



# Tetrabutylphosphonium bromide

## Apollo Scientific

Chemwatch Hazard Alert Code: 3

Part Number: OR315490

Version No: 4.4

Safety Data Sheet

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S.GHS.GB-NIR.EN

### SECTION 1 Identification of the substance / mixture and of the company / undertaking

#### Product Identifier

|                               |   |
|-------------------------------|---|
| Product name                  | Tetrabutylphosphonium bromide                   |
| Chemical Name                 | tetra-N-butylphosphonium bromide                |
| Synonyms                      | Not Available                                   |
| Proper shipping name          | ORGANOPHOSPHORUS COMPOUND, SOLID, TOXIC, N.O.S. |
| Chemical formula              | C16H36P.Br                                      |
| Other means of identification | Not Available                                   |
| CAS number                    | 3115-68-2*                                      |

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

|                          |               |
|--------------------------|---------------|
| Relevant identified uses | Not Available |
|--------------------------|---------------|

#### Details of the manufacturer or supplier of the safety data sheet

|                         |   |  |
|-------------------------|---|--|
| Registered company name | Apollo Scientific   | Apollo Scientific Ltd  |
| Address                 | Whitefield Road, Bredbury SK62QR United Kingdom                                     | Whitefield Road, Bredbury Cheshire SK6 2QR United Kingdom (NI)     |
| Telephone               | 01614060505   | +44(0) 161 406 0505  |
| Fax                     | 0161 406 0506   | Not Available  |
| Website                 | <a href="http://www.apolloscientific.co.uk/">http://www.apolloscientific.co.uk/</a> | <a href="http://apolloscientific.co.uk">apolloscientific.co.uk</a> |
| Email                   | sales@apolloscientific.co.uk  | sales@apolloscientific.co.uk                                       |

#### Emergency telephone number

|                                   |               |
|-----------------------------------|---------------|
| Association / Organisation        | Not Available |
| Emergency telephone numbers       | Not Available |
| Other emergency telephone numbers | Not Available |

### SECTION 2 Hazards identification


#### Classification of the substance or mixture

|  |  |
|--|--|
| Classification according to regulation (EC) No 1272/2008 [CLP] and | H311 - Acute Toxicity (Dermal) Category 3, H318 - Serious Eye Damage/Eye Irritation Category 1, H332 - Acute Toxicity (Inhalation) Category 4, H335 - Specific Target Organ Toxicity - Single Exposure (Respiratory Tract Irritation) Category 3, H302 - Acute Toxicity (Oral) Category 4, H315 - Skin Corrosion/Irritation Category 2 |
|--|--|

**Tetrabutylphosphonium bromide**

|                                  |  |
|----------------------------------|--|
| <b>amendments</b> <sup>[1]</sup> |  |
| <b>Legend:</b>                   | 1. Classified by Chemwatch; 2. Classification drawn from Regulation (EU) No 1272/2008 - Annex VI |

**Label elements**

|                            |   |
|----------------------------|---|
| <b>Hazard pictogram(s)</b> |  |
| <b>Signal word</b>         | <b>Danger</b>   |

**Hazard statement(s)**

|             |                                   |
|-------------|-----------------------------------|
| <b>H311</b> | Toxic in contact with skin.       |
| <b>H318</b> | Causes serious eye damage.        |
| <b>H332</b> | Harmful if inhaled.               |
| <b>H335</b> | May cause respiratory irritation. |
| <b>H302</b> | Harmful if swallowed.             |
| <b>H315</b> | Causes skin irritation.           |

**Precautionary statement(s) Prevention**

|             |  |
|-------------|--|
| <b>P271</b> | Use only outdoors or in a well-ventilated area.                                  |
| <b>P280</b> | Wear protective gloves, protective clothing, eye protection and face protection. |
| <b>P261</b> | Avoid breathing dust/fumes.  |
| <b>P264</b> | Wash all exposed external body areas thoroughly after handling.                  |
| <b>P270</b> | Do not eat, drink or smoke when using this product.                              |

**Precautionary statement(s) Response**

|                       |  |
|-----------------------|--|
| <b>P305+P351+P338</b> | IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. |
| <b>P310</b>           | Immediately call a POISON CENTER/doctor/physician/first aider.   |
| <b>P302+P352</b>      | IF ON SKIN: Wash with plenty of water.   |
| <b>P361+P364</b>      | Take off immediately all contaminated clothing and wash it before reuse.   |
| <b>P301+P312</b>      | IF SWALLOWED: Call a POISON CENTER/doctor/physician/first aider if you feel unwell.  |
| <b>P304+P340</b>      | IF INHALED: Remove person to fresh air and keep comfortable for breathing.   |
| <b>P330</b>           | Rinse mouth.   |
| <b>P332+P313</b>      | If skin irritation occurs: Get medical advice/attention.   |

