



The Best In Chemicals

SAFETY DATA SHEET

BESTCHEM ISOPROPYL ALCOHOL

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Issue Date: 12-07-2023

Revision Date: 06-11-2023

Version No.: 2.0

SECTION 1 - CHEMICAL PRODUCT AND COMPANY IDENTIFICATION

Product name

Bestchem Isopropyl Alcohol

Intended use and restriction on use

Solvent for chemicals, paints, varnishes, gums, resins, essential oils. Used in the preservation of physiological and pathological specimens. Used for extraction processes, perfumery, and pharmaceuticals. Used in the production of acetone, glycerol and isopropyl esters, acetate.

Supplier

Company: Best Chemical Co (S) Pte Ltd
Address: 60 Senoko Road, Singapore 758124
Telephone: +65 6755 2400
Emergency Tel: +65 6755 2400
Fax: +65 6752 8809
Email: enquiry@best-chemical.com
Website: www.best-chemical.com

SECTION 2 - HAZARDS IDENTIFICATION

GHS Classification

Flammable Liquids Category 2

Serious Eye Damage/Eye Irritation Category 2

Aspiration Hazard Category 2

Reproductive Toxicity Category 2

Acute Toxicity (Oral) Category 5

Acute Toxicity (Dermal) Category 5

Specific Target Organ Toxicity - Single Exposure (Respiratory Tract Irritation) Category 3

Specific Target Organ Toxicity - Single Exposure (Central Nervous System, Kidney, Systemic Toxicity) Category 1

Specific Target Organ Toxicity - Repeated Exposure (Blood vessel, Liver, Spleen) Category 2



Signal word

DANGER

Hazard Statements

H225 Highly flammable liquid and vapour.

H303 May be harmful if swallowed.

H305 May be harmful if swallowed or enters airways.

H316 Causes mild skin irritation.

H319 Causes serious eye irritation.

H335 May cause respiratory irritation.

H361 Suspected of damaging fertility or the unborn child.

H370 Causes damage to organs (Central Nervous system, Kidney, Systemic Toxicity).

H372 Causes damage to organs (Blood vessel, Liver, Spleen) through prolonged or repeated exposure.

Prevention

P210 Keep away from heat/sparks/open flames/hot surfaces – No smoking.

P233 Keep container tightly closed.

P240 Ground/bond container and receiving equipment.

P241 Use explosion-proof electrical/ventilating/lighting equipment.

P242 Use only non-sparking tools.

P243 Take precautionary measures against static discharge.

P260 Do not breathe dust/fume/gas/mist/vapors/spray.

P264 Wash hands thoroughly after handling.

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P270 Do not eat, drink, or smoke while product is in use.

P271 Use only outdoors or in a well-ventilated area.

P281 Use protective equipment as required.

Response

P303+P361+P353 If on Skin (or hair): Remove immediately all contaminated clothing. Rinse skin with water/shower.

P370+P378 In case of fire: Use appropriate media for extinction.

P305+P351+P338 If in Eyes: Rinse cautiously with water for several minutes. Remove contact lenses if present and easy to do. Continue rinsing.

P337+P313 If eye irritation persists: Get medical advice/attention.

P308+P313 If exposed or concerned: Get medical advice/attention.

P304+P340 If Inhaled: Remove victim to fresh air and keep at rest in a position comfortable for breathing.

P301+P312 If Swallowed: Immediately call a Poison Center or doctor/physician if you feel unwell.

P331 Do Not induce vomiting.

Storage

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

P235 Keep cool.

P405 Store locked up.

Disposal

P501 Dispose of contents and container to appropriate waste site or reclaimer in accordance with local and national regulations.

Other hazards which do not result in classification

Physical/Chemical Hazards

No significant hazards.

Health Hazards

Breathing of high vapor concentrations may cause dizziness, light-headedness, headache, nausea and loss of coordination. Continued inhalation may result in unconsciousness. Droplets of the product aspirated into the lungs through ingestion or vomiting may cause a serious chemical pneumonia.

Environmental Hazards

No significant hazards.

