



ABN: 81 008 668 371

# MATERIAL SAFETY DATA SHEET

## Sodium Cyanide Solid

### Section 1 – Identification of the Material and Supplier

**Product Name**

Sodium Cyanide Solid

**Other names**

Sodium cyanide, hydrocyanic acid sodium salt. Company product 1380.

**Recommended use**

Extraction of gold and silver from ores.

**Company name**

CSBP Limited

**Address**

Kwinana Beach Road, KWINANA

**State**

Western Australia

**Postcode**

6167

**Telephone number**

(08) 9411 8777 (Australia), +61 8 9411 8777 (Overseas)

**Emergency telephone number**

1800 093 333 (Australia), +61 8 9411 8444

### Section 2 – Hazard Identification

**Hazard Classification, including a statement of overall hazardous nature**

**HAZARDOUS SUBSTANCE.**

Sodium cyanide solid is classified as hazardous and specified in the NOHSC of Designated Hazardous Substances [NOHSC:10005(1999)].

**DANGEROUS GOODS.**

Sodium cyanide solid is classified for physicochemical hazards and specified as dangerous in the Australian Code for the Transport of Dangerous Goods by Road and Rail (ADG Code), 7th Edition, (FORS, 2007).

**Risk Phrases**

Sodium cyanide is classified as toxic.

**R25/26/27/28**

Very toxic by inhalation, in contact with skin and if swallowed.

**R32**

Contact with acids liberates very toxic gas

**R36/37/38**

Irritating to eyes/respiratory system and skin.

**R41**

Risk of serious damage to the eyes.

**R50/53**

Very toxic to aquatic organisms may cause long-term adverse effects in the aquatic environment.

**R55/56/57**

Toxic to fauna, soil organisms and bees.

**R67**

Vapours may cause drowsiness and dizziness.

**Safety Phrases**

Sodium cyanide is a hazardous substance.

**S1/2/4**

Keep locked up, out of the reach of children and away from living quarters.

**S7/9**

Keep container tightly closed and in a well ventilated place

**S13/14**

Keep away from food, drink and animal feeding stuffs, acids, acid salts and carbon dioxide fire extinguishers.

**S18**

Handle and open container with care.

**S20/21**

When using do not eat, drink or smoke.

**S22**

Do not breathe dust.

**S24/25**

Avoid contact with skin and eyes.

**S26**

In case of contact with eyes, rinse immediately with plenty of water and seek medical advice.



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### Safety Phrases (cont..)

<b>S27</b>	Take off immediately all contaminated clothing.
<b>S28</b>	After contact with skin, wash immediately with plenty of water.
<b>S29</b>	Do not empty into drains.
<b>S36/37/39</b>	Wear suitable protective clothing, gloves and eye/face protection.
<b>S38</b>	In case of insufficient ventilation, wear suitable respiratory equipment.
<b>S40</b>	To clean the floor and all objects contaminated by this material use sodium or calcium hypochlorite solution.
<b>S41/43</b>	In case of fire and/or explosion do not breathe fumes, use water, chemical powder or foam. Never use carbon dioxide.
<b>S45</b>	In case of accident or if you feel unwell seek medical attention immediately (show the label where possible).
<b>S46/64</b>	If swallowed, rinse mouth with water (only if the person is conscious), seek medical advice immediately and show this label.
<b>S50</b>	Do not mix with carbon dioxide, acids or acid salts
<b>S51</b>	Use only in well-ventilated areas.
<b>S53</b>	Avoid exposure – Obtain special instruction before use.
<b>S56</b>	Dispose of this material and its container to hazardous or special waste collection point
<b>S59</b>	Refer to manufacturer for information on recovery/recycling.
<b>S 57</b>	Use appropriate containment to avoid environmental contamination.
<b>S61</b>	Avoid releases to the environment. Refer to special instructions/Safety data sheet.
<b>S63</b>	In case of accident by inhalation: remove casualty to fresh air and keep at rest.