**Precautionary statement(s) Storage**

|                  |  |
|------------------|--|
| <b>P405</b>      | Store locked up.   |
| <b>P403+P233</b> | Store in a well-ventilated place. Keep container tightly closed. |

**Precautionary statement(s) Disposal**

|             |  |
|-------------|--|
| <b>P501</b> | Dispose of contents/container to authorised hazardous or special waste collection point in accordance with any local regulation. |
|-------------|--|

**SECTION 3 Composition / information on ingredients**

**Substances**

| CAS No     | %[weight] | Name                                 | Classification according to regulation (EC) No 1272/2008 [CLP] and amendments   | SCL / M-Factor |
|------------|-----------|--------------------------------------|---|----------------|
| 3115-68-2* | 100       | <u>Tetrabutylphosphonium bromide</u> | Acute Toxicity (Dermal) Category 3, Serious Eye Damage/Eye Irritation Category 1, Acute Toxicity (Inhalation) Category 4, Specific Target Organ Toxicity - Single Exposure (Respiratory Tract Irritation) Category 3, Acute Toxicity (Oral) Category 4, Skin Corrosion/Irritation Category 2; H311, H318, H332, H335, H302, H315 <sup>[1]</sup> | Not Available  |

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

**Tetrabutylphosphonium bromide**

available; [e] Substance identified as having endocrine disrupting properties

**Mixtures**

See section above for composition of Substances

**SECTION 4 First aid measures**

**Description of first aid measures**

|                     |   |
|---------------------|---|
| <b>Eye Contact</b>  | <p>If this product comes in contact with eyes:</p> <ul style="list-style-type: none"> <li>▶ Wash out immediately with water.</li> <li>▶ If irritation continues, seek medical attention.</li> <li>▶ Removal of contact lenses after an eye injury should only be undertaken by skilled personnel.</li> </ul>  |
| <b>Skin Contact</b> | <p>If skin or hair contact occurs:</p> <ul style="list-style-type: none"> <li>▶ Flush skin and hair with running water (and soap if available).</li> <li>▶ Seek medical attention in event of irritation.</li> </ul>  |
| <b>Inhalation</b>   | <ul style="list-style-type: none"> <li>▶ If fumes or combustion products are inhaled remove from contaminated area.</li> <li>▶ Lay patient down. Keep warm and rested.</li> <li>▶ Prostheses such as false teeth, which may block airway, should be removed, where possible, prior to initiating first aid procedures.</li> <li>▶ 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.</li> <li>▶ Transport to hospital, or doctor.</li> </ul> |
| <b>Ingestion</b>    | <ul style="list-style-type: none"> <li>▶ Immediately give a glass of water.</li> <li>▶ First aid is not generally required. If in doubt, contact a Poisons Information Centre or a doctor.</li> </ul>   |

**Indication of any immediate medical attention and special treatment needed**

- ▶ Most organophosphate compounds are rapidly well absorbed from the skin, conjunctiva, gastro-intestinal tract and lungs.
- ▶ They are detoxified by Cytochrome P450-mediated monooxygenases in the liver but some metabolites are more toxic than parent compounds.
- ▶ Metabolites are usually detected 12-48 hours postexposure.
- ▶ Organophosphates phosphorylate acetylcholinesterase with resultant accumulation of large amounts of acetylcholine causing initial stimulation, then exhaustion of cholinergic synapse.
- ▶ gamma-aminobutyric acid (GABA)-ergic and dopaminergic pathways provide compensatory inhibition.
- ▶ The clinical manifestation of organophosphate toxicity results from muscarinic, nicotinic and CNS symptoms.
- ▶ A garlic-like odour emanating from the patient or involved container may aid the diagnosis.
- ▶ Immediate life-threatening symptoms usually are respiratory problems.
- ▶ Frequent suction and, if necessary, endotracheal intubation and assisted ventilation may be necessary to maintain adequate oxygenation.
- ▶ Theophylline compounds, to treat bronchospasm, should be used cautiously as they may lower the seizure threshold.
- ▶ Excessive secretions and bronchospasm should respond to adequate doses of atropine.
- ▶ Diazepam is the drug of choice for convulsions.
- ▶ Usual methods of decontamination, (activated charcoal and cathartics) should be used when patients present within 4-6 hours postexposure.
- ▶ The administration of atropine, as an antidote, does not require confirmation by acetylcholinesterase levels. Severely poisoned patients develop marked resistance to the usual doses of atropine. [Atropine should not be given to a cyanosed patient - ICI] **NOTE:** Hypoxia must be corrected before atropine is given. For adult: 2 mg repeatedly SC or IV until atropinization is achieved and maintained (atropinization is characterised by decreased bronchial secretions, heart rate >100 bpm, dry mouth, dilated pupils).
- ▶ Pralidoxime (2-PAM, Protopam) is a specific antidote when given within 24 hours and perhaps up to 36-48 hours postexposure. Although it ameliorates muscle weakness, fasciculations and alterations of consciousness, it does not relieve bronchospasm or bronchorrhea and must be given concurrently with atropine. **NOTE:** Pralidoxime should be given as an adjunct to, **NOT** a replacement for atropine and should be given in every case where atropine therapy is deemed necessary. Traditional dose: 1 g (or 2 g in severe cases) by slow IV injection over 5-10 minutes. 1-2 g, 4 hourly (maximum dose 12 g in 24 hours) until clinical and analytical recovery is achieved and maintained.
- ▶ Avoid parasymphathomimetic agents. Phenothiazines and antihistamines may potentiate organophosphate activity. [Ellenhorn and Barceloux: Medical Toxicology]

