

ArmaGel DT

Armacell Korea LLC

Chemwatch Hazard Alert Code: 3

Chemwatch: 660-450

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Safety Data Sheet according to MoL Public Notice No. 2016-19 requirements

S.GHS.KOR.EN

1. PRODUCT AND COMPANY IDENTIFICATION

a) Product Name

Product name	ArmaGel DT
Other means of identification	Not Available

b) Recommended use of the chemical and restrictions on use

Relevant identified uses	Thermal insulation for pipe-work, vessels and related installation.
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c) Manufacturer/Supplier/Distributor Information

Registered company name	Armacell Korea LLC
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Email	info.korea@armacell.com

Emergency telephone number

Association / Organisation	Armacell Korea LLC
Emergency telephone numbers	+82 41 622 1822
Other emergency telephone numbers	Not Available

2. HAZARDS IDENTIFICATION

a) Hazard.Risk Classification

Classification	Not Applicable
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b) Label elements including precautionary statements

Hazard pictogram(s)	Not Applicable
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SIGNAL WORD	NOT APPLICABLE
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Hazard statement(s)

Not Applicable

Precautionary statement(s) Prevention

Not Applicable

Precautionary statement(s) Response

Not Applicable

Precautionary statement(s) Storage

Not Applicable

Precautionary statement(s) Disposal

Not Applicable

Hazards which do not result in classification other hazards (NFPA)**3. COMPOSITION/INFORMATION ON INGREDIENTS****Substances**

See section below for composition of Mixtures

Mixtures

Name	Synonyms	CAS No	%[weight]
glass, oxide	sodium calcium polyphosphate; sodium zinc polyphosphate; sodium zinc potassium polyphosphate; sodium calcium magnesium polyphosphate; lead borosilicate magnesium polyphosphate; lead borosilicate glass enamel flux; glassy sodium phosphate; sodium calcium magnesium silica polyphosphate; sodium calcium zinc silica polyphosphate; Glass Bead Blasting Media	65997-17-3	25-<50
silica gel, trimethylsilated	[SiO ₂] _x [OSi(CH ₃) ₃] _y ; Nanogel fine particle aerogel; hydrophobic silica; insulation; Isogel; amorphous silicon dioxide; amorphous precipitated silica	126877-03-0	25-<50
silica amorphous	Si-O ₂ ; Acticel; precipitated silica; hydrated silica; Aerosil; Hi-Sil; Perkasil KS 404; amorphous silica dust; Lo-Vel; Microsil; fumed silicon dioxide; silica, amorphous, fumed, non crystalline; Aquafil; Ludox; Cab-O-Grip II; Nalcoag 830; Cab-O-Sil; Nalcoag 1430; Cab-O-Sperse; Santocel; Cataloid; silica aerogel; colloidal silica; Aerosil 200; colloidal silicon dioxide; silicic anhydride; Davison SG-67; Silikill; Dicalite; Silcron; Ent 25,550; Syloid; Flo-gard; synthetic silica; Silica 100 WQ; fossil flour; Silica 300 WQ; 24/R0125; anti caking agent 551; highly dispersed SiO ₂ ; 24/R1922; Free flow agent 551; PPG Silene 732D; SafSil; Sigma-Aldrich Silica Gel A White 2-4 mm - Product No.: 10081; Merck Silica Gel 60 (less than 0.063 mm) for Column Chromatography, catalogue no. 107729; Merck Silica Gel 60 (0.063 - 0.200 mm) for Column Chromatography, catalogue no.: 107734; Merck Silica Gel 60 HF254 for Thin Layer Chromatography, catalogue no. 1.07739; Merck Silica Gel 60 GF254 for Thin Layer Chromatography, catalogue no. 107730; Merck sea sand extra pure	7631-86-9	10-<25
polyethylene	polyethylene pellets moulding powder extrusion blow moulding; low density polyethylene (LDPE) pellets; linear low density polyethylene (LLDPE) pellets; high density polyethylene; BP LDPE Grades, BP LLDPE Grades; HDPE	9002-88-4	5-<10
C.I. Pigment Black 26	Manganese Ferrite Black Spinel; Daipyroxide Black 9550; Bayferrox 303T Pigment; C.I. 77494	68186-94-7	5-<10
magnesium hydroxide	Mg(OH) ₂ ; magnesium hydrate; brucite (CAS RN: 1317-43-7); milk of magnesia; antacid	1309-42-8	5-<10
aluminium, massive forms	aluminum; aluminium rod; aluminium bar; aluminium sheet; aluminium pellet; aluminium alloy	7429-90-5.	<2.5

4. FIRST AID MEASURES**Description of first aid measures**

a) Eye contact	<p>If this product comes in contact with the eyes:</p> <ul style="list-style-type: none"> ▶ Wash out immediately with fresh running water. ▶ Ensure complete irrigation of the eye by keeping eyelids apart and away from eye and moving the eyelids by occasionally lifting the upper and lower lids. ▶ Seek medical attention without delay; if pain persists or recurs seek medical attention. ▶ Removal of contact lenses after an eye injury should only be undertaken by skilled personnel.
b) Skin contact	<p>If skin contact occurs:</p> <ul style="list-style-type: none"> ▶ Immediately remove all contaminated clothing, including footwear. ▶ Flush skin and hair with running water (and soap if available). ▶ Seek medical attention in event of irritation. <p>For thermal burns:</p> <ul style="list-style-type: none"> ▶ Decontaminate area around burn. ▶ Consider the use of cold packs and topical antibiotics. <p>For first-degree burns (affecting top layer of skin)</p> <ul style="list-style-type: none"> ▶ Hold burned skin under cool (not cold) running water or immerse in cool water until pain subsides. ▶ Use compresses if running water is not available. ▶ Cover with sterile non-adhesive bandage or clean cloth. ▶ Do NOT apply butter or ointments; this may cause infection. ▶ Give over-the counter pain relievers if pain increases or swelling, redness, fever occur. <p>For second-degree burns (affecting top two layers of skin)</p> <ul style="list-style-type: none"> ▶ Cool the burn by immerse in cold running water for 10-15 minutes. ▶ Use compresses if running water is not available. ▶ Do NOT apply ice as this may lower body temperature and cause further damage.