### Poison Schedule

SUSDP Poison Schedule 7

## Section 3 – Composition/Information on Ingredients

### Chemical identity of ingredients

Sodium cyanide  
Sodium carbonate  
Sodium formate  
Sodium hydroxide  
Water

### Proportion of ingredients

Greater than 97 % (wt/wt)  
Less than 2.5 % (wt/wt)  
Less than 0.5 % (wt/wt)  
Less than 0.5 % (wt/wt)  
Remainder

### CAS Number for ingredients

143-33-9  
497-19-8  
141-53-7  
1310-73-2



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### Section 4 – First Aid Measures

#### First Aid

**TO BE EFFECTIVE, FIRST AID MUST BE PROMPT.**

**SODIUM CYANIDE SOLID IS POISONOUS BY INGESTION AND INHALATION OF ITS DUST. CONTACT WITH SKIN AND EYES AND MAY CAUSE IRRITATION OF THE SKIN AND EYES AND POISONING SYMPTOMS SIMILAR TO THOSE FOR INGESTION.**

**OF PRIME IMPORTANCE IS THE PROTECTION OF THE RESCUER. NO ATTEMPT AT RESCUE SHOULD BE PERFORMED UNTIL AN APPROPRIATE HAZARD ASSESMENT OF THE EXPOSURE SITE IS MADE AND APPROPRIATE PERSONAL PROTECTION EQUIPMENT AND PERSONNEL ARE IN PLACE.**

**FIRST AID ATTENTION MUST BE GIVEN AS URGENTLY AS POSSIBLE AS OUTLINED BELOW. ALL SUSPECTED SODIUM CYANIDE INGESTION, INHALATION AND CONTACT SHOULD RECEIVE MEDICAL ATTENTION. TRAINING ON HANDLING SODIUM CYANIDE INCIDENTS USING THIS MSDS SHOULD BE PROVIDED BEFORE ANY SODIUM CYANIDE HANDLING OR USE COMMENCES.**

#### First Aid Facilities

First aid procedures, equipment, medication and training for the treatment of exposure to sodium cyanide should be in place BEFORE the use commences. First aid personnel should be aware of the nearest hospitals which are familiar with the treatment of sodium cyanide exposure.

Equipment and medication in place should be:

Safety shower and eyewash stations immediately accessible in the workplace;

Eye-wash bottle;

Personal protective equipment for use by first aid personnel;

Fresh, clean, cool drinking water;

Resuscitation bag and mask (or Oxy-Viva);

Cyanide Emergency Kit: containing Amyl Nitrite Pearls; Hydroxycobalamine and Sodium Thiosulfate; Oxygen;

“Space” or thermal blankets for treating patients for shock.

#### **FIRST AID PROCEDURES FOR DEALING WITH THIS PRODUCT AND EXPOSURE TO IT**

##### **1. Personal Protection By First Aid Personnel**

First aid personnel providing first aid treatment to a patient exposed to sodium cyanide solid should observe the following precautions for their own personal protection:

- Avoid contact with contaminated skin, clothing and equipment by wearing protective gloves;
- Wear chemical goggles as a minimum level of eye protection to prevent sodium cyanide dust entering eyes;
- Avoid inhalation of sodium cyanide dust during rescue in contaminate areas by wearing suitable respiratory protection;
- Respiratory protection suggested is: an air supplied breathing apparatus, or positive pressure self-contained breathing apparatus.

##### **2. Swallowed**

Immediately:

- Remove the patient from the source of contamination – to fresh air, if hydrogen cyanide gas (HCN) is present;
- If the patient is not breathing, do not use mouth to mouth, or mouth to nose ventilation, because of the danger to the rescuer, instead use a resuscitation bag and mask – (Oxy-Viva);
- If pulse is absent, start external cardiac massage and follow standard Advanced Cardiovascular Life Support (ACLS) guidelines;
- Give 100% oxygen by mask (Oxy-Viva) if available;



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### 2. Swallowed (cont..)

- Remove all contaminated clothing and footwear into a sealable collection bag – launder contaminated clothing thoroughly and wash the affected areas with soap and copious amounts of water;
- Arrange for the urgent transfer of the patient, accompanied by an attendant with the Cyanide Emergency Kit, to medical professionals;
- Those persons designated as competent may open the Cyanide Emergency Kit and commence use of any amyl nitrite pearls to treat the effects of cyanide exposure.

**Amyl Nitrite should not be used unless the patient is clearly deteriorating, despite oxygen administration, and there is a reasonable confidence that cyanide intoxication is the cause.**

### 3. Eyes

Persons with potential eye exposure should not wear contact lenses.

