Title: # MATERIAL SAFETY DATA SHEET (MSDS)

CALCIUM CHLORIDE ANHYDROUS

Section 1: Chemical Product and Company Identification

Product Name: Calcium Chloride Anhydrous

Chemical Name: Calcium Chloride

Trade Name: Calcium Chloride Prills

Synonyms: Calcium Dichloride, Calcium Chloride Pellets,

Anhydrous Calcium Chloride, Calcium Chloride Mini-Prills

Chemical Formula: $CaCl_2$

Recommended Use and Restrictions on Use:

Recommended Use:

Crude Oil and Gas sector as fluid additive in drilling operation, Hydrocarbon dehydration, Ice melting as quick deicing agent, Refrigerant liquor, Concrete acceleration, Hardener in paper corrugated board industry, Brine for food processing, Purification/ Treatment of drinking water produced through deionization and sea brine reverse osmosis process and a host of other diversified applications including agriculture.

Restrictions on Use:

Not for Ingestion

Section 2 : Composition and Information on Ingredients

Substances:

Constituents	EC #	CAS #	Concentration w/w	Classification Regulation
Calcium Chloride	233-140-8	10043-52-4	94-97%	Category 2, H319
Sodium Chloride	231-598-3	7647-14-5	0 – 2 %	Not classified
Potassium Chloride	231-211-8	7447-40-7	0 – 3 %	Not classified
Calcium Bromide	232-164-6	7789-41-5	0 – 2.6 %	Not classified

Section 3: Hazards Identification

Classification of the Substance or Mixture

According to Regulation EC No. 1278/2008 (CLP):

Serious eye damage/eye irritation, Hazard category 2,; H 319: causes serious eye irritation

According to Directive 67/548/EEC:Xi;R36 irritating to eyes

Label Elements

According to the CLP Regulation:

GHS Hazard Pictogram:

GHS07: exclamation mark

Signal Word: Warning

Hazard Statement: H319 Causes serious eye irritation
P280 Wear protective gloves/protective clothing/eye protection/face protection

Precautionary Statements: P264 Wash hands thoroughly after handling
P305+P351+P338. If in Eyes: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. P337+P313. If eye irritation persists: Get medical advice.

Other Labels:

Content: Calcium Chloride94-99 %

Other Hazards: The product can cause minor skin irritation and dry skin.

Section 4 : First Aid Measures

Description of First Aid Measures:

Inhalation: Remove to fresh air, keep warm and rest. If symptoms persist; seek medical attention.

Skin Contact: Remove contaminated clothing. Wash off any skin contamination immediately with plenty of water. Launder clothes before re-use.

Eye Contact: Remove contact lenses if present. Rinse eyes thoroughly with wash solution or clean water for at least 10 minutes. Eyelids should be held away from the eyeball to ensure thorough rinsing. Seek medical attention.

Ingestion:	Do not induce vomiting. Wash out mouth with water and give plenty of water to drink (at least 300 ml). Obtain medical advice if symptoms persist.

Most Important Symptoms and Effects, both Acute and Delayed

Inhalation:	Inhalation of aerosols from the product could irritate the respiratory systems. For single exposure no irreversible effect is known.
Skin Contact:	Could cause moderate skin irritation. The product will not give delayed symptoms.
Eye Contact:	Could cause severe irritation of the eye. If the eye is not washed thoroughly, there is a risk of irreversible eye damage.
	Could cause irritation of oesophagus and the stomach. No delayed or irreversible symptoms are expected.

Indication of any Immediate Medical Attention and Special Treatment Needed

Do not induce vomiting. The product could be strengthened with the hydrogen chloride from the stomach and cause irritation on oesophagus or it might irritate the respiratory system. Wash out mouth with water and give plenty of water to drink (at least 300 ml) and observe the patient.

Section 5: Fire and Explosion Data

Flammable Properties:

The product is not combustible.