**NOTE:** Acute pancreatitis in organophosphate intoxication may be more common than reported. The possible pathogenesis of pancreatic insult are excessive cholinergic stimulation of the pancreas and ductular hypertension. Early recognition and appropriate therapy for acute pancreatitis may lead to an improved prognosis.

Cheng-Tin Hsiao, et al; *Clinical Toxicology* 34(3), 343-347 (1996)

**BIOLOGICAL EXPOSURE INDEX - BEI**

These represent the determinants observed in specimens collected from a healthy worker exposed at the Exposure Standard (ES or TLV):

| Determinant                             | Index                        | Sampling Time | Comments |
|---|------------------------------|---------------|----------|
| 1. Cholinesterase activity in red cells | 70% of individual's baseline | Discretionary | NS       |

B: Background levels occur in specimens collected from subjects **NOT** exposed

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NS:Non-specific determinant; Also observed after exposure to other materials

SQ:Semi-quantitative determinant; Interpretation may be ambiguous. Should be used as a screening test or confirmatory test.

Some jurisdictions require that health surveillance be conducted on occupationally exposed workers. Such surveillance should emphasise

- demography, occupational and medical history and health advice
- physical examination
- baseline estimation of red cell and plasma cholinesterase activity levels by the Ellman method. Estimation of red cell and plasma cholinesterase activity towards the end of the working day

## SECTION 5 Firefighting measures

### Extinguishing media

- There is no restriction on the type of extinguisher which may be used.
- Use extinguishing media suitable for surrounding area.

### Special hazards arising from the substrate or mixture

|                             |             |
|-----------------------------|-------------|
| <b>Fire Incompatibility</b> | None known. |
|-----------------------------|-------------|

### Advice for firefighters

|                              |  |
|------------------------------|--|
| <b>Fire Fighting</b>         | <ul style="list-style-type: none"><li>▸ Alert Fire Brigade and tell them location and nature of hazard.</li><li>▸ Wear breathing apparatus plus protective gloves in the event of a fire.</li><li>▸ Prevent, by any means available, spillage from entering drains or water courses.</li><li>▸ Use fire fighting procedures suitable for surrounding area.</li><li>▸ <b>DO NOT</b> approach containers suspected to be hot.</li><li>▸ Cool fire exposed containers with water spray from a protected location.</li><li>▸ If safe to do so, remove containers from path of fire.</li><li>▸ Equipment should be thoroughly decontaminated after use.</li></ul> |
| <b>Fire/Explosion Hazard</b> | <ul style="list-style-type: none"><li>▸ Non combustible.</li><li>▸ Not considered a significant fire risk, however containers may burn. May emit poisonous fumes.</li></ul>  |