SECTION 3 - COMPOSITION / INFORMATION ON INGREDIENTS

Chemical identification Isopropyl Alcohol

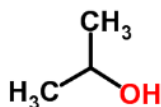
Synonyms isopropanol, 2-Propanol, Propan-2-ol

Composition 99.9%

Chemical structure C₃H₈O

EC Number 200-661-7

CAS No. 67-63-0



SECTION 4 - FIRST AID MEASURES

Swallowed

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. Seek medical advice. If spontaneous vomiting appears imminent or occurs, hold patient's head down, lower than their hips to help avoid possible aspiration of vomitus.

Eye

If this product comes in contact with the eyes: 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.

Skin

If skin or hair contact occurs: Flush skin and hair with running water (and soap if available). Seek medical attention in event of irritation.

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Inhaled

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.

Most important symptoms/effects, acute and delayed.

Any material aspirated during vomiting may produce lung injury.

Indication of immediate medical attention and special treatment needed, if necessary

Rapid onset respiratory depression and hypotension indicates serious ingestions that require careful cardiac and respiratory monitoring together with immediate intravenous access. Rapid absorption precludes the usefulness of emesis or lavage 2 hours post-ingestion. Activated charcoal and cathartics are not clinically useful. Ipecac is most useful when given 30 mins. post-ingestion. There are no antidotes. Management is supportive. Treat hypotension with fluids followed by vasopressors. Watch closely, within the first few hours for respiratory depression; follow arterial blood gases and tidal volumes. Ice water lavage and serial haemoglobin levels are indicated for those patients with evidence of gastrointestinal bleeding. Any material aspirated during vomiting may produce lung injury, therefore emesis should not be induced mechanically or pharmacologically. Mechanical means should be used if it is considered necessary to evacuate the stomach contents; these include gastric lavage after endotracheal intubation. If spontaneous vomiting has occurred after ingestion, the patient should be monitored for difficult breathing, as adverse effects of aspiration into the lungs may be delayed up to 48 hours.

Protection of first-aid providers

When assisting the casualty, wear an air-supplied respirator or a compressed-air open-circuit SCBA (self-contained breathing apparatus).

SECTION 5 - FIRE FIGHTING MEASURES

Extinguishing media

Alcohol stable foam. Dry chemical powder. BCF (where regulations permit). Carbon dioxide. Water spray or fog - Large fires only.

Fire fighting

Alert Fire Brigade and tell them location and nature of hazard. May be violently or explosively reactive. Wear breathing apparatus plus protective gloves in the event of a fire. Prevent, by any means available, spillage from entering drains or water course. Consider evacuation (or protect in place). Fight fire from a safe distance, with adequate cover. If safe, switch off electrical equipment until vapour fire hazard removed. Use water delivered as a fine spray to control the 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

Liquid and vapour are highly flammable. Severe fire hazard when exposed to heat, flame and/or oxidisers. Vapour may travel a considerable distance to source of ignition. Heating may cause expansion or decomposition leading to violent rupture of containers. On combustion, may emit toxic fumes of carbon monoxide (CO). Combustion products include: carbon dioxide (CO₂), other pyrolysis products typical of burning organic material. WARNING: Long standing in contact with air and light may result in the formation of potentially explosive peroxides.

Fire incompatibility

Avoid contamination with oxidising agents i.e. nitrates, oxidising acids, chlorine bleaches, pool chlorine etc. as ignition may result.

Personal protective equipment

Breathing apparatus. Chemical protective gloves. Chemical splash suit. Chemical goggles. Safety glasses with side shields. Safety footwear or safety gumboots.

SECTION 6 - ACCIDENTAL RELEASE MEASURES

Personal precautions, protective equipment and emergency procedures

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

Environmental precautions

Environmental precaution is contained in Section 12 of the MSDS.

Methods and material for containment and cleaning up

Minor spills

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Remove all ignition sources. 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 small quantities with vermiculite or other absorbent material. Wipe up. Collect residues in a flammable waste container.