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	<ul style="list-style-type: none"> ‣ Do NOT break blisters or apply butter or ointments; this may cause infection. ‣ Protect burn by cover loosely with sterile, nonstick bandage and secure in place with gauze or tape. <p>To prevent shock: (unless the person has a head, neck, or leg injury, or it would cause discomfort):</p> <ul style="list-style-type: none"> ‣ Lay the person flat. ‣ Elevate feet about 12 inches. ‣ Elevate burn area above heart level, if possible. ‣ Cover the person with coat or blanket. ‣ Seek medical assistance. <p>For third-degree burns Seek immediate medical or emergency assistance.</p> <p>In the mean time:</p> <ul style="list-style-type: none"> ‣ Protect burn area cover loosely with sterile, nonstick bandage or, for large areas, a sheet or other material that will not leave lint in wound. ‣ Separate burned toes and fingers with dry, sterile dressings. ‣ Do not soak burn in water or apply ointments or butter; this may cause infection. ‣ To prevent shock see above. ‣ For an airway burn, do not place pillow under the person's head when the person is lying down. This can close the airway. ‣ Have a person with a facial burn sit up. ‣ Check pulse and breathing to monitor for shock until emergency help arrives.
c) Inhalation	<ul style="list-style-type: none"> ‣ If dust is inhaled, remove from contaminated area. ‣ Encourage patient to blow nose to ensure clear breathing passages. ‣ Ask patient to rinse mouth with water but to not drink water. ‣ Seek immediate medical attention.
d) Ingestion	<ul style="list-style-type: none"> ‣ Immediately give a glass of water. ‣ First aid is not generally required. If in doubt, contact a Poisons Information Centre or a doctor.

e) Indication of immediate medical attention and notes for physician

Treat symptomatically.

for copper intoxication:

- Unless extensive vomiting has occurred empty the stomach by lavage with water, milk, sodium bicarbonate solution or a 0.1% solution of potassium ferrocyanide (the resulting copper ferrocyanide is insoluble).
 - Administer egg white and other demulcents.
 - Maintain electrolyte and fluid balances.
 - Morphine or meperidine (Demerol) may be necessary for control of pain.
 - If symptoms persist or intensify (especially circulatory collapse or cerebral disturbances, try BAL intramuscularly or penicillamine in accordance with the supplier's recommendations.
 - Treat shock vigorously with blood transfusions and perhaps vasopressor amines.
 - If intravascular haemolysis becomes evident protect the kidneys by maintaining a diuresis with mannitol and perhaps by alkalinising the urine with sodium bicarbonate.
 - It is unlikely that methylene blue would be effective against the occasional methaemoglobinemia and it might exacerbate the subsequent haemolytic episode.
 - Institute measures for impending renal and hepatic failure.
- [GOSSELIN, SMITH & HODGE: Commercial Toxicology of Commercial Products]
- A role for activated charcoals or emesis is, as yet, unproven.
 - In severe poisoning CaNa₂EDTA has been proposed.
- [ELLENHORN & BARCELOUX: Medical Toxicology]
- In cases of nickel poisoning, dimercaptol delivered by deep intramuscular injection may be a suitable antidote. (Patients should not exhibit renal or hepatic dysfunction.) The use of diethyldithiocarbamate is the subject of ongoing research.
 - Irritant contact dermatoses or eczemas may respond to applications of weak antiseptic packs, antibiotic ointments (tetracycline or erythromycin) or inert pastes and ointments. Systemic antibiotics are advisable in the presence of lymphangitis or lymphadenitis.

Both dermal and oral toxicity of manganese salts is low because of limited solubility of manganese. No known permanent pulmonary sequelae develop after acute manganese exposure. Treatment is supportive.

[Ellenhorn and Barceloux: Medical Toxicology]

In clinical trials with miners exposed to manganese-containing dusts, L-dopa relieved extrapyramidal symptoms of both hypo kinetic and dystonic patients. For short periods of time symptoms could also be controlled with scopolamine and amphetamine. BAL and calcium EDTA prove ineffective.

[Gosselin et al: Clinical Toxicology of Commercial Products.]

5. FIRE-FIGHTING MEASURES

a) Suitable (and unsuitable) extinguishing media

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

b) Specific hazards arising from the chemical (e.g. nature of any hazardous combustion products)

Fire Incompatibility	‣ Avoid contamination with oxidising agents i.e. nitrates, oxidising acids, chlorine bleaches, pool chlorine etc. as ignition may
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c) Special protective equipment and precautions for fire-fighters

Fire Fighting	<ul style="list-style-type: none"> ▶ When silica dust is dispersed in air, firefighters should wear inhalation protection as hazardous substances from the fire may be adsorbed on the silica particles. ▶ When heated to extreme temperatures, (>1700 deg.C) amorphous silica can fuse. ▶ Alert Fire Brigade and tell them location and nature of hazard. ▶ Wear breathing apparatus plus protective gloves in the event of a fire.
Fire/Explosion Hazard	<ul style="list-style-type: none"> ▶ Non combustible. ▶ Not considered a significant fire risk, however containers may burn. <p>Decomposes on heating and produces: carbon monoxide (CO) carbon dioxide (CO₂) hydrogen fluoride silicon dioxide (SiO₂) metal oxides other pyrolysis products typical of burning organic material.</p> <p>When aluminium oxide dust is dispersed in air, firefighters should wear protection against inhalation of dust particles, which can also contain hazardous substances from the fire absorbed on the alumina particles. May emit poisonous fumes. May emit corrosive fumes.</p>

6. ACCIDENTAL RELEASE MEASURES

a) Personal precautions, protective equipment and emergency procedures

See section 8

b) Environmental precautions and protective procedures

See section 12

c) Methods and materials for containment and cleaning up

Minor Spills	<ul style="list-style-type: none"> ▶ Clean up all spills immediately. ▶ Avoid breathing dust and contact with skin and eyes.
Major Spills	<p>Moderate hazard.</p> <ul style="list-style-type: none"> ▶ CAUTION: Advise personnel in area.