Extinguishing Media

a. Recommended Extinguishing Media:

Choose extinguishing media depending on surrounding fire e.g. Carbon dioxide, dry chemical powder or appropriate foam. Use water to keep non-leaking, fire exposed containers cool.

b. Not Recommended Extinguishing Media:

All extinguishing media are allowed; Select the appropriate extinguishing media depending on the surrounding fire.

Special Hazards Arising from the Substance or the Mixture:

No special hazards.

Advise for Fire Fighters:

Protective actions and/or special protective equipment depending on surrounding fire.

Section 6: Accidental Release Measures

Personal Precautions, Protective Equipment and Emergency Procedures

Keep irrelevant people out of accident region. Spilled material may cause a slipping hazard on some surfaces. To wear personal protective equipment (Section 8) to prevent any contamination of skin, eyes and personal clothing.

Environmental Precautions:

Prevent uncontrolled discharges into the environment (rivers, water courses, sewers etc.). See relevant exposure scenarios covering intended use of calcium chloride as de-icing and dust control product.

Methods and material for containment and cleaning up

Containment of a Spill:

In case of large release to a sensitive environment: embank with sand or other inert material and collect the material.

Cleaning up a Spill:

Clean up spills as soon as they occur. Collect as much as possible in a suitable clean container, preferably for re-use, otherwise for disposal.

Other Information Relating to Spills and Releases:

Wash the spillage area with large quantities of water. Do not wash out with water in a sensitive environment.

Reference to other Sections:

For waste measures, see Section 13.

Section 7: Handling and Storage

Precautions for Safe Handling:

Operate in a well-ventilated area. Atmospheric levels should be controlled in compliance with the exposure scenarios and occupational exposure limits. Avoid inhalation of dusts. Avoid contact with skin and eyes. Wash contaminated skin or clothes immediately after contact with the product. Report any skin problems that may develop. For personal protection equipment and ventilation control measures, see Section 8. Do not eat, drink or smoke when handling the product. Wash hands after finishing working with the product.

Conditions for Safe Storage, Including any Incompatibilities:

Store at a dry place, not above normal room temperature. Do not store with acids and/or strong oxidizing and/or reducing agents. Avoid excessive ventilation during storage as the product can absorb moisture from the air. No special exhaust ventilation required.

Specific End use (S)

No specific end uses. See the different exposure scenarios.

Section 8: Exposure Controls/Personal Protection

Control Parameters:

National Occupational Exposure Limit Values, EH40, 2005 with Updates

Dust (inhalable amount of any dust): Workplace Exposure Limit (WEL) 8h: 10 mg/m^3

Respirable Dust: Workplace Exposure Limit (WEL) 8h: 4 mg/m^3

Derived No Effect Level (DNEL):

Worker DNEL inhalation, long term 5 mg/m^3 (ES9)

Worker DNEL inhalation, short term 10 mg/m^3 (ES9)

Consumer, general population DNEL inhalation, long term 2.5 mg/m^3

Consumer, general population DNEL inhalation, short term 5 mg/ m^3

DNEL inhalation, long term systematic effects: no DNEL is derived. No long term effects are expected, also taking into account the recommended daily intake of 1000mg/kg bw $CaCl_2$.

DNEL dermal, acute only needs to be derived if an acute toxicity hazard (leading to classification and labelling) has been identified and peak exposures are likely to occur. The available data do not trigger classification for acute systematic dermal toxicity.

DNEL dermal, long term effects: no DNEL is derived.

Predicted No Effect Concentration (PNEC):

Deposition onto soil and plants*): NE_{dep} 150 g/m^2. If the product is used for de-icing or dust control, see ES7.

Sensitive terrestrial plants: 215 mg chloride/kg. If the product is used for de-icing or dust control, see ES7.

PNEC water/marine: because the calcium and chloride concentration varies between aquatic ecosystems (0.06-210 mg/L), it is not considered useful to derive a generic PNEC water or PNEC marine (neither added or intermittent values).

PNEC fresh water/marine sediment: no toxicity data on fresh water or marine sediment organisms are available. Calcium chloride is present in the environment as calcium and chloride ions, which implies that it will not adsorb on particulate matter. It is not considered useful to derive a PNEC fresh water or PNEC marine sediment.

