in rats (OECD TG 421), no effects on reproductive performance, fertility, fetal anomalies, fetal viability, spermatogenesis, spermatogenic cycle were reported up to 250 mg/kg-bw/day. Dose levels were chosen based on the acute lethality studies for the ammonium salt and on a 90-day repeat-dose study in rats with the sodium salt (high dose: 225 mg/kg-bw/day). In the developmental/reproduction study, animals were dosed prior to and during mating through gestation until lactation day 4. There was a transient depression in pup body weight at the 250 mg/kg dose level on lactation day 0 which resolved by day 4. This effect was not considered adverse. Based on the available data, the persulfates do not show evidence of reproductive or developmental toxicity. The NOAEL is 250 mg/kg bw/day</p>
AMMONIUM PERSULFATE	Inhalation (rat) TCLo: 3.8 mg/m ³ /23H/7D-I

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410 Ammonium Persulphate & AMMONIUM PERSULFATE	<p>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.</p> <p>Allergic reactions which develop in the respiratory passages as bronchial asthma or rhinoconjunctivitis, are mostly the result of reactions of the allergen with specific antibodies of the IgE class and belong in their reaction rates to the manifestation of the immediate type. In addition to the allergen-specific potential for causing respiratory sensitisation, the amount of the allergen, the exposure period and the genetically determined disposition of the exposed person are likely to be decisive. Factors which increase the sensitivity of the mucosa may play a role in predisposing a person to allergy. They may be genetically determined or acquired, for example, during infections or exposure to irritant substances. Immunologically the low molecular weight substances become complete allergens in the organism either by binding to peptides or proteins (haptens) or after metabolism (prohaptens).</p> <p>Particular attention is drawn to so-called atopic diathesis which is characterised by an increased susceptibility to allergic rhinitis, allergic bronchial asthma and atopic eczema (neurodermatitis) which is associated with increased IgE synthesis.</p> <p>Exogenous allergic alveolitis is induced essentially by allergen specific immune-complexes of the IgG type; cell-mediated reactions (T lymphocytes) may be involved. Such allergy is of the delayed type with onset up to four hours following exposure.</p> <p>The following information refers to contact allergens as a group and may not be specific to this product.</p> <p>Contact allergies quickly manifest themselves as contact eczema, more rarely as urticaria or Quincke's oedema. 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 sensitisation potential: the distribution of the substance and the opportunities for contact with it are equally important. A weakly sensitising substance which is widely distributed can be a more important allergen than one with stronger sensitising 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.</p>			
	Acute Toxicity	✓	Carcinogenicity	✗
Skin Irritation/Corrosion	✓	Reproductivity	✗	
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

12.1. Toxicity

410 Ammonium Persulphate	ENDPOINT	TEST DURATION (HR)	SPECIES	VALUE	SOURCE
	Not Available	Not Available	Not Available	Not Available	Not Available
ammonium persulfate	ENDPOINT	TEST DURATION (HR)	SPECIES	VALUE	SOURCE
	LC50	96	Fish	76.3mg/L	2
	EC50	48	Crustacea	21.22mg/L	2
	EC50	72	Algae or other aquatic plants	83.7mg/L	2
	NOEC	120	Crustacea	5mg/L	2
Legend:	<p>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</p>				

In air ammonia is persistent whilst, in water, it biodegrades rapidly to nitrate, producing a high oxygen demand. Ammonia is strongly adsorbed to soil. Ammonia is non-persistent in water (half-life 2 days) and is moderately toxic to fish under normal temperature and pH conditions. Ammonia is harmful to aquatic life at low concentrations but does not concentrate in the food chain. Ammonium ions may be toxic to fish at 0.3 mg/l

Drinking Water Standards:

0.5 mg/l (UK max.)

1.5 mg/l (WHO Levels)

Soil Guidelines: none available.

Air Quality Standards: none available.

for persulfates (salts):

Environmental fate:

Aqueous solutions of persulfates decompose at ordinary temperatures. Decomposition occurs under moist conditions or at higher temperatures, and when heated to decomposition (120 degree C) toxic fumes of SO_x are emitted. During use oxygen may be formed. Degradation produces sulfates and at elevated temperatures pyrosulfate.