7. HANDLING AND STORAGE

a) Precautions for safe handling

Safe handling	<p>Polyalpaolefin (PAO) dimers require bonding and grounding to prevent static hazards which could cause a fire</p> <ul style="list-style-type: none"> ▶ Electrostatic discharge may be generated during pumping - this may result in fire. ▶ Ensure electrical continuity by bonding and grounding (earthing) all equipment. ▶ Avoid all personal contact, including inhalation. ▶ Wear protective clothing when risk of exposure occurs. ▶ Organic powders when finely divided over a range of concentrations regardless of particulate size or shape and suspended in air or some other oxidizing medium may form explosive dust-air mixtures and result in a fire or dust explosion (including secondary explosions) ▶ Minimise airborne dust and eliminate all ignition sources. Keep away from heat, hot surfaces, sparks, and flame.
Other information	<ul style="list-style-type: none"> ▶ Store in original containers. ▶ Keep containers securely sealed.

b) Conditions for safe storage (including any incompatibilities)

Suitable container	<ul style="list-style-type: none"> ▶ Polyethylene or polypropylene container. ▶ Check all containers are clearly labelled and free from leaks.
Storage incompatibility	<p>Inorganic derivative of Group 11 metal. For aluminas (aluminium oxide): Incompatible with hot chlorinated rubber. In the presence of chlorine trifluoride may react violently and ignite. For frits:</p> <ul style="list-style-type: none"> ▶ Avoid storage with hydrogen fluoride/ hydrofluoric acid, oxygen difluoride, manganese trifluoride, fluorine and other fluorine containing compounds, manganese trioxide, chlorates, chlorine trifluoride, chlorine trioxide, strong alkalis, metal oxides, concentrated orthophosphoric acid or vinyl acetate. <p>Polypropylene is liable to chain degradation from exposure to UV radiation such as that present in sunlight. Oxidation usually occurs at the secondary carbon atom present in every repeat unit. The substance may be or contains a "metalloid"</p>

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The following elements are considered to be metalloids; boron, silicon, germanium, arsenic, antimony, tellurium and (possibly) polonium
The electronegativities and ionisation energies of the metalloids are between those of the metals and nonmetals, so the metalloids exhibit characteristics of both classes. The reactivity of the metalloids depends on the element with which they are reacting.

Silicas:

- ▶ react with hydrofluoric acid to produce silicon tetrafluoride gas
- ▶ react with xenon hexafluoride to produce explosive xenon trioxide
- ▶ reacts exothermically with oxygen difluoride, and explosively with chlorine trifluoride (these halogenated materials are not commonplace industrial materials) and other fluorine-containing compounds
- ▶ may react with fluorine, chlorates
- ▶ are incompatible with strong oxidisers, manganese trioxide, chlorine trioxide, strong alkalis, metal oxides, concentrated orthophosphoric acid, vinyl acetate
- ▶ may react vigorously when heated with alkali carbonates.
- ▶ Avoid strong acids, bases.
- ▶ Avoid reaction with oxidising agents

Specific end use(s)

See section 1.2

8. EXPOSURE CONTROLS & PERSONAL PROTECTION

a) Control parameters (e.g. occupational exposure limit values, biological limit values):

OCCUPATIONAL EXPOSURE LIMITS (OEL)

INGREDIENT DATA

Source	Ingredient	Material name	TWA	STEL	Peak	Notes
Korea (South) Occupational Exposure Standards (Korean)	glass, oxide	광물털 섬유	10 mg/m3	Not Available	Not Available	발암성 2, (알칼리 산화물 및 알칼리토금속 산화물의 총량비가 18% 이상인 불특정 모양의 인공유리규산 섬유에 한정함)
Korea (South) Occupational Exposure Standards for Carcinogenic Substances (Korean)	glass, oxide	광물털 섬유	10 mg/m3	Not Available	Not Available	Not Available
Korea (South) Occupational Exposure Standards (Korean)	silica amorphous	규조토	10 mg/m3	Not Available	Not Available	Not Available
Korea (South) Occupational Exposure Standards (Korean)	silica amorphous	산화규소 (비결정체 규조토)	10 mg/m3	Not Available	Not Available	Not Available
Korea (South) Occupational Exposure Standards (Korean)	silica amorphous	산화규소 (비결정체 침전된 규소)	10 mg/m3	Not Available	Not Available	Not Available
Korea (South) Occupational Exposure Standards (Korean)	silica amorphous	산화규소(비결정체 실리카겔)	10 mg/m3	Not Available	Not Available	Not Available
Korea (South) Occupational Exposure Standards (Korean)	silica amorphous	산화규소 (비결정체 규소, 용융된)	0.1 mg/m3	Not Available	Not Available	호흡성
Korea (South) Occupational Exposure Standards (Respirable microdust / Total dust) (Korean)	silica amorphous	산화규소 (비결정체 규소, 용융된)	0.1 mg/m3	Not Available	Not Available	Not Available
Korea (South) Occupational Exposure Standards (Korean)	C.I. Pigment Black 26	망간 및 무기 화합물	1 mg/m3	Not Available	Not Available	Not Available
Korea (South) Occupational Exposure Standards (Korean)	aluminium, massive forms	알루미늄(용접흄)	5 mg/m3	Not Available	Not Available	Not Available
Korea (South) Occupational Exposure Standards (Korean)	aluminium, massive forms	알루미늄(금속분진)	10 mg/m3	Not Available	Not Available	Not Available
Korea (South) Occupational Exposure Standards (Korean)	aluminium, massive forms	알루미늄(피로파우더)	5 mg/m3	Not Available	Not Available	Not Available