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 breathing apparatus plus protective gloves. Prevent, by any means available, spillage from entering drains or water course. Consider evacuation (or protect in place). No smoking, naked lights or ignition sources. Increase ventilation. Stop leak if safe to do so. Water spray or fog may be used to disperse / absorb vapour. Contain spill with sand, earth or vermiculite. Use only spark-free shovels and explosion proof equipment. Collect recoverable product into labelled containers for recycling. Absorb remaining product with sand, earth or vermiculite. Collect solid residues and seal in labelled drums for disposal. Wash area and prevent runoff into drains. If contamination of drains or waterways occurs, advise emergency services.

SECTION 7 - HANDLING AND STORAGE

Procedure for handling

Containers, even those that have been emptied, may contain explosive vapours. Do NOT cut, drill, grind, weld or perform similar operations on or near containers. DO NOT allow clothing wet with material to stay in contact with skin. The substance accumulates peroxides which may become hazardous only if it evaporates or is distilled or otherwise treated to concentrate the peroxides. The substance may concentrate around the container opening for example. Purchases of peroxidizable chemicals should be restricted to ensure that the chemical is used completely before it can become peroxidised. A responsible person should maintain an inventory of peroxidizable chemicals or annotate the general chemical inventory to indicate which chemicals are subject to peroxidation. An expiration date should be determined. The chemical should either be treated to remove peroxides or disposed of before this date. The person or laboratory receiving the chemical should record a receipt date on the bottle. The individual opening the container should add an opening date. Unopened containers received from the supplier should be safe to store for 18 months. Opened containers should not be stored for more than 12 months. Avoid all personal contact, including inhalation. Wear protective clothing when risk of exposure occurs. Use in a well-ventilated area. Prevent concentration in hollows and sumps. DO NOT enter confined spaces until atmosphere has been checked. Avoid smoking, naked lights, heat or ignition sources. When handling, DO NOT eat, drink or smoke. Vapour may ignite on pumping or pouring due to static electricity. DO NOT use plastic buckets. Earth and secure metal containers when dispensing or pouring product. Use spark-free tools when handling. Avoid contact with incompatible materials. Keep containers securely sealed. Avoid physical damage to containers. Always wash hands with soap and water after handling. Work clothes should be laundered separately. 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.

Suitable container

DO NOT use aluminium or galvanised containers. Packing as supplied by manufacturer. Plastic containers may only be used if approved for flammable liquid. Check that containers are clearly labelled and free from leaks. For low viscosity materials (i): Drums and jerry cans must be of the non-removable head type. (ii): Where a can is to be used as an inner package, the can must have a screwed enclosure. For materials with a viscosity of at least 2680 cSt. (23 deg. C) For manufactured product having a viscosity of at least 250 cSt. (23 deg. C) Manufactured product that requires stirring before use and having a viscosity of at least 20 cSt (25 deg. C): (i) Removable head packaging; (ii) Cans with friction closures and (iii) low pressure tubes and cartridges may be used. 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. In addition, where inner packaging's are glass and contain liquids of packing group I there must be sufficient inert absorbent to absorb any spillage, unless the outer packaging is a close fitting moulded plastic box and the substances are not incompatible with the plastic.

Storage incompatibility

Avoid isocyanates. Isopropanol (syn: isopropyl alcohol, IPA): forms ketones and unstable peroxides on contact with air or oxygen; the presence of ketones especially methyl ethyl ketone (MEK, 2-butanone) will accelerate the rate of peroxidation reacts violently with strong oxidisers, powdered aluminium (exothermic), crotonaldehyde, diethyl aluminium bromide (ignition), dioxygenyl tetrafluoroborate (ignition/ ambient temperature), chromium trioxide (ignition), potassium-tert-butoxide (ignition), nitroform (possible explosion), oleum (pressure increased in closed container), cobalt chloride, aluminium triisopropoxide, hydrogen plus palladium dust (ignition), oxygen gas, phosgene, phosgene plus iron salts (possible explosion), sodium dichromate plus sulfuric acid (exothermic/incandescence), triisobutyl aluminium reacts with phosphorus trichloride forming hydrogen chloride gas reacts, possibly violently, with alkaline earth and alkali metals, strong acids, strong caustics, acid anhydrides, halogens, aliphatic amines, aluminium isopropoxide, isocyanates, acetaldehyde, barium perchlorate (forms highly explosive perchloric ester compound), benzoyl peroxide, chromic acid, dialkylzincs, dichlorine oxide, ethylene oxide (possible