Immediately irrigate eye with copious amounts of water, while holding eyelids open, for at least 15 minutes. Seek medical assistance immediately.

### 4. Skin

Wash affected area with copious amounts of water for at least 15 minutes.

Remove contaminated clothing and launder before re-use.

Seek medical assistance following skin contact.

### 5. Inhalation

Proceed as for **2. Swallowed** above.

### ADVICE TO DOCTOR.

**Treatment should include the following measures:**

- Immediate attention should be directed towards assisted ventilation, administration of 100 % oxygen, insertion of intravenous lines and institution of cardiac monitoring, if available;
- Attention should be given to monitoring the level of consciousness;
- Administer antidote if signs of serious cyanide poisoning are present:
  - Insert indwelling cannula into vein:
  - Take 5 mL of blood in a plain clotted tube (red top in Western Australia) for later confirmation of diagnosis by measurement of the cyanide level. (Take blood in a heparinised tube and place on ice for immediate transfer to laboratory if direct testing for cyanide levels is available). At the same time take blood for lactic acid level (urgent). An elevated lactic acid level is a useful test to assist in confirmation of the diagnosis.

**Note: Cyanide poisoning is a clinical diagnosis and treatment is instigated on clinical grounds.**

- Treatment path
  - Administer intravenously 5 to 15 grams of hydroxycobalamine over 30 minutes, or faster if necessary. In the Cyanide Emergency Kit these are made up of two 2.5 gram doses that are set to be re-constituted with the saline in the plastic transfer device. An IV giving set is to be inserted into the re-constituted IV hydroxycobalamine bottle. If this has been left in the cardboard packet, it can be hung like an IV bottle through the hole in the top of the box;
  - Also administer sodium thiosulfate 12.5 grams over 10 to 20 minutes with the hydroxycobalamine;

**Note: Hydroxycobalamine is the recommended treatment in patients in whom the diagnosis is not clear and where there is a clinical suspicion of cyanide poisoning.**

- If cyanide has been swallowed, whilst gastric lavage, charcoal and cathartics may be used after an antidote therapy, if less than two hours have passed since ingestion, there is little evidence to support a benefit and one should take the advice of an emergency care physicians prior to commencing;
- Obtain an arterial blood gas measurement immediately, and correct any severe metabolic acidosis (pH below 7.20) with bicarbonate;

**Note: The best way to treat metabolic and cardiorespiratory complications of cyanide poisoning is the use of an appropriate antidote.**



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### Supportive care should include the following measures:

- All patients with suspected, or proven, cyanide poisoning should be taken to hospital for evaluation and observation;
- Follow the patient's progress for at least 24 hours;
- Watch for the development for pulmonary oedema and aspiration pneumonia in comatose patients;
- Consider more antidote if there is a persistent metabolic acidosis. Bicarbonate can be used cautiously. Correct metabolic acidosis with bicarbonate when blood pH falls below 7.20, and be sure to correct electrolyte imbalance (for example, hyperkalemia, hypercalcemia);
- Oxygen requirement would be expected to decrease after successful administration of the antidote.

### Long Term Complications

No data available.

Further information about the treatment for exposure to this product can be obtained from the Poisons Information Centre on (08) 13 1126 (Australia only)

## Section 5 – Fire Fighting Measures

### Product flammability

Sodium cyanide solid is not combustible and is not considered a fire risk, but may generate toxic, flammable, corrosive and explosive hydrogen cyanide gas if in contact with water, CO<sub>2</sub> fire extinguishers, and some foam fire extinguishers if these contain acidic agents.

### Suitable extinguishing media

**DO NOT USE CARBON DIOXIDE.** Extinguish fires with water spray or fog. Do not use straight stream of water. Most foams will react with sodium cyanide solid and release toxic and corrosive fumes. For small fires use dry chemical extinguishers or dry sand.

### Hazard from combustion products

Although sodium cyanide itself is not combustible, intense heat may cause sodium cyanide to decompose, giving off toxic, flammable, corrosive and explosive hydrogen cyanide gas.