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EMERGENCY LIMITS


Ingredient	Material name	TEEL-1	TEEL-2	TEEL-3
glass, oxide	Fibrous glass; (Fiber glass; Glass frit; Synthetic vitreous fibers)	15 mg/m3	170 mg/m3	990 mg/m3
silica amorphous	Silica gel, amorphous synthetic	18 mg/m3	200 mg/m3	1,200 mg/m3
silica amorphous	Silica, amorphous fumed	18 mg/m3	100 mg/m3	630 mg/m3
silica amorphous	Siloxanes and silicones, dimethyl, reaction products with silica; (Hydrophobic silicon dioxide, amorphous)	120 mg/m3	1,300 mg/m3	7,900 mg/m3
silica amorphous	Silica, amorphous fume	45 mg/m3	500 mg/m3	3,000 mg/m3
silica amorphous	Silica amorphous hydrated	18 mg/m3	740 mg/m3	4,500 mg/m3
polyethylene	Polyethylene	16 mg/m3	170 mg/m3	1,000 mg/m3
magnesium hydroxide	Magnesium hydroxide	26 mg/m3	280 mg/m3	1,700 mg/m3

Ingredient	Original IDLH	Revised IDLH
glass, oxide	Not Available	Not Available
silica gel, trimethylsilated	Not Available	Not Available
silica amorphous	3,000 mg/m3	Not Available
polyethylene	Not Available	Not Available
C.I. Pigment Black 26	500 mg/m3	Not Available
magnesium hydroxide	Not Available	Not Available
aluminium, massive forms	Not Available	Not Available

OCCUPATIONAL EXPOSURE BANDING

Ingredient	Occupational Exposure Band Rating	Occupational Exposure Band Limit
magnesium hydroxide	E	≤ 0.01 mg/m ³
Notes:	<i>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.</i>	

Exposure controls

b) Appropriate 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.
Personal protection	
Eye and face protection	<ul style="list-style-type: none"> ▶ Safety glasses with side shields. ▶ Chemical goggles.
Skin protection	See Hand protection below
Hands/feet protection	<p>NOTE:</p> <ul style="list-style-type: none"> ▶ The material may produce skin sensitisation in predisposed individuals. Care must be taken, when removing gloves and other protective equipment, to avoid all possible skin contact. <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>Experience indicates that the following polymers are suitable as glove materials for protection against undissolved, dry solids, where abrasive particles are not present.</p> <ul style="list-style-type: none"> ▶ polychloroprene.
Body protection	See Other protection below
Other protection	<ul style="list-style-type: none"> ▶ Overalls. ▶ P.V.C.

Respiratory protection

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

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

Environmental exposure controls

See section 12

9. PHYSICAL AND CHEMICAL PROPERTIES

Information on basic physical and chemical properties

a) Appearance (physical state, color etc)	Gray solid.		
Physical state	Manufactured	n) Relative density	160-240
b) Odour	Not Available	o) Partition coefficient: n-octanol/water	Not Available
c) Odour threshold	Not Available	p) Auto-ignition temperature	Not Applicable
d) pH	Not Applicable	q) Decomposition temperature	Not Available
e) Melting point/freezing point	Not Available	r) Viscosity	Not Applicable
f) Initial boiling point and boiling range:	Not Available	s) Molecular mass	Not Applicable
g) Flash point	Not Applicable	Taste	Not Available
h) Evaporation rate	Not Applicable	Explosive properties	Not Available
i) Flammability (solid, gas)	Not Applicable	Oxidising properties	Not Available
j) Upper flammability or explosive limits	Not Applicable	Surface Tension (dyn/cm or mN/m)	Not Applicable
j) Lower flammability or explosive limits	Not Applicable	Volatile Component (%vol)	Not Available
k) Vapor pressure	Not Applicable	Gas group	Not Available
l) Solubility	Not Available	pH as a solution (1%)	Not Applicable
m) Vapor density	Not Applicable	VOC g/L	Not Available

10. STABILITY AND REACTIVITY

Reactivity	See section 7
a) Chemical stability and possibility of hazardous reactions	<ul style="list-style-type: none"> ▶ Unstable in the presence of incompatible materials. ▶ Product is considered stable.
Possibility of hazardous reactions	See section 7
b) Conditions to avoid (e.g. static discharge, shock or vibration, etc)	See section 7
c) Incompatible materials	See section 7
d) Hazardous decomposition products	See section 5

11. TOXICOLOGICAL INFORMATION

a) Information on the likely routes of exposure

Continued...