## SECTION 6 Accidental release measures

### Personal precautions, protective equipment and emergency procedures

See section 8

### Environmental precautions

See section 12

### Methods and material for containment and cleaning up

|                     |   |
|---------------------|---|
| <b>Minor Spills</b> | <ul style="list-style-type: none"><li>▸ Remove all ignition sources.</li><li>▸ Clean up all spills immediately.</li><li>▸ Avoid contact with skin and eyes.</li><li>▸ Control personal contact with the substance, by using protective equipment.</li><li>▸ Use dry clean up procedures and avoid generating dust.</li><li>▸ Place in a suitable, labelled container for waste disposal.</li></ul>  |
| <b>Major Spills</b> | <ul style="list-style-type: none"><li>▸ Clear area of personnel and move upwind.</li><li>▸ Alert Fire Brigade and tell them location and nature of hazard.</li><li>▸ Wear breathing apparatus plus protective gloves.</li><li>▸ Prevent, by any means available, spillage from entering drains or water course.</li><li>▸ Stop leak if safe to do so.</li><li>▸ Contain spill with sand, earth or vermiculite.</li><li>▸ Collect recoverable product into labelled containers for recycling.</li><li>▸ Neutralise/decontaminate residue (see Section 13 for specific agent).</li><li>▸ Collect solid residues and seal in labelled drums for disposal.</li><li>▸ Wash area and prevent runoff into drains.</li><li>▸ After clean up operations, decontaminate and launder all protective clothing and equipment before storing and re-using.</li><li>▸ If contamination of drains or waterways occurs, advise emergency services.</li></ul> |

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

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**SECTION 7 Handling and storage**

**Precautions for safe handling**

|                          |  |
|--------------------------|--|
| <b>Safe handling</b>     | <ul style="list-style-type: none"> <li>▶ Avoid all personal contact, including inhalation.</li> <li>▶ Wear protective clothing when risk of exposure occurs.</li> <li>▶ Use in a well-ventilated area.</li> <li>▶ Prevent concentration in hollows and sumps.</li> <li>▶ <b>DO NOT enter confined spaces until atmosphere has been checked.</b></li> <li>▶ <b>DO NOT allow material to contact humans, exposed food or food utensils.</b></li> <li>▶ Avoid contact with incompatible materials.</li> <li>▶ <b>When handling, DO NOT eat, drink or smoke.</b></li> <li>▶ Keep containers securely sealed when not in use.</li> <li>▶ Avoid physical damage to containers.</li> <li>▶ Always wash hands with soap and water after handling.</li> <li>▶ Work clothes should be laundered separately. Launder contaminated clothing before re-use.</li> <li>▶ Use good occupational work practice.</li> <li>▶ Observe manufacturer's storage and handling recommendations contained within this SDS.</li> <li>▶ Atmosphere should be regularly checked against established exposure standards to ensure safe working conditions are maintained.</li> </ul> |
| <b>Other information</b> | <ul style="list-style-type: none"> <li>▶ Store in original containers.</li> <li>▶ Keep containers securely sealed.</li> <li>▶ Store in a cool, dry, well-ventilated area.</li> <li>▶ Store away from incompatible materials and foodstuff containers.</li> <li>▶ Protect containers against physical damage and check regularly for leaks.</li> <li>▶ Observe manufacturer's storage and handling recommendations contained within this SDS.</li> </ul>  |

**Conditions for safe storage, including any incompatibilities**

|                                |  |
|--------------------------------|--|
| <b>Suitable container</b>      | <ul style="list-style-type: none"> <li>▶ Lined metal can, lined metal pail/ can.</li> <li>▶ Plastic pail.</li> <li>▶ Polyliner drum.</li> <li>▶ Packing as recommended by manufacturer.</li> <li>▶ Check all containers are clearly labelled and free from leaks.</li> </ul> <p>For low viscosity materials</p> <ul style="list-style-type: none"> <li>▶ Drums and jerricans must be of the non-removable head type.</li> <li>▶ Where a can is to be used as an inner package, the can must have a screwed enclosure.</li> </ul> <p>For materials with a viscosity of at least 2680 cSt. (23 deg. C) and solids (between 15 C deg. and 40 deg C.):</p> <ul style="list-style-type: none"> <li>▶ Removable head packaging;</li> <li>▶ Cans with friction closures and</li> <li>▶ low pressure tubes and cartridges</li> </ul> <p>may be used.</p> <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> |
| <b>Storage incompatibility</b> | <p>None known</p> <ul style="list-style-type: none"> <li>▶ Hygroscopic</li> <li>▶ Light sensitive</li> <li>▶ Store under argon</li> </ul>  |

**SECTION 8 Exposure controls / personal protection**

**Control parameters**

**Occupational Exposure Limits (OEL)**

**INGREDIENT DATA**

Not Available

**Emergency Limits**

| Ingredient            | TEEL-1        | TEEL-2        | TEEL-3        |
|-----------------------|---------------|---------------|---------------|
| Tetrabutylphosphonium | Not Available | Not Available | Not Available |