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explosion), hexamethylene diisocyanate (possible explosion), hydrogen peroxide (forms explosive compound), hypochlorous acid, isopropyl chlorocarbonate, lithium aluminium hydride, lithium tetrahydroaluminate, nitric acid, nitrogen dioxide, nitrogen tetraoxide (possible explosion), pentafluoroguanidine, perchloric acid (especially hot), permonosulfuric acid, phosphorus pentasulfide, tangerine oil, triethylaluminium, triisobutylaluminium, trinitromethane attacks some plastics, rubber and coatings reacts with metallic aluminium at high temperature may generate electrostatic charges. Alcohols: are incompatible with strong acids, acid chlorides, acid anhydrides, oxidising and reducing agents. Reacts, possibly violently, with alkaline metals and alkaline earth metals to produce hydrogen. React with strong acids, strong caustics, aliphatic amines, isocyanates, acetaldehyde, benzoyl peroxide, chromic acid, chromium oxide, dialkylzincs, dichlorine oxide, ethylene oxide, hypochlorous acid, isopropyl chlorocarbonate, lithium tetrahydroaluminate, nitrogen dioxide, pentafluoroguanidine, phosphorus halides, phosphorus pentasulfide, tangerine oil, triethylaluminium, triisobutylaluminium should not be heated above 49 deg. C. when in contact with aluminium equipment. Secondary alcohols and some branched primary alcohols may produce potentially explosive peroxides after exposure to light and/or heat.

Storage requirements

Store in original containers in approved flame-proof area. No smoking, naked lights, heat or ignition sources. DO NOT store in pits, depression, basement or areas where vapours may be trapped. Keep containers securely sealed. Store away from incompatible materials in a cool, dry well-ventilated area. Protect containers against physical damage and check regularly for leaks. Observe manufacturer's storage and handling recommendations contained within this MSDS. Tank storage: Tanks must be specifically designed for use with this product. Bulk storage tanks should be diked (bunded). Locate tanks away from heat and other sources of ignition. Cleaning, inspection and maintenance of storage tanks is a specialist operation, which requires the implementation of strict procedures and precautions. Keep in a cool place. Electrostatic charges will be generated during pumping. Electrostatic discharge may cause fire. Ensure electrical continuity by bonding and grounding (earthing) all equipment to reduce the risk. The vapours in the head space of the storage vessel may lie in the flammable/explosive range and hence may be flammable. For containers, or container linings use mild steel, stainless steel. Examples of suitable materials are: high density polyethylene (HDPE), polypropylene (PP), and Viton (FMK), which have been specifically tested for compatibility with this product. For container linings, use amine-adduct cured epoxy paint. For seals and gaskets use: graphite, PTFE, Viton A, Viton B. Unsuitable material: Some synthetic materials may be unsuitable for containers or container linings depending on the material specification and intended use. Examples of materials to avoid are: natural rubber (NR), nitrile rubber (NBR), ethylene propylene rubber (EPDM), polymethyl methacrylate (PMMA), polystyrene, polyvinyl chloride (PVC), polyisobutylene. However, some may be suitable for glove materials. Do not cut, drill, grind, weld or perform similar operations on or near containers. Containers, even those that have been emptied, can contain explosive vapours.