Inhaled	<p>The material is not thought to produce adverse health effects or irritation of the respiratory tract (as classified by EC Directives using animal models). Nevertheless, good hygiene practice requires that exposure be kept to a minimum and that suitable control measures be used in an occupational setting.</p> <p>Not normally a hazard due to non-volatile nature of product</p> <p>Cobalt poisoning can cause inflammation of the terminal airways (bronchioles), and cause lethargy and death within hours. Manganese fume is toxic and produces nervous system effects characterised by tiredness. Acute poisoning is rare although acute inflammation of the lungs may occur.</p> <p>Copper poisoning following exposure to copper dusts and fume may result in headache, cold sweat and weak pulse. Capillary, kidney, liver and brain damage are the longer term manifestations of such poisoning.</p>
Ingestion	<p>Magnesium salts are generally absorbed so slowly that swallowing these cause few toxic effects, with purging being the most significant. If it cannot be removed (for example in bowel obstruction or paralysis), it may irritate the gut lining and be absorbed into the body.</p> <p>The material has NOT been classified by EC Directives or other classification systems as "harmful by ingestion". This is because of the lack of corroborating animal or human evidence.</p> <p>Not normally a hazard due to the physical form of product. The material is a physical irritant to the gastro-intestinal tract</p> <p>In toxic doses soluble cobalt salts produce stomach pain and vomiting, flushing of the face and ears, rash, ringing in the ears, nervous deafness and reduced blood flow to the extremities.</p> <p>A metallic taste, nausea, vomiting and burning feeling in the upper stomach region occur after ingestion of copper and its derivatives. The vomitus is usually green/blue and discolours contaminated skin.</p> <p>Poisonings rarely occur after oral administration of manganese salts because they are poorly absorbed from the gut.</p>
Skin Contact	<p>Skin contact is not thought to have harmful health effects (as classified under EC Directives); the material may still produce health damage following entry through wounds, lesions or abrasions.</p> <p>There is some evidence to suggest that this material can cause inflammation of the skin on contact in some persons.</p> <p>Though considered non-harmful, slight irritation may result from contact because of the abrasive nature of the aluminium oxide particles. Thus it may cause itching and skin reaction and inflammation.</p> <p>Open cuts, abraded or irritated skin should not be exposed to this material</p> <p>Exposure to copper, by skin, has come from its use in pigments, ointments, ornaments, jewellery, dental amalgams and IUDs (intra-uterine devices), and in killing fungi and algae. Although copper is used in the treatment of water in swimming pools and reservoirs, there are no reports of toxicity from these applications.</p> <p>Entry into the blood-stream, through, 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.</p>
Eye	<p>There is some evidence to suggest that this material can cause eye irritation and damage in some persons.</p> <p>Copper salts, in contact with the eye, may produce inflammation of the conjunctiva, or even ulceration and cloudiness of the cornea.</p>
Chronic	<p>Repeated or long-term occupational exposure is likely to produce cumulative health effects involving organs or biochemical systems.</p> <p>Harmful: danger of serious damage to health by prolonged exposure through inhalation, in contact with skin and if swallowed. This material can cause serious damage if one is exposed to it for long periods. It can be assumed that it contains a substance which can produce severe defects.</p> <p>There is limited evidence that, skin contact with this product is more likely to cause a sensitisation reaction in some persons compared to the general population.</p> <p>Amorphous silicas generally are less hazardous than crystalline silicas, but the former can be converted to the latter on heating and subsequent cooling. Inhalation of dusts containing crystalline silicas may lead to silicosis, a disabling lung disease that may take years to develop.</p> <p>Animal testing shows long term exposure to aluminium oxides may cause lung disease and cancer, depending on the size of the particle. The smaller the size, the greater the tendencies of causing harm.</p> <p>Inhalation of cobalt powder can induce asthma, chest tightness and chronic inflammation of the bronchi. Chronic exposure to cobalt causes increase in blood haemoglobin, increased production of cells in the blood marrow and thyroid gland, discharge from around the heart and damage to the alpha cells of the pancreas.</p> <p>In a case of chronic abuse of magnesium citrate, symptoms seen included tiredness and severe low blood pressure which did not respond to treatment. Blood tests revealed extremely high levels of magnesium, and the patient was found to have a perforated ulcer of the duodenum.</p> <p>Prolonged use of magnesium hydroxide may result in stone in the stools and kidney failure. Long-term use of high amounts also results in depletion of body phosphorus stores, causing low phosphate in the blood and urine, increased absorption of calcium in the bone and debility with anorexia, weakness, bone pain, and malaise.</p> <p>Nickel causes a skin sensitisation which may produce a chronic eczema. At first an itch appears followed one week later by a red skin eruption with ulcers which discharge and become crusted.</p> <p>Soluble silicates do not exhibit sensitizing potential. Testing in bacterial and animal experiments have not shown any evidence of them causing mutations or birth defects.</p> <p>For copper and its compounds (typically copper chloride):</p> <p>Acute toxicity: There are no reliable acute oral toxicity results available. Animal testing shows that skin in exposure to copper may lead to hardness of the skin, scar formation, exudation and reddish changes.</p> <p>Manganese is an essential trace element. Chronic exposure to low levels of manganese can include a mask-like facial expression, spastic gait, tremors, slurred speech, disordered muscle tone, fatigue, anorexia, loss of strength and energy, apathy and poor concentration.</p> <p>There has been concern that this material can cause cancer or mutations, but there is not enough data to make an assessment. Overexposure to the breathable dust may cause coughing, wheezing, difficulty in breathing and impaired lung function. Chronic symptoms may include decreased vital lung capacity and chest infections.</p>

ArmaGel DT

ArmaGel DT	TOXICITY	IRRITATION
	Not Available	Not Available
glass, oxide	TOXICITY	IRRITATION
	Oral (rat) LD50: >2000 mg/kg ^[1]	Not Available
silica gel, trimethylsilated	TOXICITY	IRRITATION
	Dermal (rabbit) LD50: >5000 mg/kg ^[2]	Eye (rabbit): non-irritating *
	Inhalation (rat) LC50: >0.139 mg/l/14h**[Grace] ^[2]	Skin (rabbit): non-irritating *
	Oral (rat) LD50: 3160 mg/kg ^[2]	
silica amorphous	TOXICITY	IRRITATION
	Dermal (rabbit) LD50: >5000 mg/kg ^[2]	Eye (rabbit): non-irritating *
	Inhalation (rat) LC50: >0.139 mg/l/14h**[Grace] ^[2]	Eye: no adverse effect observed (not irritating) ^[1]
	Oral (rat) LD50: 3160 mg/kg ^[2]	Skin (rabbit): non-irritating *
		Skin: no adverse effect observed (not irritating) ^[1]
polyethylene	TOXICITY	IRRITATION
	Dermal (rabbit) LD50: >2000 mg/kg ^[2]	Not Available
	Inhalation (mouse) LC50: 1.5 mg/l/30m ^[2]	
	Oral (rat) LD50: >3000 mg/kg ^[2]	
C.I. Pigment Black 26	TOXICITY	IRRITATION
	Not Available	Not Available
magnesium hydroxide	TOXICITY	IRRITATION
	Oral (rat) LD50: >2000 mg/kg ^[1]	Not Available
aluminium, massive forms	TOXICITY	IRRITATION
	Oral (rat) LD50: >2000 mg/kg ^[1]	Eye: no adverse effect observed (not irritating) ^[1]
		Skin: no adverse effect observed (not irritating) ^[1]
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	