**Tetrabutylphosphonium bromide**

| Ingredient | TEEL-1 | TEEL-2 | TEEL-3 |
|------------|--------|--------|--------|
| bromide    |        |        |        |

| Ingredient                    | Original IDLH | Revised IDLH  |
|-------------------------------|---------------|---------------|
| Tetrabutylphosphonium bromide | Not Available | Not Available |

**Occupational Exposure Banding**

| Ingredient                    | Occupational Exposure Band Rating | Occupational Exposure Band Limit |
|-------------------------------|-----------------------------------|----------------------------------|
| Tetrabutylphosphonium bromide | E                                 | ≤ 0.01 mg/m <sup>3</sup>         |

**Notes:** Occupational exposure banding is a process of assigning chemicals into specific categories or bands based on a chemical's potency and the adverse health outcomes associated with exposure. The output of this process is an occupational exposure band (OEB), which corresponds to a range of exposure concentrations that are expected to protect worker health.

**Exposure 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.

Local exhaust ventilation usually required. If risk of overexposure exists, wear approved respirator. Correct fit is essential to obtain adequate protection. Supplied-air type respirator may be required in special circumstances. Correct fit is essential to ensure adequate protection.

An approved self contained breathing apparatus (SCBA) may be required in some situations.

Provide adequate ventilation in warehouse or closed storage area. Air contaminants generated in the workplace possess varying "escape" velocities which, in turn, determine the "capture velocities" of fresh circulating air required to effectively remove the contaminant.

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

Within each range the appropriate value depends on:

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

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

|   |  |
|---|--|
| <p><b>Individual protection measures, such as personal protective equipment</b></p> |  |
|---|--|

## Tetrabutylphosphonium bromide

|                                |   |
|--------------------------------|---|
| <b>Eye and face protection</b> | <ul style="list-style-type: none"> <li>▸ Safety glasses with side shields</li> <li>▸ Chemical goggles. [AS/NZS 1337.1, EN166 or national equivalent]</li> <li>▸ 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].</li> </ul>   |
| <b>Skin protection</b>         | See Hand protection below   |
| <b>Hands/feet protection</b>   | <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> <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"> <li>· frequency and duration of contact,</li> <li>· chemical resistance of glove material,</li> <li>· glove thickness and</li> <li>· dexterity</li> </ul> <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"> <li>· 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.</li> <li>· 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.</li> <li>· Some glove polymer types are less affected by movement and this should be taken into account when considering gloves for long-term use.</li> <li>· Contaminated gloves should be replaced.</li> </ul> <p>As defined in ASTM F-739-96 in any application, gloves are rated as:</p> <ul style="list-style-type: none"> <li>· Excellent when breakthrough time &gt; 480 min</li> <li>· Good when breakthrough time &gt; 20 min</li> <li>· Fair when breakthrough time &lt; 20 min</li> <li>· Poor when glove material degrades</li> </ul> <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"> <li>· 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.</li> <li>· 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</li> </ul> <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"> <li>▸ Wear chemical protective gloves, e.g. PVC.</li> <li>▸ Wear safety footwear or safety gumboots, e.g. Rubber</li> </ul> |
| <b>Body protection</b>         | See Other protection below  |
| <b>Other protection</b>        | <ul style="list-style-type: none"> <li>▸ Overalls.</li> <li>▸ Eyewash unit.</li> <li>▸ Barrier cream.</li> <li>▸ Skin cleansing cream.</li> </ul>   |

**Respiratory protection**

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

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

## Tetrabutylphosphonium bromide

|           |   |            |         |
|-----------|---|------------|---------|
| 100+ x ES | - | 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(SO<sub>2</sub>), G = Agricultural chemicals, K = Ammonia(NH<sub>3</sub>), 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.
- Where protection from nuisance levels of dusts are desired, use type N95 (US) or type P1 (EN143) dust masks. Use respirators and components tested and approved under appropriate government standards such as NIOSH (US) or CEN (EU)
- Use approved positive flow mask if significant quantities of dust becomes airborne.
- Try to avoid creating dust conditions.