### Special protective precautions and equipment for fire fighters

Wear full body protective clothing (PVC jackets and pants, PVC gloves and chemical resistant boots) with self-contained breathing apparatus with a full-face piece operated in pressure-demand or positive pressure mode. Prevent spillage from entering drains or waterways. Consider evacuation. Use water to control fire. Wet sodium cyanide spill will cause surfaces to be slippery and slimy. If required, use soda ash, or other suitable alkaline material, to control the pH of the water/cyanide mixture created. If safe and practicable to do so remove sodium cyanide containers from path of fire.

Equipment should be thoroughly decontaminated after use.

After intervention, take shower, remove clothing carefully, clean and check equipment.

### Hazchem Code

2X

## Section 6 – Accidental Release Measures

### Emergency procedures

The hazardous nature of sodium cyanide, require emergency and spill procedures to be effective to avoid both human and environmental exposure. Hazardous conditions may result if material is managed improperly. Make plans in advance to handle possible emergencies, including obtaining stocks of absorbent materials. Always wear recommended personal protective equipment and respiratory protection. Good ventilation is necessary.



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### Methods and Materials for containment and clean up

For **ALL** spills, evacuate unprotected personnel upwind and out of danger. Wear appropriate personal protective equipment and breathing apparatus. If safe to do so, prevent further release of sodium cyanide. Shut off all possible sources of ignition. Stay upwind of any dust or mist released. Increase ventilation and allow any dust or mist released to vent to a safe area. Restrict access to spill site. Avoid, or minimise, the use of water on spilt solid or dust. Using a shovel/front end loader as required, recover as much material as possible into dedicated drums, and where possible return collected spills to process, or manufacturer. If possible contain the surface area of a sodium cyanide solid spill by bunding with sand, earth or vermiculite.

### Initial Clean Up With Ferrous Sulfate

Generously cover any remaining residue with lime or soda ash (to maintain pH at 9 or higher), add ferrous sulfate then add water and mix well. Allow about 30 minutes for complete penetration and neutralisation to take effect. Collect residue and store in dedicated container for disposal. Prevent run-off into drains and waterways. After clean up, test area for free cyanide level present; if free cyanide is more than 10 parts per million (ppm), repeat clean up using ferrous sulfate; if free cyanide is less than 10 ppm proceed with final clean up using hypochlorite solution.

### Final Clean Up With Calcium/Sodium Hypochlorite

Make up a dilute aqueous chlorine solution using either calcium hypochlorite or sodium hypochlorite. Spray this chlorine solution evenly to the area to be decontaminated. After thorough contact of the chlorine solution with the contaminated area is made, test area for free cyanide present. If free cyanide is more than 1 ppm, repeat clean up using chlorine solution. Prevent run-off into drains and waterways.

For a large spill notify Fire and Rescue Services then CSBP Emergency Response.

Dispose of all neutralised solutions in accordance with the requirements of the Department of Environment Protection.

For the management of cyanide emergencies during transport by road or rail, SAA/SNZ HB76: Dangerous Goods-Initial Response Guide, Guide 40 should be consulted. This Guide should be carried at all times when sodium cyanide is being transported.

Clean up personnel will need personal full protection equipment and respiratory protection. Portable safety shower and eyewash facilities may also be needed for clean up personnel. Bags of ferrous sulfate neutralising agent, calcium/sodium hypochlorite drums, bags of soda ash, or other suitable alkaline material, chemical absorbent and substantial amounts of water will be required for large spill. A front-end loader may be required to scoop up neutralised cyanide/lime/soda ash residue, as are dedicated empty drums to store the neutralised residue.

## Section 7 – Handling and Storage

### Precautions for safe handling

Regulated dangerous goods as Class 6.1 Toxic. Proper protective clothing must be worn that covers the body including the face. A safety shower and eyewash should be available. Do not breathe dust or mist. Avoid contact with skin, eyes and clothing.

Do not smoke anywhere near the storage and handling of sodium cyanide solid or associated handling equipment.

Do not touch damaged containers or spilled material unless wearing appropriate personal protective equipment.

Change and wash clothing, and personal protective equipment if contaminated, or before storing and/or re-using. Wash hands and face thoroughly after handling and before work breaks, eating, drinking, smoking and using toilet facilities.