Persulfates are not expected to adsorb to soil due to their dissociation properties, instability (hydrolysis) and high water solubility. They should behave as free ions or decompose into sulfate ions. In soils, upon decomposition, the cation could form more stable sulfate or bisulfate salts.

Persulfates are not expected to bioaccumulate in the soil or in aqueous solution. They will decompose into inorganic sulfate or bisulfate

In alkaline, neutral and dilute acid solutions persulfate decomposes according to reaction (1) while in strongly acid solutions reactions (2) and (3) occur:

1. S₂O₈(-) + H₂O → 2HSO₄(-) + 1/2

2. S₂O₈ + H₂O → H₂SO₅ + H₂SO₄

3. H₂SO₅ + H₂O → H₂O₂ + H₂SO₄

Since the decomposition (hydrolysis) rate is first order, the half life is independent of initial concentration. Half lives of potassium persulfate at 50 deg C, as a function of pH, were calculated from the following data:

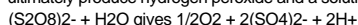
The rates of decomposition in water for potassium persulfate at various pH's.

pH	1.0	1.6	3.0	7.0	10.0
Half-life (hrs)	20	65	125	130	210

Continued...

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The main kinetic mechanism begins with homolytic cleavage of persulfate to form sulfate ion radicals. These radicals initiate a series of propagating reactions producing hydroxyl radicals, which ultimately produce hydrogen peroxide and a solution of acid sulfate. The net reaction is:



The rate equation was described as having two terms once the solution became sufficiently acid:

$$-d[(S_2O_8)^{2-}]/dt = k_1(H_2O)((S_2O_8)^{2-}) + k_2(H^+)((S_2O_8)^{2-})$$

The rate constant for the acid-catalysed term, k_2 , and it was determined to be $3.5 \times 10^{-3} \text{ min}^{-1} (\text{m/l})^{-1}$. This term becomes dominant at low pH's.

Ecotoxicity:

For potassium persulfate

Fish LC50 (-): *Poecilia reticulata* 845 mg/l

Daphnia EC50: 92-251 mg/l

Tubificidae EC50 (-): 575 mg/l

Cyclops strenuus EC50 (-): 1175 mg/l

for inorganic sulfates:

Environmental fate:

Data from tap water studies with human volunteers indicate that sulfates produce a laxative effect at concentrations of 1000 - 1200 mg/litre, but no increase in diarrhoea, dehydration or weight loss. The presence of sulfate in drinking-water can also result in a noticeable taste; the lowest taste threshold concentration for sulfate is approximately 250 mg/litre as the sodium salt. Sulfate may also contribute to the corrosion of distribution systems. No health-based guideline value for sulfate in drinking water is proposed. However, there is an increasing likelihood of complaints arising from a noticeable taste as concentrations in water increase above 500 mg/litre.

Sulfates 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 soil, the inorganic sulfates 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.

Sulfate in water can also be reduced by sulfate bacteria (*Thiobacilli*) which use them as a source of energy.

In anaerobic environments sulfate is biologically reduced to (hydrogen) sulfide by sulfate reducing bacteria, or incorporated into living organisms as source of sulfur, and thereby included in the sulfur cycle. Sodium sulfate is not reactive in aqueous solution at room temperature. Sodium sulfate will completely dissolve, ionise and distribute across the entire planetary 'aquasphere'. Some sulfates may eventually be deposited, the majority of sulfates participate in the sulfur cycle in which natural and industrial sodium sulfate are not distinguishable.

The BCF of sodium sulfate is very low and therefore significant bioconcentration is not expected. Sodium and sulfate ions are essential to all living organisms and their intracellular and extracellular concentrations are actively regulated. However some plants (e.g. corn and *Kochia Scoparia*), are capable of accumulating sulfate to concentrations that are potentially toxic to ruminants.