## SECTION 9 Physical and chemical properties

## Information on basic physical and chemical properties

|   |               |  |                |
|---|---------------|--|----------------|
| <b>Appearance</b>                                   | Not Available |  |                |
| <b>Physical state</b>                               | Solid         | <b>Relative density (Water = 1)</b>            | Not Available  |
| <b>Odour</b>  | Not Available | <b>Partition coefficient n-octanol / water</b> | Not Available  |
| <b>Odour threshold</b>                              | Not Available | <b>Auto-ignition temperature (°C)</b>          | Not Available  |
| <b>pH (as supplied)</b>                             | Not Available | <b>Decomposition temperature (°C)</b>          | Not Available  |
| <b>Melting point / freezing point (°C)</b>          | 104           | <b>Viscosity (cSt)</b>                         | Not Available  |
| <b>Initial boiling point and boiling range (°C)</b> | Not Available | <b>Molecular weight (g/mol)</b>                | Not Available  |
| <b>Flash point (°C)</b>                             | Not Available | <b>Taste</b>                                   | Not Available  |
| <b>Evaporation rate</b>                             | Not Available | <b>Explosive properties</b>                    | Not Available  |
| <b>Flammability</b>                                 | Not Available | <b>Oxidising properties</b>                    | Not Available  |
| <b>Upper Explosive Limit (%)</b>                    | Not Available | <b>Surface Tension (dyn/cm or mN/m)</b>        | Not Applicable |
| <b>Lower Explosive Limit (%)</b>                    | Not Available | <b>Volatile Component (%vol)</b>               | Not Available  |
| <b>Vapour pressure (kPa)</b>                        | Not Available | <b>Gas group</b>                               | Not Available  |
| <b>Solubility in water</b>                          | Not Available | <b>pH as a solution (1%)</b>                   | Not Available  |
| <b>Vapour density (Air = 1)</b>                     | Not Available | <b>VOC g/L</b>                                 | Not Available  |

## SECTION 10 Stability and reactivity

|   |  |
|---|--|
| <b>Reactivity</b>                         | See section 7  |
| <b>Chemical stability</b>                 | <ul style="list-style-type: none"> <li>▸ Unstable in the presence of incompatible materials.</li> <li>▸ Product is considered stable.</li> <li>▸ Hazardous polymerisation will not occur.</li> </ul> |
| <b>Possibility of hazardous reactions</b> | See section 7  |
| <b>Conditions to avoid</b>                | See section 7  |



## Tetrabutylphosphonium bromide

|   |               |
|---|---------------|
| <b>Incompatible materials</b>           | See section 7 |
| <b>Hazardous decomposition products</b> | See section 5 |

## SECTION 11 Toxicological information

## Information on toxicological effects

|                     |  |
|---------------------|--|
| <b>Inhaled</b>      | Inhalation of dusts, generated by the material, during the course of normal handling, may be harmful.<br>The material is not thought to produce respiratory irritation (as classified by EC Directives using animal models). Nevertheless inhalation of dusts, or fumes, especially for prolonged periods, may produce respiratory discomfort and occasionally, distress.  |
| <b>Ingestion</b>    | The material is not thought to produce adverse health effects following ingestion (as classified by EC Directives using animal models). Nevertheless, adverse systemic effects have been produced following exposure of animals by at least one other route and good hygiene practice requires that exposure be kept to a minimum.   |
| <b>Skin Contact</b> | Skin contact is not thought to produce harmful health effects (as classified under EC Directives using animal models). Systemic harm, however, has been identified following exposure of animals by at least one other route and the material may still produce health damage following entry through wounds, lesions or abrasions.<br>Open cuts, abraded or irritated skin should not be exposed to this material<br>Entry into the blood-stream, through, for example, cuts, abrasions or lesions, may produce systemic injury with harmful effects.<br>Examine the skin prior to the use of the material and ensure that any external damage is suitably protected. |
| <b>Eye</b>          | Although the material is not thought to be an irritant (as classified by EC Directives), direct contact with the eye may cause transient discomfort characterised by tearing or conjunctival redness (as with windburn). Slight abrasive damage may also result.   |
| <b>Chronic</b>      | Long-term exposure to the product is not thought to produce chronic effects adverse to the health (as classified by EC Directives using animal models); nevertheless exposure by all routes should be minimised as a matter of course.   |

**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

|  |   |                                 |   |
|--|---|---------------------------------|---|
| <b>Acute Toxicity</b>                    | ✓ | <b>Carcinogenicity</b>          | ✗ |
| <b>Skin Irritation/Corrosion</b>         | ✓ | <b>Reproductivity</b>           | ✗ |
| <b>Serious Eye Damage/Irritation</b>     | ✓ | <b>STOT - Single Exposure</b>   | ✓ |
| <b>Respiratory or Skin sensitisation</b> | ✗ | <b>STOT - Repeated Exposure</b> | ✗ |
| <b>Mutagenicity</b>                      | ✗ | <b>Aspiration Hazard</b>        | ✗ |

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

## SECTION 12 Ecological information

## Toxicity

**Legend:** Extracted from 1. IUCLID Toxicity Data 2. Europe ECHA Registered Substances - Ecotoxicological Information - Aquatic Toxicity 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