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## Sodium Cyanide Solid

### Conditions for safe storage, including any incompatibilities

Ensure sodium cyanide solid in bulk is stored and handled in accordance with Australian Standard AS 4452 *The storage and handling of toxic substances*. Ensure adequate ventilation to keep airborne concentration below exposure standard. Where necessary, use local exhaust ventilation in conjunction with P2 canister respirator, or as appropriate, self contained breathing apparatus.

Keep workplaces and stores well ventilated. Toxic concentrations of hydrogen cyanide gas can be reached when cyanide is in prolonged contact with air in a closed area. When opening a container storing cyanide, remove the lid, and move away to let the accumulated gas out of the container before returning to obtain the quantity required.

Store away from acids and water –sodium cyanide will release toxic and flammable hydrogen cyanide gas in contact with these substances. Store away from chlorinating agents. Contact with these may form toxic cyanogen chloride gas. Incompatible with oxidizing agents, copper, zinc, magnesium, tin, or their alloys (i.e., bronze, brass, galvanised metals, etc.) and aluminium.

Sodium cyanide solid will absorb moisture to evolve hydrogen cyanide gas.

## Section 8 – Exposure Controls/Personal Protection

### National exposure standards

ES-TWA	ES-STEL	ES-Peak
5 mg/m <sup>3</sup> as Cyanide (CN <sup>-</sup> ) dust	No data assigned by NOHSC	No data assigned by NOHSC
10 ppm as Hydrogen Cyanide (HCN)	Peak Limitation	Peak Limitation

### Biological limit values

No data available.

### Engineering controls

Handle sodium cyanide solid within closed systems whenever possible. Provide adequate ventilation at all times.

### Personal protective equipment

Whenever the risk of exposure exists, such as opening sodium cyanide containers, non-routine operations and emergency circumstances, the following personal protection measure are recommended:

#### Respiratory protection

Canister respirator P2 type if air sampling indicates hydrogen cyanide level is between 11 and 50 mg/m<sup>3</sup> (Australian Standard *AS 1716 Respiratory protective devices*). Air supplied, or positive pressure, self contained breathing apparatus recommended where air sampling indicates hydrogen cyanide gas concentration exceeds 50 mg/m<sup>3</sup>.

#### Personal protective equipment (cont..)

##### Hand protection

PVC or butyl rubber gauntlet-type gloves.

##### Eye protection

Chemical splash goggles (gas tight type preferred) and full face shield.

##### Skin protection

PVC overalls or jacket and pants and butyl rubber Wellington boots.



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## Sodium Cyanide Solid

### Section 9 – Physical and Chemical Properties

#### Appearance (colour, physical form, shape)

White solid briquette.

#### Odour

Slight bitter almond odour

#### pH

10% solution, approximately 9.

#### Vapour pressure

Virtually nil at dry, ambient conditions; 100 Pa at 800 °C.

#### Vapour density

No data available

#### Boiling point/range

1,500 °C at 101.3 kPa.

#### Freezing/melting point

Melts between 560 and 635 °C at 101.3 kPa.

#### Solubility

Solubility in water approximately 48 g/100 mL at 20 °C; sparingly soluble in ethanol.

#### Specific gravity or density

Specific Gravity: 1.5 to 1.6 at 20 °C; Bulk Density: 0.75 to 0.90 tonne/m<sup>3</sup> at 20 °C

#### Flash point and method of detecting flash point

Not applicable

#### Upper and lower flammable (explosive) limits in air

Not applicable

#### Ignition temperature

Not applicable

#### Viscosity

For a 30 % (wt/wt) aqueous solution: 10.3 mPa.s at 21.5 °C.

### Section 10 – Stability and Reactivity

#### Chemical stability

Stable at ambient conditions of use and storage.

#### Conditions to avoid

Hydrogen cyanide forms if heated above 300 °C. Contact with water, acids, acid salts and carbon dioxide lead to the liberation of hydrogen cyanide gas.

#### Incompatible materials

Incompatible with oxidizing agents, copper, zinc, magnesium, tin, or their alloys (i.e., bronze, brass, galvanised metals, etc.) and aluminium.

#### Hazardous decomposition products

Toxic and flammable hydrogen cyanide gas.

#### Hazardous reactions

Store away from acids, acid salts, water and carbon dioxide fire extinguishers – sodium cyanide will release toxic and flammable hydrogen cyanide gas in contact with these substances. Store away from chlorinating agents – contacts with these may form toxic cyanogen chloride gas.