Ecotoxicity:

For sulfate in general:

Fish LC50: toxic from 7000 mg/l

Bacteria: toxic from 2500 mg/l

Algae were shown to be the most sensitive to sodium sulfate; EC50 120 h = 1,900 mg/l. For invertebrates (*Daphnia magna*) the EC50 48 h = 4,580 mg/l and fish appeared to be the least sensitive with a LC50 96h = 7,960 mg/l for *Pimephales promelas*. Activated sludge showed a very low sensitivity to sodium sulfate. There was no effect up to 8 g/l. Sodium sulfate is not very toxic to terrestrial plants. *Picea banksiana* was the most sensitive species, an effect was seen at 1.4 g/l. Sediment dwelling organisms were not very sensitive either, with an LC50 96h = 660 mg/l for *Trycorythus sp.* Overall it can be concluded that sodium sulfate has no acute adverse effect on aquatic and sediment dwelling organisms. Toxicity to terrestrial plants is also low.

No data were found for long term toxicity. The acute studies all show a toxicity of sodium sulfate higher than 100 mg/l, no bioaccumulation is expected,

DO NOT discharge into sewer or waterways.

12.2. Persistence and degradability

Ingredient	Persistence: Water/Soil	Persistence: Air
	No Data available for all ingredients	No Data available for all ingredients

12.3. Bioaccumulative potential

Ingredient	Bioaccumulation
	No Data available for all ingredients

12.4. Mobility in soil

Ingredient	Mobility
	No Data available for all ingredients

12.5. Results of PBT and vPvB assessment

	P	B	T
Relevant available data	Not Applicable	Not Applicable	Not Applicable
PBT Criteria fulfilled?	Not Applicable	Not Applicable	Not Applicable

12.6. Other adverse effects

No data available

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

Product / Packaging disposal	<ul style="list-style-type: none"> ▶ Containers may still present a chemical hazard/ danger when empty. ▶ Return to supplier for reuse/ recycling if possible. <p>Otherwise:</p> <ul style="list-style-type: none"> ▶ If container can not be cleaned sufficiently well to ensure that residuals do not remain or if the container cannot be used to store the same product, then puncture containers, to prevent re-use, and bury at an authorised landfill. ▶ Where possible retain label warnings and SDS and observe all notices pertaining to the product. ▶ Waste persulfate solids or solutions will be treated to decompose the material into innocuous metal sulfates or diluted to levels where they are no longer hazardous. ▶ Used product containers and residual (waste) persulfate solutions will either be diluted and sent to a wastewater treatment facility or sent into a domestic waste system. Under these conditions the product is expected to be dilute and to degrade into sulfate or bisulfate salts. ▶ Large quantities of persulfate waste materials are usually collected in appropriate containers and disposed of as hazardous waste.
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Continued...

410 Ammonium Persulphate

	<p>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.</p> <p>A Hierarchy of Controls seems to be common - the user should investigate:</p> <ul style="list-style-type: none"> ▶ Reduction ▶ Reuse ▶ Recycling ▶ Disposal (if all else fails) <p>This material may be recycled if unused, or if it has not been contaminated so as to make it unsuitable for its intended use. 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. In most instances the supplier of the material should be consulted.</p> <ul style="list-style-type: none"> ▶ DO NOT allow wash water from cleaning or process equipment to enter drains. ▶ It may be necessary to collect all wash water for treatment before disposal. ▶ In all cases disposal to sewer may be subject to local laws and regulations and these should be considered first. ▶ Where in doubt contact the responsible authority. ▶ Recycle wherever possible or consult manufacturer for recycling options. ▶ Consult State Land Waste Management Authority for disposal. ▶ Bury residue in an authorised landfill. ▶ Recycle containers if possible, or dispose of in an authorised landfill.
Waste treatment options	Not Available
Sewage disposal options	Not Available

SECTION 14 TRANSPORT INFORMATION

Labels Required

		Limited quantity: 410-1KG
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Land transport (ADR)

14.1. UN number	1444										
14.2. UN proper shipping name	AMMONIUM PERSULPHATE										
14.3. Transport hazard class(es)	<table border="0"> <tr> <td>Class</td> <td>5.1</td> </tr> <tr> <td>Subrisk</td> <td>Not Applicable</td> </tr> </table>	Class	5.1	Subrisk	Not Applicable						
Class	5.1										
Subrisk	Not Applicable										
14.4. Packing group	III										
14.5. Environmental hazard	Not Applicable										
14.6. Special precautions for user	<table border="0"> <tr> <td>Hazard identification (Kemler)</td> <td>50</td> </tr> <tr> <td>Classification code</td> <td>O2</td> </tr> <tr> <td>Hazard Label</td> <td>5.1</td> </tr> <tr> <td>Special provisions</td> <td>Not Applicable</td> </tr> <tr> <td>Limited quantity</td> <td>5 kg</td> </tr> </table>	Hazard identification (Kemler)	50	Classification code	O2	Hazard Label	5.1	Special provisions	Not Applicable	Limited quantity	5 kg
Hazard identification (Kemler)	50										
Classification code	O2										
Hazard Label	5.1										
Special provisions	Not Applicable										
Limited quantity	5 kg										