**DO NOT** discharge into sewer or waterways.

## Persistence and degradability

| Ingredient                    | Persistence: Water/Soil | Persistence: Air |
|-------------------------------|-------------------------|------------------|
| Tetrabutylphosphonium bromide | LOW                     | LOW              |

## Bioaccumulative potential

| Ingredient                    | Bioaccumulation        |
|-------------------------------|------------------------|
| Tetrabutylphosphonium bromide | HIGH (LogKOW = 6.3114) |

**Tetrabutylphosphonium bromide**

**Mobility in soil**

| Ingredient                    | Mobility           |
|-------------------------------|--------------------|
| Tetrabutylphosphonium bromide | LOW (KOC = 101400) |


**SECTION 13 Disposal considerations**

**Waste treatment methods**

| Product / Packaging disposal |  |
|------------------------------|--|
|                              | <ul style="list-style-type: none"> <li>▶ Recycle wherever possible or consult manufacturer for recycling options.</li> <li>▶ Consult State Land Waste Management Authority for disposal.</li> <li>▶ Bury residue in an authorised landfill.</li> <li>▶ Recycle containers if possible, or dispose of in an authorised landfill.</li> </ul> |

**SECTION 14 Transport information**

**Labels Required**

|                         |   |
|-------------------------|---|
|                         |  |
| <b>Marine Pollutant</b> | NO  |

**Land transport (ADR-RID)**

|                                     |   |                |
|-------------------------------------|---|----------------|
| <b>UN number or ID number</b>       | 3464  |                |
| <b>UN proper shipping name</b>      | ORGANOPHOSPHORUS COMPOUND, SOLID, TOXIC, N.O.S. |                |
| <b>Transport hazard class(es)</b>   | Class   | 6.1            |
|                                     | Subsidiary risk                                 | Not Applicable |
| <b>Packing group</b>                | III   |                |
| <b>Environmental hazard</b>         | Not Applicable                                  |                |
| <b>Special precautions for user</b> | Hazard identification (Kemler)                  | 60             |
|                                     | Classification code                             | T2             |
|                                     | Hazard Label                                    | 6.1            |
|                                     | Special provisions                              | 43 274         |
|                                     | Limited quantity                                | 5 kg           |
|                                     | Tunnel Restriction Code                         | 2 (E)          |

**Air transport (ICAO-IATA / DGR)**

|                                     |   |                |
|-------------------------------------|---|----------------|
| <b>UN number</b>                    | 3464  |                |
| <b>UN proper shipping name</b>      | Organophosphorus compound, solid, toxic, n.o.s. * |                |
| <b>Transport hazard class(es)</b>   | ICAO/IATA Class                                   | 6.1            |
|                                     | ICAO / IATA Subrisk                               | Not Applicable |
|                                     | ERG Code  | 6L             |
| <b>Packing group</b>                | III   |                |
| <b>Environmental hazard</b>         | Not Applicable                                    |                |
| <b>Special precautions for user</b> | Special provisions                                | A3 A5 A6       |
|                                     | Cargo Only Packing Instructions                   | 677            |
|                                     | Cargo Only Maximum Qty / Pack                     | 200 kg         |
|                                     | Passenger and Cargo Packing Instructions          | 670            |
|                                     | Passenger and Cargo Maximum Qty / Pack            | 100 kg         |

## Tetrabutylphosphonium bromide

|  |   |       |
|--|---|-------|
|  | Passenger and Cargo Limited Quantity Packing Instructions | Y645  |
|  | Passenger and Cargo Limited Maximum Qty / Pack            | 10 kg |

## Sea transport (IMDG-Code / GGVSee)

|                                     |   |                |
|-------------------------------------|---|----------------|
| <b>UN number</b>                    | 3464  |                |
| <b>UN proper shipping name</b>      | ORGANOPHOSPHORUS COMPOUND, SOLID, TOXIC, N.O.S. |                |
| <b>Transport hazard class(es)</b>   | IMDG Class                                      | 6.1            |
|                                     | IMDG Subrisk                                    | Not Applicable |
| <b>Packing group</b>                | III   |                |
| <b>Environmental hazard</b>         | Not Applicable                                  |                |
| <b>Special precautions for user</b> | EMS Number                                      | F-A, S-A       |
|                                     | Special provisions                              | 43 223 274     |
|                                     | Limited Quantities                              | 5 kg           |