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## Sodium Cyanide Solid

### Section 11 – Toxicological Information

#### HEALTH EFFECTS

When handled in accordance with the guidelines in this material safety data sheet, sodium cyanide solid should not present any health effects. If this product is mishandled, the following symptoms may develop:

#### Acute:

Sodium cyanide solid is a very toxic chemical asphyxiant – may cause death soon after exposure by all means of entry into the human body. It may cause caustic burns in contact with human flesh. Cyanide inhibits cytochrome oxidase preventing oxygen utilization leading to cytotoxic anoxia. Acute effects depend on the degree of histotoxic hypoxia. Death results from central nervous system failure. Venous blood remains oxygenated and victim may appear pink,

#### Inhalation:

Inhalation of sodium cyanide dust, or hydrogen cyanide vapour above the solid, may result in burns and irritation to the nose and upper respiratory tract, leading to coughing and sore throat. Lesions of the nasal septum and delayed pulmonary oedema may result. Toxic amounts may be inhaled leading to poisoning symptoms which include weakness, headache, dizziness, shortness of breath, chest pain, confusion, cyanosis (bluish skin due to deficient oxygenation of the blood), weak and irregular heartbeat, collapse, unconsciousness, coma and death. Death can be very rapid. The lethal oral dose of hydrogen cyanide is estimated to be approximately 50 mg in an adult (Sullivan, J.B. Jr., G.R. Krieger (eds.), *Hazardous Materials Toxicology-Clinical Principles of Environmental Health*, Baltimore, Williams and Wilkins, 1992).

Human physiological response to various concentrations of hydrogen cyanide in air are summarised in the table below:

HCN Level in		Duration in minutes	Resulting Conditions on Humans
mg/m <sup>3</sup>	ppm		
2.2 - 5.5	2 - 5	-	Threshold of “bitter almonds” smell detectable by some people.
11	10	-	NOHSC peak limitation exposure standard.
19.8 - 39.6	18 - 36	Several hours	Slight symptoms of cyanide poisoning.
48.5 - 59.4	45 - 54	30 - 60 minutes	Tolerated without immediate or delayed effects.
121 - 148.5	110 - 135	30 - 60 minutes	Fatal, or dangerous to life.
148.5	135	30 minutes	Fatal.
199.1	181	10 minutes	Fatal.
297	270	Immediately	Immediately fatal.

(Simenova, F., Fishbein, L., Concise International Chemical Assessment Document 61, *Hydrogen Cyanide and Cyanides: Human Health Aspects*, International Program in Chemical Safety, Geneva, World Health Organisation, 2004).

#### Skin:

Sodium cyanide solid will cause severe irritation and chemical burns. Sweat increases rate of absorption into skin. Toxic amounts may be absorbed through the skin, leading to poisoning symptoms similar to those for inhalation. LD<sub>50</sub> (Dermal, rat) = 33 mg/kg.

#### Eye:

Sodium cyanide solid will cause severe irritation to the eye, leading to redness, pain and possible eye burns. May cause chemical conjunctivitis and corneal damage leading to loss of sight. Toxic amounts may be absorbed through the eye, leading to poisoning symptoms similar to those for inhalation.



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### Swallowed:

Sodium cyanide solid is very toxic and may be fatal if swallowed. It will cause caustic burns, resulting in severe gastrointestinal tract irritation with nausea and vomiting, accompanied by severe burning sensation. Toxic amounts ingested may lead to poisoning symptoms similar for those for inhalation. The mean lethal dose by mouth of cyanide in an 80 kg male human adult is thought to be in the range of 50 to 200 mg and death is rarely delayed more than one hour (Gosselin *et al*, *Clinical Toxicology of Commercial Products*. 5<sup>th</sup> Ed., Baltimore: Williams and Wilkins, 1984). LD<sub>50</sub> (Oral, rat) = 6.44 mg/kg.