Air transport (ICAO-IATA / DGR)

14.1. UN number	1444														
14.2. UN proper shipping name	Ammonium persulphate														
14.3. Transport hazard class(es)	<table border="0"> <tr> <td>ICAO/IATA Class</td> <td>5.1</td> </tr> <tr> <td>ICAO / IATA Subrisk</td> <td>Not Applicable</td> </tr> <tr> <td>ERG Code</td> <td>5L</td> </tr> </table>	ICAO/IATA Class	5.1	ICAO / IATA Subrisk	Not Applicable	ERG Code	5L								
ICAO/IATA Class	5.1														
ICAO / IATA Subrisk	Not Applicable														
ERG Code	5L														
14.4. Packing group	III														
14.5. Environmental hazard	Not Applicable														
14.6. Special precautions for user	<table border="0"> <tr> <td>Special provisions</td> <td>Not Applicable</td> </tr> <tr> <td>Cargo Only Packing Instructions</td> <td>563</td> </tr> <tr> <td>Cargo Only Maximum Qty / Pack</td> <td>100 kg</td> </tr> <tr> <td>Passenger and Cargo Packing Instructions</td> <td>559</td> </tr> <tr> <td>Passenger and Cargo Maximum Qty / Pack</td> <td>25 kg</td> </tr> <tr> <td>Passenger and Cargo Limited Quantity Packing Instructions</td> <td>Y546</td> </tr> <tr> <td>Passenger and Cargo Limited Maximum Qty / Pack</td> <td>10 kg</td> </tr> </table>	Special provisions	Not Applicable	Cargo Only Packing Instructions	563	Cargo Only Maximum Qty / Pack	100 kg	Passenger and Cargo Packing Instructions	559	Passenger and Cargo Maximum Qty / Pack	25 kg	Passenger and Cargo Limited Quantity Packing Instructions	Y546	Passenger and Cargo Limited Maximum Qty / Pack	10 kg
Special provisions	Not Applicable														
Cargo Only Packing Instructions	563														
Cargo Only Maximum Qty / Pack	100 kg														
Passenger and Cargo Packing Instructions	559														
Passenger and Cargo Maximum Qty / Pack	25 kg														
Passenger and Cargo Limited Quantity Packing Instructions	Y546														
Passenger and Cargo Limited Maximum Qty / Pack	10 kg														

Sea transport (IMDG-Code / GGVSee)

14.1. UN number	1444
14.2. UN proper shipping name	AMMONIUM PERSULPHATE

410 Ammonium Persulphate

14.3. Transport hazard class(es)	IMDG Class	5.1
	IMDG Subrisk	Not Applicable
14.4. Packing group	III	
14.5. Environmental hazard	Not Applicable	
14.6. Special precautions for user	EMS Number	F-A, S-Q
	Special provisions	Not Applicable
	Limited Quantities	5 kg

Inland waterways transport (ADN)

14.1. UN number	1444	
14.2. UN proper shipping name	AMMONIUM PERSULPHATE	
14.3. Transport hazard class(es)	5.1	Not Applicable
14.4. Packing group	III	
14.5. Environmental hazard	Not Applicable	
14.6. Special precautions for user	Classification code	O2
	Special provisions	Not Applicable
	Limited quantity	5 kg
	Equipment required	PP
	Fire cones number	0