## Inland waterways transport (ADN)

|                                     |   |                |
|-------------------------------------|---|----------------|
| <b>UN number</b>                    | 3464  |                |
| <b>UN proper shipping name</b>      | ORGANOPHOSPHORUS COMPOUND, SOLID, TOXIC, N.O.S. |                |
| <b>Transport hazard class(es)</b>   | 6.1   | Not Applicable |
| <b>Packing group</b>                | III   |                |
| <b>Environmental hazard</b>         | Not Applicable                                  |                |
| <b>Special precautions for user</b> | Classification code                             | T2             |
|                                     | Special provisions                              | 43; 274; 802   |
|                                     | Limited quantity                                | 5 kg           |
|                                     | Equipment required                              | PP, EP         |
|                                     | Fire cones number                               | 0              |

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

Not Applicable

## Transport in bulk in accordance with MARPOL Annex V and the IMSBC Code

| Product name                  | Group         |
|-------------------------------|---------------|
| Tetrabutylphosphonium bromide | Not Available |

## Transport in bulk in accordance with the IGC Code

| Product name                  | Ship Type     |
|-------------------------------|---------------|
| Tetrabutylphosphonium bromide | Not Available |

## SECTION 15 Regulatory information

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

Tetrabutylphosphonium bromide is found on the following regulatory lists

Europe EC Inventory

European Union - European Inventory of Existing Commercial Chemical Substances (EINECS)

## National Inventory Status

| National Inventory                               | Status                             |
|--|------------------------------------|
| Australia - AIIIC / Australia Non-Industrial Use | No (Tetrabutylphosphonium bromide) |

## Tetrabutylphosphonium bromide

| National Inventory            | Status  |
|-------------------------------|---|
| Canada - DSL                  | Yes   |
| Canada - NDSL                 | No (Tetrabutylphosphonium bromide)  |
| China - IECSC                 | Yes   |
| Europe - EINEC / ELINCS / NLP | Yes   |
| Japan - ENCS                  | Yes   |
| Korea - KECI                  | Yes   |
| New Zealand - NZIoC           | Yes   |
| Philippines - PICCS           | Yes   |
| USA - TSCA                    | Yes   |
| Taiwan - TCSI                 | Yes   |
| Mexico - INSQ                 | No (Tetrabutylphosphonium bromide)  |
| Vietnam - NCI                 | Yes   |
| Russia - FBEPH                | Yes   |
| <b>Legend:</b>                | Yes = All CAS declared ingredients are on the inventory<br>No = 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

|               |            |
|---------------|------------|
| Revision Date | 11/07/2023 |
| Initial Date  | 11/07/2023 |

## SDS Version Summary

| Version | Date of Update | Sections Updated  |
|---------|----------------|---|
| 3.4     | 11/07/2023     | Korean MSDS Number, Identification of the substance / mixture and of the company / undertaking - Supplier Information |

## 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

ES: Exposure Standard

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

BEL: Biological Exposure Index

AIIC: Australian Inventory of Industrial Chemicals

**Tetrabutylphosphonium bromide**

DSL: Domestic Substances List  
NDSL: Non-Domestic Substances List  
IECSC: Inventory of Existing Chemical Substance in China  
EINECS: European INventory of Existing Commercial chemical Substances  
ELINCS: European List of Notified Chemical Substances  
NLP: No-Longer Polymers  
ENCS: Existing and New Chemical Substances Inventory  
KECI: Korea Existing Chemicals Inventory  
NZIoC: New Zealand Inventory of Chemicals  
PICCS: Philippine Inventory of Chemicals and Chemical Substances  
TSCA: Toxic Substances Control Act  
TCSI: Taiwan Chemical Substance Inventory  
INSQ: Inventario Nacional de Sustancias Químicas  
NCI: National Chemical Inventory  
FBEPH: Russian Register of Potentially Hazardous Chemical and Biological Substances

**Classification and procedure used to derive the classification for mixtures according to Regulation (EC) 1272/2008 [CLP]**

| <b>Classification according to regulation (EC) No 1272/2008 [CLP] and amendments</b>                 | <b>Classification Procedure</b> |
|--|---------------------------------|
| Acute Toxicity (Dermal)<br>Category 3, H311  | Expert judgement                |
| Serious Eye Damage/Eye Irritation Category 1, H318   | Expert judgement                |
| Acute Toxicity (Inhalation)<br>Category 4, H332  | On basis of test data           |
| Specific Target Organ Toxicity - Single Exposure (Respiratory Tract Irritation)<br>Category 3 , H335 | Expert judgement                |
| Acute Toxicity (Oral)<br>Category 4, H302  | Expert judgement                |
| Skin Corrosion/Irritation<br>Category 2, H315  | Expert judgement                |