### Chronic:

Cyanide may be highly acutely toxic, but it has lower toxicity on a chronic basis. Prolonged or repeated exposure may cause drying of the skin, dermatitis, ulceration, skin necrosis, loss of appetite, weight loss, dizziness, shortness of breath, muscle cramps and irritation to upper respiratory tract. Chronic cyanide intoxication has been associated with such human diseases as retro tubular neuritis in pernicious anaemia, Leber's optic atrophy and Nigerian nutritional Neuropathy. Following long-term exposure at 15 ppm levels, individual cases of thyroid dysfunction have been reported (Barnerjee *et al*, Evaluation of cyanide exposure and its effect on thyroid function on workers in a cable industry, *J Occup Environ Med.*, 39(3):258-260, 1997). As acutely toxic as cyanide is, repeated low-level doses of cyanide do not necessarily result in cumulative adverse effects.

## Section 12 – Ecological Information

### Ecotoxicity

Fish and aquatic invertebrates are very sensitive to cyanide exposure. Small concentrations, in the range of 5 to 20 mg cyanide per litre, causes a reduction in swimming performance, inhibiting reproduction and altering growth patterns. Increased cyanide concentrations in the range of 30 to 200 mg/L causes the deaths of many species of fish and invertebrates. Algae and macrophytes can tolerate much higher environmental concentrations of free cyanide than fish and invertebrates, but cyanide exposures may leave an aquatic plant community dominated by less sensitive species. Birds and higher mammals are susceptible to cyanide poisoning and display many symptoms associated with humans exposed to cyanide. The rapid recovery of some birds to sub-lethal doses of cyanide may be due to the rapid metabolism of cyanide to thiocyanate and its subsequent excretion. Cyanide has low persistence and is not accumulated or stored in any mammal studied.

### Persistence and degradability

Potentially biodegradable by abiotic degradation. In aerobic conditions, microbial activity degrades cyanide ion (CN<sup>-</sup>), in concentration up to 200 parts per million, to ammonia which then oxidises to nitrate (NO<sub>3</sub>). Biological degradation may also occur under anaerobic conditions, but CN<sup>-</sup> concentrations of more than 2 ppm are toxic to anaerobic micro organisms. Hydrogen cyanide may be hydrolysed to formic acid or ammonium formate- this reaction is not fast but may be appreciable faster in anaerobic conditions such as ground water.

- Water/Soil – in soils cyanide ion (CN<sup>-</sup>) migrates easily to ground water and at high concentrations is toxic to soil micro organisms;
- Groundwater – persists in groundwater due to lack of sunlight/oxygen needed to degrade it to benign forms.

### Mobility

- Air – HCN and small amounts of sodium cyanide present as dust particles – duration 1-3 years before settling out;

In alkaline conditions, due to approximately 2.5 % (<sup>wt</sup>/<sub>wt</sub>) total alkalinity content of sodium cyanide briquette:

- Water – considerable solubility and mobility – at surface water interface cyanide ion (CN<sup>-</sup>) oxidises in the presence of sunlight and oxygen to yield cyanate ion (CNO<sup>-</sup>), thiocyanate ion (SCN<sup>-</sup>), ammonia, nitrate (NO<sub>3</sub>) and various other compounds;
- Soil/Sediments – adsorption on minerals soil constituents possible - most persistent in groundwater and at higher pH.



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### Environmental fate (exposure)

#### Acute ecotoxicity:

Fish: 96 hr LD<sub>50</sub> (Oncorhynchus mykiss): 0.028 mg/L, (as cyanide); in fresh water conditions at 6 °C;

Fish: 96 hr LD<sub>50</sub> (Perca flavescens): 0.076 - 0.108 mg/L, (as cyanide); in fresh water conditions;

Fish: 96 hr LD<sub>50</sub> (Pimephales promelas): 0.082 - 0.113 mg/L, (as cyanide); in fresh water conditions;

Crustaceans: 96 hr LD<sub>50</sub> (Daphnia magna): 0.16 mg/L, (as cyanide), in fresh water conditions;

Soil organisms: 96 hr EC<sub>50</sub> (Lumbriculus variegatus): 11 mg/L, (as cyanide);

Terrestrial plants: 32 days EC<sub>50</sub> (Pimephales promelas): 22.4 mg/L, (as cyanide);

Birds: 96 days EC<sub>50</sub> (Lymnaea luteola): 2.5 mg/L, (as cyanide).

### Bioaccumulative potential

Low potential for human bioaccumulation. Does not bioaccumulate in fish.