SECTION 8 - EXPOSURE CONTROLS / PERSONAL PROTECTION



Control parameters

OCCUPATIONAL EXPOSURE LIMITS (OEL)

INGREDIENT DATA

Source	Ingredient	Material name	TWA	STEL	Peak	Notes
Singapore Permissible Exposure Limits of Toxic Substances	Isopropanol	Isopropyl Alcohol	400 ppm / 983 mg/m ³	1230 mg/m ³ / 500 ppm	Not Available	Not Available

EMERGENCY LIMITS

Ingredient	TEEL-1	TEEL-2	TEEL-3
Isopropanol	400 ppm	2000* ppm	12000** ppm

Ingredient	Original IDLH	Revised IDLH
Isopropanol	2,000 ppm	Not Available

Respirator protection

Type A Filter of sufficient capacity. Cartridge respirators should never be used for emergency ingress or in areas of unknown vapour concentrations or oxygen content. The wearer must be warned to leave the contaminated area immediately on detecting any odours through the respirator. The odour may indicate that the mask is not functioning properly, that the vapour concentration is too high, or that the mask is not properly fitted. Because of these limitations, only restricted use of cartridge respirators is considered appropriate. Cartridge performance is affected by humidity. Cartridges should be changed after 2

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hr of continuous use unless it is determined that the humidity is less than 75%, in which case, cartridges can be used for 4 hr. Used cartridges should be discarded daily, regardless of the length of time used.

Eye/face protection

Safety glasses with side shields. Chemical goggles.

Hands/feet/skin protection

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 cannot be calculated in advance and has therefore to be checked prior to the application. 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. 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. Suitability and durability of glove type is dependent on usage. Important factors in the selection of gloves include: frequency and duration of contact, chemical resistance of glove material, glove thickness and dexterity. When prolonged or frequently repeated contact may occur, a glove with a protection class of 5 or higher (breakthrough time greater than 240 minutes) is recommended. When only brief contact is expected, a glove with a protection class of 3 or higher (breakthrough time greater than 60 minutes) 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. As defined in ASTM F-739-96 in any application, gloves are rated as: Excellent when breakthrough time > 480 min. Good when breakthrough time > 20 min. Fair when breakthrough time < 20 min. Poor when glove material degrades. For general applications, gloves with a thickness typically greater than 0.35 mm, are recommended. 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. 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. Note: Depending on the activity being conducted, gloves of varying thickness may be required for specific tasks. For example: 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. 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. Wear chemical protective gloves, e.g. PVC. Wear safety footwear or safety gumboots, e.g. Rubber.

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. 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.

Engineering controls

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. For flammable liquids and flammable gases, local exhaust ventilation or a process enclosure ventilation system may be required. Ventilation equipment should be explosion-resistant. 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:

solvent, vapours, degreasing etc., evaporating from tank (in still air).

Air Speed:

0.25-0.5 m/s (50-100 f/min)

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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.)

Within each range the appropriate value depends on:

Lower end of the range

- 1: Room air currents minimal or favourable to capture.
- 2: Contaminants of low toxicity or of nuisance value only.
- 3: Intermittent, low production.
- 4: Large hood or large air mass in motion.

Upper end of the range

- 1: Disturbing room air currents
- 2: Contaminants of high toxicity
- 3: High production, heavy use
- 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. Adequate ventilation is typically taken to be that which limits the average concentration to no more than 25% of the LEL within the building, room or enclosure containing the dangerous substance. Ventilation for plant and machinery is normally considered adequate if it limits the average concentration of any dangerous substance that might potentially be present to no more than 25% of the LEL. However, an increase up to a maximum 50% LEL can be acceptable where additional safeguards are provided to prevent the formation of a hazardous explosive atmosphere. For example, gas detectors linked to emergency shutdown of the process might be used together with maintaining or increasing the exhaust ventilation on solvent evaporating ovens and gas turbine enclosures. Temporary exhaust ventilation systems may be provided for non-routine higher-risk activities, such as cleaning, repair or maintenance in tanks or other confined spaces or in an emergency after a release. The work procedures for such activities should be carefully considered. The atmosphere should be continuously monitored to ensure that ventilation is adequate and the area remains safe. Where workers will enter the space, the ventilation should ensure that the concentration of the dangerous substance does not exceed 10% of the LEL (irrespective of the provision of suitable breathing apparatus)

Fire-fighting measures for specific fire/chemical PPE advice is contained in Section 5 of the MSDS.