GLASS, OXIDE	A similar spherical glass powder was nontoxic to rats at 5,000 mg/kg. All animals survived, gained weight and appeared active and healthy. There are no known reports of subchronic toxicity of nonfibrous glass. There are no known reports of carcinogenicity of nonfibrous glass. When tested for primary irritation potential, a similar material caused minimal irritation to eyes and was non-irritating to skin. Dust in excess of recommended exposure limits may result in irritation to the respiratory tract
SILICA GEL, TRIMETHYLSILATED	all Toxicity data for silica amorphous
POLYETHYLENE	polyethylene pyrolyzate For poly-alpha-olefins (PAOs): PAOs are highly branched, isoparaffinic chemicals produced by oligomerisation of 1-octene, 1-decene and/or 1-dodecene. The crude polyalphaolefin mixture is then distilled into appropriate product fractions to meet specific viscosity specifications and hydrogenated. Inclusion of polyethylene in the diet of rats at 8 g/kg/day did not result in treatment-related effects. Polyethylene implanted into rats and mice has reportedly caused local tumorigenic activity at doses of 33 to 2120 mg/kg, but the relevance to human exposure is not certain.
MAGNESIUM HYDROXIDE	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.
ALUMINIUM, MASSIVE FORMS	for copper and its compounds (typically copper chloride): Acute toxicity: There are no reliable acute oral toxicity results available. In an acute dermal toxicity study (OECD TG 402), one group of 5 male rats and 5 groups of 5 female rats received doses of 1000, 1500 and 2000 mg/kg bw via dermal application for 24 hours.
GLASS, OXIDE & C.I. PIGMENT BLACK 26 & MAGNESIUM HYDROXIDE & ALUMINIUM, MASSIVE	No significant acute toxicological data identified in literature search.

FORMS	
SILICA GEL, TRIMETHYLSILATED & SILICA AMORPHOUS	For silica amorphous: Derived No Adverse Effects Level (NOAEL) in the range of 1000 mg/kg/d. In humans, synthetic amorphous silica (SAS) is essentially non-toxic by mouth, skin or eyes, and by inhalation. Epidemiology studies show little evidence of adverse health effects due to SAS. Reports indicate high/prolonged exposures to amorphous silicas induced lung fibrosis in experimental animals; in some experiments these effects were reversible. [PATTYS]
SILICA AMORPHOUS & POLYETHYLENE	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.

b) Health hazards information

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

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

12. ECOLOGICAL INFORMATION

a) Aquatic and terrestrial ecotoxicity

	ENDPOINT	TEST DURATION (HR)	SPECIES	VALUE	SOURCE
ArmaGel DT	Not Available	Not Available	Not Available	Not Available	Not Available
glass, oxide	LC50	96	Fish	>1-mg/L	2
	EC50	48	Crustacea	0.476mg/L	2
	EC50	96	Algae or other aquatic plants	0.002-0.655mg/L	2
	NOEC	240	Algae or other aquatic plants	0.001-mg/L	2
silica gel, trimethylsilated	Not Available	Not Available	Not Available	Not Available	Not Available
	ENDPOINT	TEST DURATION (HR)	SPECIES	VALUE	SOURCE
silica amorphous	LC50	96	Fish	1-289.09mg/L	2
	EC50	48	Crustacea	ca.7600mg/L	1
	EC50	72	Algae or other aquatic plants	440mg/L	1
	NOEC	720	Crustacea	34.223mg/L	2
polyethylene	LC50	96	Fish	16.252mg/L	3
	EC50	96	Algae or other aquatic plants	61.666mg/L	3
C.I. Pigment Black 26	LC50	96	Fish	0.05mg/L	2
	EC50	48	Crustacea	5.11mg/L	2
	EC50	72	Algae or other aquatic plants	18mg/L	2
	NOEC	504	Fish	0.52mg/L	2
magnesium hydroxide	LC50	96	Fish	2-820mg/L	2
	EC50	48	Crustacea	343.56mg/L	2

Continued...

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	EC50	72	Algae or other aquatic plants	>100mg/L	2
aluminium, massive forms	ENDPOINT	TEST DURATION (HR)	SPECIES	VALUE	SOURCE
	LC50	96	Fish	0.001-0.134mg/L	2
	EC50	48	Crustacea	0.7364mg/L	2
	EC50	72	Algae or other aquatic plants	0.001-0.799mg/L	2
	BCF	360	Algae or other aquatic plants	9mg/L	4
	NOEC	168	Crustacea	0.001-mg/L	2
Legend:	Extracted from 1. IUCLID Toxicity Data 2. Europe ECHA Registered Substances - Ecotoxicological Information - Aquatic Toxicity 3. EPIWIN Suite V3.12 (QSAR) - Aquatic Toxicity Data (Estimated) 4. US EPA, Ecotox database - Aquatic Toxicity Data 5. ECETOC Aquatic Hazard Assessment Data 6. NITE (Japan) - Bioconcentration Data 7. METI (Japan) - Bioconcentration Data 8. Vendor Data				

For copper:

Atmospheric Fate - Copper is unlikely to accumulate in the atmosphere due to a short residence time for airborne copper aerosols. Airborne coppers, however, may be transported over large distances.

for magnesium compounds in general:

Fish LC50: 100-400 mg/l

Environmental Fate: Polyalphaolefins (PAOs) have low volatility potential to air and can be biodegraded to a greater extent, thus, PAOs are not expected to persist in the environment.