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

Not Applicable

SECTION 15 REGULATORY INFORMATION

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

AMMONIUM PERSULFATE(7727-54-0) IS FOUND ON THE FOLLOWING REGULATORY LISTS

ADN - European Agreement concerning the International Carriage of Dangerous Goods by Inland Waterways	European Customs Inventory of Chemical Substances ECICS (English)
Europe EC Inventory	European Trade Union Confederation (ETUC) Priority List for REACH Authorisation
Europe ECHA Registered Substances - Classification and Labelling - DSD-DPD	European Union - European Inventory of Existing Commercial Chemical Substances (EINECS) (English)
Europe European Agreement concerning the International Carriage of Dangerous Goods by Road - ADR 2017 (Russian)	European Union (EU) Annex I to Directive 67/548/EEC on Classification and Labelling of Dangerous Substances - updated by ATP: 31
Europe European Customs Inventory of Chemical Substances - ECICS (Slovak)	European Union (EU) Regulation (EC) No 1272/2008 on Classification, Labelling and Packaging of Substances and Mixtures - Annex VI
Europe European Customs Inventory of Chemical Substances ECICS (Bulgarian)	European Union (EU) Regulation (EC) No 1272/2008 on Classification, Labelling and Packaging of Substances and Mixtures - Annex VI - Chemwatch Standard Format
Europe European Customs Inventory of Chemical Substances ECICS (Czech)	European Union (EU) Transport of Dangerous Goods by Road - Dangerous Goods List (English)
Europe European Customs Inventory of Chemical Substances ECICS (Romanian)	European Union (EU) Transport of Dangerous Goods by Road - Dangerous Goods List (French)
European Agreement concerning the International Carriage of Dangerous Goods by Road (ADR 2011, Norwegian)	European Union (EU) Transport of Dangerous Goods by Road - Dangerous Goods List (German)
European Agreement concerning the International Carriage of Dangerous Goods by Road (ADR 2011, Portuguese)	International Air Transport Association (IATA) Dangerous Goods Regulations
European Agreement concerning the International Carriage of Dangerous Goods by Road (ADR 2011, Spanish)	International Maritime Dangerous Goods Requirements (IMDG Code)
European Agreement concerning the International Carriage of Dangerous Goods by Road (ADR 2015, German)	Regulations concerning the International Carriage of Dangerous Goods by Rail - Table A: Dangerous Goods List - RID 2019 (English)
European Agreement concerning the International Carriage of Dangerous Goods by Road (ADR 2017, English)	United Nations Recommendations on the Transport of Dangerous Goods Model Regulations (Chinese)
European Agreement concerning the International Carriage of Dangerous Goods by Road (ADR 2019, French)	United Nations Recommendations on the Transport of Dangerous Goods Model Regulations (English)
European Agreement concerning the International Carriage of Dangerous Goods by Road (ADR-S 2019, Swedish)	United Nations Recommendations on the Transport of Dangerous Goods Model Regulations (Spanish)
European Chemical Agency (ECHA) Classification & Labelling Inventory - Chemwatch Harmonised classification	

This safety data sheet is in compliance with the following EU legislation and its adaptations - as far as applicable - : Directives 98/24/EC, - 92/85/EEC, - 94/33/EC, - 2008/98/EC, - 2010/75/EU; Commission Regulation (EU) 2015/830; Regulation (EC) No 1272/2008 as updated through ATPs.

15.2. Chemical safety assessment

No Chemical Safety Assessment has been carried out for this substance/mixture by the supplier.

National Inventory Status

National Inventory	Status
Australia - AICS	Yes
Canada - DSL	Yes
Canada - NDSL	No (ammonium persulfate)
China - IECSC	Yes

Continued...

410 Ammonium Persulfate

Europe - EINEC / ELINCS / NLP	Yes
Japan - ENCS	Yes
Korea - KECI	Yes
New Zealand - NZIoC	Yes
Philippines - PICCS	Yes
USA - TSCA	Yes
Legend:	Yes = All ingredients are on the inventory No = Not determined or one or more ingredients are not on the inventory and are not exempt from listing(see specific ingredients in brackets)

SECTION 16 OTHER INFORMATION

Revision Date	16/03/2020
Initial Date	26/02/2018

Full text Risk and Hazard codes

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 available engineering controls must be considered.

For detailed advice on Personal Protective Equipment, refer to the following EU CEN Standards:

EN 166 Personal eye-protection

EN 340 Protective clothing

EN 374 Protective gloves against chemicals and micro-organisms

EN 13832 Footwear protecting against chemicals

EN 133 Respiratory protective devices

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

Reason For Change

A-1.02 - Update to the emergency phone number information.