SECTION 9 - PHYSICAL AND CHEMICAL PROPERTIES

Appearance

Clear, colourless highly flammable liquid.

Physical properties

State	Liquid	Molecular Weight (g/mol)	60.1
Melting Point/Freezing Point (°C)	-90	Kinematic Viscosity (cSt)	Not Available
Initial Boiling Point and Boiling Range (°C)	83	Dynamic Viscosity	Not Available
Flash Point (°C)	11.7	Solubility in water (g/l)	Soluble
Decomposition Temp (°C)	Not Available	pH (1% solution)	Not Available
Flammability	Highly Flammable	pH (as supplied)	Not Available
Explosive properties	Not Available	Vapour Pressure (kPa)	4.4 @ 25°C
Auto ignition Temp (°C)	456	Density and/or Relative Density (water=1)	0.787 @ 20°C (Relative Density)
Upper Explosive Limit (%)	12	Relative Vapour density (air=1)	2.1
Lower Explosive Limit (%)	2	Evaporation Rate (BuAc=1)	Not Available
Volatile Component (%vol)	Not Available	Odour	Sharp musty odor like rubbing alcohol.
Surface Tension (dyn/cm or mN/m)	Not Available	Odour Threshold	Not Available
Partition Coefficient n-octanol/water	0.05	Particle Characteristics	Not Available

SECTION 10 - CHEMICAL STABILITY AND REACTIVITY INFORMATION

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Conditions contributing to instability

Unstable in the presence of incompatible materials. Product is considered stable. Hazardous polymerisation will not occur.

Fire/Explosion Hazard/Fire Incompatibility is contained in Section 5 of the MSDS.

Incompatible materials handling and storage is contained in Section 7 of the MSDS.

SECTION 11 - TOXICOLOGICAL INFORMATION

Acute toxicity

Isopropanol

TOXICITY

LD50 - Dermal - (rabbit) - 12800 mg/kg

LC50 - Inhalation - (mouse) - 53 mg/l/4 hours

LD50 - Oral - (mouse) - 3600 mg/kg

IRRITATION

Eye - (rabbit) - 10 mg - moderate

Eye - (rabbit) - 100 mg - SEVERE

Eye - (rabbit) - 100 mg - 24 hours - moderate

Skin - (rabbit) - 500 mg - mild

Skin corrosion or irritation

The material is not thought to produce adverse health effects or skin irritation following contact (as classified by EC Directives using animal models). Nevertheless, good hygiene practice requires that exposure be kept to a minimum and that suitable gloves be used in an occupational setting. Repeated exposure may cause skin cracking, flaking or drying following normal handling and use. Most liquid alcohols appear to act as primary skin irritants in humans. Significant percutaneous absorption occurs in rabbits but not apparently in man. Open cuts, abraded or irritated skin should not be exposed to this material. Entry into the blood-stream, for example, cuts, abrasions or lesions, may produce systemic injury with harmful effects. Examine the skin prior to the use of the material and ensure that any external damage is suitably protected.

Serious eye damage or irritation

This material can cause eye irritation and damage in some persons. Isopropanol vapour may cause mild eye irritation at 400 parts per million. Splashes may cause severe eye irritation, possible burns to the cornea and eye damage. Eye contact may cause tearing and blurring of vision.

Respiratory or skin sensitisation

The material can cause respiratory irritation in some persons. The body's response to such irritation can cause further lung damage. Inhalation of vapours may cause drowsiness and dizziness. This may be accompanied by sleepiness, reduced alertness, loss of reflexes, lack of co-ordination, and vertigo. Inhalation of vapours or aerosols (mists, fumes), generated by the material during the course of normal handling, may be damaging to the health of the individual. Aliphatic alcohols with more than 3-carbons cause headache, dizziness, drowsiness, muscle weakness and delirium, central depression, coma, seizures and behavioral changes. Secondary respiratory depression and failure, as well as low blood pressure and irregular heart rhythms, may follow. The odour of isopropanol may give some warning of exposure, but odour fatigue may occur. Inhalation of isopropanol may produce irritation of the nose and throat with sneezing, sore throat and runny nose.