## Section 13 – Disposal Considerations

### Disposal methods and containers

Due to its inherent properties, hazardous conditions may result if material is managed improperly. Dispose of all contained and contaminated spill residue in accordance with the requirements of the Department of the Environment. Contact CSBP Limited for technical advice on disposal method.

### Special precautions for landfill or incineration

No data available

## Section 14 – Transport Information

### UN Number

1689

### UN Proper shipping name

Sodium Cyanide

### Class and subsidiary risk

Class 6.1 Toxic. No subsidiary risk.

### Packing group

I

### Special precautions for user

Transport in accordance with the Australian Code for the Transport of Dangerous Goods by Road and Rail (ADG Code) and IMO. Transport only in packaging approved by the Department of Consumer and Employment Protection – typically, a sparge container, or composite intermediate bulk container (CIBC), comprising a woven polypropylene bulka-bag, a heat-sealed polyethylene box liner, and a plywood pallet-box. CIBC's may be stored on their own, but may only be transported in an approved sea container.

### Hazchem code

2X

## Section 15 – Regulatory Information

### Australian regulatory information

SUSDP Poison Schedule 7. Licensing is required for this chemical in all States and Territories.

Listed on the Australian Inventory of Chemical Substances (AICS).

### Additional national and/or international regulatory information

OSHA: Hazardous by definition of Hazard Communication Standard (29CFR 1910.1200).

This product is subject to the EC directive 82/501/EEC and amendments.



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## Sodium Cyanide Solid

### Section 16 – Other Information

#### Key / legend to abbreviations and acronyms used in the MSDS

NOEC	No Observable Effect Concentration - concentration where no effect can be seen
NOHSC	National Occupational Health and Safety Commission
SUSDP	Standard for the Uniform Scheduling of Drugs and Poisons
EC <sub>50</sub> :	Environmental concentration 50. The concentration of a material, in ppm or ppb, in the environment (usually water) a single dose of which is expected to cause a biological effect on 50% of a group of test animals.
ES-TWA	Exposure Standard – Time weighted average
ES-STEL	Exposure Standard – Short term exposure level
ES-Peak	Exposure Standard – Peak level
FORS	Federal Office of Road and Safety
LC <sub>50</sub> :	Lethal concentration 50, median lethal concentration
LD <sub>50</sub>	Lethal dose 50. The single dose of a substance that causes the death of 50% of an animal population from exposure to the substance by any route other than inhalation
% (wt/wt)	Percent amount on a weight per weight basis
% (wt/vol)	Percent amount on a weight per volume basis
PPM	Parts per million
Zone 1 Class 1	An area where an explosive gas atmosphere can be expected to occur periodically or occasionally during normal operation. (More than 10 hours per year but less than 1000 hours per year)

#### Literature references

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- International Critical Tables of Numerical Data, Physics, Chemistry and Technology, National Research Council, 1<sup>st</sup> Edition, McGraw-Hill, New York, 1928.
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- Kirk-Othmer Encyclopaedia of Chemical Technology, 4<sup>th</sup> Edition, Wiley InterScience, New York, 1997.
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# MATERIAL SAFETY DATA SHEET

## Sodium Cyanide Solid

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Chemalert [www.chemalert.net](http://www.chemalert.net)

Guidance for the Compilation of Safety Data Sheets for Fertilizer Materials, European Fertilizer Manufacturers Association, online at [www.efma.org/Publications/Guidance/Index.asp](http://www.efma.org/Publications/Guidance/Index.asp)

### Sources for data

### Important Notes

1. To the best of our knowledge this document complies with the National Code of Practice for the Preparation of Material Safety Data Sheets 2<sup>nd</sup> Edition [NOHSC:2011 (2003)].
2. This material safety data sheet summarises our best knowledge of the health and safety hazard information of the product and how to safely handle and use the product in the workplace. Each user should read this material safety data sheet and consider the information in the context of how the product will be handled and used in the workplace, including in conjunction with other products.
3. If clarification or further information is needed to ensure that an appropriate risk assessment can be made, the user should contact the Safety and Emergency Services Department, CSBP Limited on (08) 9411 8777 (Australia), +61 8 9411 8777 (Overseas).
4. Our responsibility for products sold, is subject to our terms and conditions, a copy of which is sent to our customers, and is also available on request.
5. CSBP reserves the right to make change to material safety data sheets without notice.