Effects on aquatic organisms: Toxicity tests conducted on a wide range of aquatic organisms show that PAOs are practically non-toxic up to the limits of its solubility.

When spilled this product may act as a typical oil, causing a film, sheen, emulsion or sludge at or beneath the surface of the body of water. The oil film on water surface may physically affect the aquatic organisms, due to the interruption of the oxygen transfer between the air and the water

Oils of any kind can cause:

- ▶ drowning of water-fowl due to lack of buoyancy, loss of insulating capacity of feathers, starvation and vulnerability to predators due to lack of mobility
- ▶ lethal effects on fish by coating gill surfaces, preventing respiration
- ▶ asphyxiation of benthic life forms when floating masses become engaged with surface debris and settle on the bottom and
- ▶ adverse aesthetic effects of fouled shoreline and beaches

In case of accidental releases on the soil, a fine film is formed on the soil, which prevents the plant respiration process and the soil particle saturation.

Drinking Water Standards: hydrocarbon total: 10 ug/l (UK max.).

For copper: Ecotoxicity - Significant effects are expected on various species of microalgae, some species of macroalgae, and a range of invertebrates, including crustaceans, gastropods and sea urchins. Copper is moderately toxic to crab and their larvae and is highly toxic to gastropods (mollusks, including oysters, mussels and clams).

For Copper: Typical foliar levels of copper are: Uncontaminated soils (0.3-250 mg/kg) ; Contaminated soils (150-450 mg/kg) ; Mining/smelting soils (6.1-25 mg/kg80 mg/kg300 mg/kg).

Terrestrial Fate: Plants - Generally, vegetation reflects soil copper levels in its foliage.

For Organic Pigments:

Environmental Fate: Organic pigments are highly persistent in natural environments.

Atmospheric Fate: The chemical processes underlying breakdown of organic pigments through light or atmospheric conditions are difficult to clarify.

For Lead:

Environmental Fate: Lead is assessed as low hazard if it remains in its solid, massive, metallic form. Lead, in the form of alkyls, has been introduced to the environment primarily from leaded gasoline/petrol.

Microbial methylation plays important roles in the biogeochemical cycling of the metalloids and possibly in their detoxification. Many microorganisms (bacteria, fungi, and yeasts) and animals are now known to biomethylate arsenic, forming both volatile (e.g., methylarsines) and nonvolatile (e.g., methylarsonic acid and dimethylarsinic acid) compounds.

For Manganese and its Compounds:

Environmental Fate: Manganese is a naturally occurring element in the environment occurring as a result of weathering of geological material. It also occurs from its use in steel manufacture/ coal mining.

For Cobalt Compounds:

Environmental Fate: The sources of cobalt in the atmosphere are both natural and man-made. The primary man-made sources of cobalt are the burning of fossil fuels, phosphate fertilizers, mining/smelting/processing of cobalt containing ores, etc.

For Nickel: Transport and distribution of nickel particulates between different environmental compartments, is strongly influenced by particle size. Fine particulate matter has a longer residence time in the environment and is carried a long distance from its source; larger particles are deposited near the emission source.

For Amorphous Silica: Amorphous silica is chemically and biologically inert. It is not biodegradable.

For Silica:

Environmental Fate: Most documentation on the fate of silica in the environment concerns dissolved silica, in the aquatic environment, regardless of origin, (man-made or natural), or structure, (crystalline or amorphous).

Terrestrial Fate: Silicon makes up 25.7% of the Earth's crust, by weight, and is the second most abundant element, being exceeded only by oxygen.

DO NOT discharge into sewer or waterways.

b) Persistence and degradability

Ingredient	Persistence: Water/Soil	Persistence: Air
silica amorphous	LOW	LOW
polyethylene	LOW	LOW

Continued...

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c) Bioaccumulative potential

Ingredient	Bioaccumulation
silica amorphous	LOW (LogKOW = 0.5294)
polyethylene	LOW (LogKOW = 1.2658)

d) Mobility in soil

Ingredient	Mobility
silica amorphous	LOW (KOC = 23.74)
polyethylene	LOW (KOC = 14.3)

e) Other adverse effects

No data available

13. DISPOSAL CONSIDERATIONS

a) Disposal method

b) Disposal precaution (including the disposal method of contaminated container and packaging)	<ul style="list-style-type: none"> ▶ DO NOT allow wash water from cleaning or process equipment to enter drains. ▶ It may be necessary to collect all wash water for treatment before disposal.
Other disposal recommendations	

14. TRANSPORT INFORMATION

Labels Required

Marine Pollutant	NO
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Land transport (UN): NOT REGULATED FOR TRANSPORT OF DANGEROUS GOODS

a) UN number	Not Applicable				
b) UN proper shipping name	Not Applicable				
c) Transport hazard class	<table border="0"> <tr> <td>Class</td> <td>Not Applicable</td> </tr> <tr> <td>Subrisk</td> <td>Not Applicable</td> </tr> </table>	Class	Not Applicable	Subrisk	Not Applicable
Class	Not Applicable				
Subrisk	Not Applicable				
d) Packing group	Not Applicable				
Environmental hazard	Not Applicable				
f) Special precaution which a user to be aware of or needs to comply with in connection with transport or conveyance either within or outside their premises	<table border="0"> <tr> <td>Special provisions</td> <td>Not Applicable</td> </tr> <tr> <td>Limited quantity</td> <td>Not Applicable</td> </tr> </table>	Special provisions	Not Applicable	Limited quantity	Not Applicable
Special provisions	Not Applicable				
Limited quantity	Not Applicable				