Germ cell mutagenicity

Not Available

Carcinogenicity

ISOPROPANOL: 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.

Reproductive toxicity

A decrease in the frequency of mating has been found in among animals, and newborns have been found to have a greater incidence of low birth weight. Tumours of the testes have been observed in the male rat.

Specific target organ toxicity - single exposure

May cause lung/kidney/liver damage.

Specific target organ toxicity - repeated exposure

May cause kidney damage.

Aspiration hazard

Accidental ingestion of the material may be damaging to the health of the individual. Overexposure to non-ring alcohols causes nervous system symptoms. These include headache, muscle weakness and in co-ordination, giddiness, confusion, delirium and coma. Swallowing 10 millilitres of isopropanol may cause serious injury; 100 millilitres may be fatal if not properly treated. The adult single lethal dose is approximately 250 millilitres. Isopropanol is twice as poisonous as ethanol, and the effects caused are similar, except that isopropanol does not cause an initial feeling of well-being. Swallowing may cause nausea, vomiting and diarrhea; vomiting and stomach inflammation is more prominent with isopropanol than with ethanol. Animals given near-lethal doses also showed in co-ordination, lethargy, inactivity and loss of consciousness. There is evidence that a slight tolerance to isopropanol may be acquired. Swallowing of the liquid may cause aspiration into the lungs with the risk of chemical pneumonitis; serious consequences may result.

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Potential health effects

Inhalation May be harmful if inhaled. Vapours may cause drowsiness and dizziness.

Ingestion May be harmful if swallowed.

Skin May cause skin irritation.

Eyes May cause eye irritation/damage.

Signs and Symptoms of Exposure

Long-term exposure to respiratory irritants may result in airways disease, involving difficulty breathing and related whole-body problems. Substance accumulation, in the human body, may occur and may cause some concern following repeated or long-term occupational exposure. Long term, or repeated exposure of isopropanol may cause in co-ordination and tiredness. Repeated inhalation exposure to isopropanol may produce sleepiness, in co-ordination and liver degeneration. Animal data show developmental effects only at exposure levels that produce toxic effects in adult animals. Isopropanol does not cause genetic damage. There are inconclusive reports of human sensitisation from skin contacts with isopropanol. Chronic alcoholics are more tolerant of the whole-body effects of isopropanol. Animal testing showed the chronic exposure did not produce reproductive effects. NOTE: Commercial isopropanol does not contain "isopropyl oil", which caused an excess incidence of sinus and throat cancers in isopropanol production workers in the past. "Isopropyl oil" is no longer formed during production of isopropanol.

ISOPROPANOL: Asthma-like symptoms may continue for months or even years after exposure to the material ends. This may be due to a non-allergic condition known as reactive airways dysfunction syndrome (RADS) which can occur after exposure to high levels of highly irritating compound. Main criteria for diagnosing RADS include the absence of previous airways disease in a non-atopic individual, with sudden onset of persistent asthma-like symptoms within minutes to hours of a documented exposure to the irritant. Other criteria for diagnosis of RADS include a reversible airflow pattern on lung function tests, moderate to severe bronchial hyperreactivity on methacholine challenge testing, and the lack of minimal lymphocytic inflammation, without eosinophilia. 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. On the other hand, industrial bronchitis is a disorder that occurs as a result of exposure due to high concentrations of irritating substance (often particles) and is completely reversible after exposure ceases. The disorder is characterised by difficulty breathing, cough and mucus production. Isopropanol is irritating to the eyes, nose and throat but generally not to the skin. Prolonged high dose exposure may also produce depression of the central nervous system and drowsiness. Few have reported skin irritation. It can be absorbed from the skin or when inhaled. Intentional swallowing is common particularly among alcoholics or suicide victims and also leads to fainting, breathing difficulty, nausea, vomiting and headache. In the absence of unconsciousness, recovery usually occurred. Repeated doses may damage the kidneys. The material may cause skin irritation after prolonged or repeated exposure and may produce on contact skin redness, swelling, the production of vesicles, scaling and thickening of the skin.