Air transport (ICAO-IATA / DGR): NOT REGULATED FOR TRANSPORT OF DANGEROUS GOODS

a) UN number	Not Applicable						
b) UN proper shipping name	Not Applicable						
c) Transport hazard class	<table border="0"> <tr> <td>ICAO/IATA Class</td> <td>Not Applicable</td> </tr> <tr> <td>ICAO / IATA Subrisk</td> <td>Not Applicable</td> </tr> <tr> <td>ERG Code</td> <td>Not Applicable</td> </tr> </table>	ICAO/IATA Class	Not Applicable	ICAO / IATA Subrisk	Not Applicable	ERG Code	Not Applicable
ICAO/IATA Class	Not Applicable						
ICAO / IATA Subrisk	Not Applicable						
ERG Code	Not Applicable						
d) Packing group	Not Applicable						
Environmental hazard	Not Applicable						

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f) Special precaution which a user to be aware of or needs to comply with in connection with transport or conveyance either within or outside their premises	Special provisions	Not Applicable
	Cargo Only Packing Instructions	Not Applicable
	Cargo Only Maximum Qty / Pack	Not Applicable
	Passenger and Cargo Packing Instructions	Not Applicable
	Passenger and Cargo Maximum Qty / Pack	Not Applicable
	Passenger and Cargo Limited Quantity Packing Instructions	Not Applicable
	Passenger and Cargo Limited Maximum Qty / Pack	Not Applicable

Sea transport (IMDG-Code / GGVSee): NOT REGULATED FOR TRANSPORT OF DANGEROUS GOODS

a) UN number	Not Applicable
b) UN proper shipping name	Not Applicable
c) Transport hazard class	IMDG Class : Not Applicable
	IMDG Subrisk : Not Applicable
d) Packing group	Not Applicable
Environmental hazard	Not Applicable
f) Special precaution which a user to be aware of or needs to comply with in connection with transport or conveyance either within or outside their premises	EMS Number : Not Applicable
	Special provisions : Not Applicable
	Limited Quantities : Not Applicable

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

Not Applicable

15. REGULATORY INFORMATION

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

a) Industrial Safety and Health Act:	Not Applicable
b) Chemicals Control Act:	Not Applicable
c) Dangerous Material Safety Control Act:	Not Applicable
d) Wastes Management Act:	Not Available
e) Other requirements in domestic and other countries	see below

GLASS, OXIDE IS FOUND ON THE FOLLOWING REGULATORY LISTS

Korea (South) Carcinogenic Substances
Korea (South) Existing Chemicals List (KECL)

Korea (South) Occupational Exposure Standards (Korean)
Korea (South) Occupational Exposure Standards for Carcinogenic Substances (Korean)

SILICA GEL, TRIMETHYLSILATED IS FOUND ON THE FOLLOWING REGULATORY LISTS

Not Applicable

SILICA AMORPHOUS IS FOUND ON THE FOLLOWING REGULATORY LISTS

International Agency for Research on Cancer (IARC) - Agents Classified by the IARC Monographs
International WHO List of Proposed Occupational Exposure Limit (OEL) Values for Manufactured Nanomaterials (MNMS)
Korea (South) Existing Chemicals List (KECL)
Korea (South) GHS

Korea (South) Occupational Exposure Standards (Korean)
Korea (South) Occupational Exposure Standards (Respirable microdust / Total dust) (Korean)
Korea (South) Toxic Chemicals Control Act - Chemicals not Relevant to Toxic

POLYETHYLENE IS FOUND ON THE FOLLOWING REGULATORY LISTS

ArmaGel DT

International Agency for Research on Cancer (IARC) - Agents Classified by the IARC Monographs

Korea (South) Existing Chemicals List (KECL)

C.I. PIGMENT BLACK 26 IS FOUND ON THE FOLLOWING REGULATORY LISTS

Korea (South) Existing Chemicals List (KECL)
Korea (South) GHS

Korea (South) Occupational Exposure Standards (Korean)

MAGNESIUM HYDROXIDE IS FOUND ON THE FOLLOWING REGULATORY LISTS

Korea (South) Existing Chemicals List (KECL)

ALUMINIUM, MASSIVE FORMS IS FOUND ON THE FOLLOWING REGULATORY LISTS

Korea (South) Existing Chemicals List (KECL)

Korea (South) Occupational Exposure Standards (Korean)

National Inventory Status

National Inventory	Status
Australia - AICS	No (silica gel, trimethylsilated)
Canada - DSL	No (silica gel, trimethylsilated)
Canada - NDSL	No (glass, oxide; silica gel, trimethylsilated; polyethylene; C.I. Pigment Black 26; magnesium hydroxide; aluminium, massive forms)
China - IECSC	No (silica gel, trimethylsilated)
Europe - EINEC / ELINCS / NLP	No (silica gel, trimethylsilated; polyethylene)
Japan - ENCS	No (glass, oxide; silica gel, trimethylsilated; C.I. Pigment Black 26; aluminium, massive forms)
Korea - KECL	No (silica gel, trimethylsilated)
New Zealand - NZIoC	No (silica gel, trimethylsilated)
Philippines - PICCS	No (silica gel, trimethylsilated)
USA - TSCA	No (silica gel, trimethylsilated)
Taiwan - TCSI	Yes
Mexico - INSQ	No (silica gel, trimethylsilated)
Vietnam - NCI	No (silica gel, trimethylsilated)
Russia - ARIPS	No (silica gel, trimethylsilated; C.I. Pigment Black 26)
Legend:	Yes = All CAS declared ingredients are on the inventory No = One or more of the CAS listed ingredients are not on the inventory and are not exempt from listing (see specific ingredients in brackets)

16. OTHER INFORMATION

a) Information source and references	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.
b) Issuing date	03/04/2020
c) Revision number and date	2.1.1.1, 03/04/2020
d) Others	Not Available

SDS Version Summary

Version	Issue Date	Sections Updated
2.1.1.1	03/04/2020	Physical Properties

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