SECTION 12 - ECOLOGICAL INFORMATION

DO NOT discharge into sewer or waterways.

Toxicity

Toxicity to fish

LC50 - Fish - >1400 mg/l - 96 hours

Toxicity to daphnia and other aquatic invertebrates

EC50 - Crustacea - 7550 mg/l - 48 hours

EC50 - Algae or other aquatic plants - >1000 mg/l - 72 hours

EC50 - Algae or other aquatic plants - >1000 mg/l - 96 hours

Ecotoxicity

Ingredient	Persistence: Water/Soil	Persistence: Air	Bioaccumulation	Mobility
Isopropanol	LOW	LOW	LOW	HIGH

SECTION 13 - DISPOSAL CONSIDERATIONS

Consult manufacturer for recycling options and recycle where possible. Consult State Land Waste Management Authority for disposal. Incinerate residue at an approved site. Recycle containers if possible, or dispose of in an authorised landfill.

SECTION 14 - TRANSPORTATION INFORMATION

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Labels Required: FLAMMABLE LIQUID

Land Transport UNDG:

Class or division:	3	Subsidiary risk:	Not Applicable
UN No.:	1219	UN packing group:	II
Environmental hazard:	Not Applicable		

Special Precautious

Limited quantity:	1 L	Special provisions:	Not Applicable
Shipping Name:	ISOPROPANOL (ISOPROPYL ALCOHOL)		

Air Transport IATA:

ICAO/IATA Class:	3	ICAO/IATA Subrisk:	Not Applicable
UN/ID Number:	1219	Packing Group:	II
Environmental hazard:	Not Applicable	ERG Code:	3L

Special precautions

Special provisions: A180

Cargo Only

Packing Instructions:	364	Maximum Qty / Pack:	60 L
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Passenger and Cargo

Packing Instructions:	353	Maximum Qty / Pack:	5 L
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Passenger and Cargo Limited

Quantity Packing Instructions:	Y341	Maximum Qty / Pack:	1 L
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Shipping Name: ISOPROPANOL (ISOPROPYL ALCOHOL)

Maritime Transport IMDG:

IMDG Class:	3	IMDG Subrisk:	Not Applicable
UN Number:	1219	Packing Group:	II
Environmental hazard:	Not Applicable		

Special precautions

EMS Number:	F - E , S - D	Special provisions:	Not Applicable
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Limited Quantities: 1 L

Shipping Name: ISOPROPANOL (ISOPROPYL ALCOHOL)

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

Product name	Pollution Category	Ship Type
Oxygenated Aliphatic Hydrocarbon Mixture	Z	3

SECTION 15 - REGULATORY INFORMATION

REGULATIONS

ISOPROPANOL IS FOUND ON THE FOLLOWING REGULATORY LISTS; International Agency for Research on Cancer (IARC) - Agents Classified by the IARC Monographs - Not Classified as Carcinogenic. Singapore Permissible Exposure Limits of Toxic Substances.

National Inventory	Status
Australia - AIC / Australia Non-Industrial Use	Y
Canada - DSL	Y
Canada - NDSL	N [Isopropanol]
China - IECSC	Y
Europe - EINEC / ELINCS / NLP	Y
Japan - ENCS	Y
Korea - KECI	Y
New Zealand - NZIoC	Y

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Philippines - PICCS	Y
USA - TSCA	Y
Taiwan - TCSI	Y
Mexico - INSQ	Y
Vietnam - NCI	Y
Russia - FBEPH	Y
Legend:	Y = All CAS declared ingredients are on the inventory N = One or more of the CAS listed ingredients are not on the inventory. These ingredients may be exempt or will require registration.

SECTION 16 - OTHER INFORMATION

Reason for the revision: General update.

The above information is believed to be correct but does not purport to be all inclusive and shall be used only as a guide. The information in this document is based on the present state of our knowledge and is applicable to the product with regard to appropriate safety precautions. It does not represent any guarantee of the properties of the products. Best Chemical Co (S) Pte Ltd shall not be held liable for any damage resulting from handling or from contact with the above product.

End of SDS