PNEC terrestrial: no toxicity data on terrestrial organisms are available. Calcium chloride is present in the environment as calcium and chloride ions, which implies that it will not adsorb on particulate

matter. It is not considered useful to derive a PNEC terrestrial.

PNEC Sewage Treatment Plant (STP): No toxicity data on sewage treatment plant organisms are available. Because the calcium and chloride concentration varies between aquatic ecosystems, it is not considered useful to derive a generic PNEC STP or PNEC STP-added.

PNEC Oral: In view of the nutritional aspects, the metabolism and the mechanisms of action of calcium and chloride ions, it is not considered useful to derive a PNEC oral (secondary poisoning).

*) A tentative PNEC, a so-called "no-effect deposition" (NEdep) was derived for the exposure route for deposition of calcium chloride via road salts or dust suppressors. It should be noted that although the units refer to exposure via air, this value reflects effects caused by calcium chloride from air into soil or onto plants' surface.

Biological Limit Values: None

Recommended Surveillance Procedure:

Normally not necessary. If there is a suspicion that occupational exposure limits or DNEL for inhalation values could be surpassed, measurements of calcium chloride dust (total dust as worst case) could be done.

Exposure Controls

Technical Control Measures: Handling of calcium chloride in prills form normally does not demand any special exhaust ventilation.

Eye/face Protection: Use suitable eye protection if eye contact is likely. Most materials for protective goggles and face visors will probably be suitable, e.g. polycarbonate.

Skin Protection:

Hand Protection: Wear gloves (tested to EN 374) if hand contamination is likely. Suitable glove materials are neoprene (chloroprene) and nitrile rubber. Permeation time for the material > 0.5 mm is probably 8 hours. Non suitable materials are leather gloves (material decomposition) Wash off any skin contamination immediately. Contaminated gloves should be carefully rinsed with water before re-use.

Body Protection: Normal working clothes are suitable.

Respiratory Protection: If calcium chloride liquid is handled normally, there is no demand of any respiratory protection.

Section 9: Physical and Chemical Properties

All data in this section is for the anhydrous calcium chloride, unless otherwise specified.

Appearance:	Solid
Colour:	White
Odour:	Odourless
Odour Threshold:	Not applicable

pH:	7-11 (10% water solution)
Melting Point/ Freezing Point:	782 °C
Initial Boiling Point/Boiling Range:	> 1600 °C
Flash Point:	Not applicable
Evaporation Rate:	Not applicable
Flammability:	The substance is non-flammable
Upper/Lower Flammability	
or Explosive Limits:	Not applicable
Vapour Pressure:	0.1 Pa at 20 °C
Vapour Density:	Not applicable
Relative Density:	2.15 at 25 °C
	2.15 at 15 °C
Solubility:	745 g/l at 20 °C
	1524 g/l at 100 °C
Partition Coefficient	
n-Octanol/Water:	Not applicable, inorganic substance
Auto-Ignition Temperature:	Not applicable
Decomposition Temperature:	Not applicable
Viscosity:	Not applicable for a solid product
Explosive Properties:	The substance is non-explosive
Oxidizing Properties:	The substance is non-oxidizing

Section 10: Stability and Reactivity Data

Reactivity:	Calcium chloride can react with strong reducing or oxidizing agents.
Chemical Stability:	Calcium chloride is stable under recommended storage and handling conditions.
Possibility of Hazardous Reactions:	Calcium chloride can react violently with some strong reducing and oxidizing agents.
Conditions to Avoid:	Strong reducing and oxidizing agents.

Incompatible Materials: Calcium chloride can cause pitting of and corrosion of some grades of stainless steel. High temperature and stress conditions can promote stress corrosion cracking.

Hazardous Decomposition Products: None when used according to identified uses.

Section 11: Toxicological Information

Information on Toxicological Effects

Acute Toxicity:

The acute toxicity of calcium chloride is low. The combined oral LD50 value in the GLP-compliant study with rat was 2301 mg/kg bw (Toxicological Laboratories Limited, 1987). The dermal LD50 value in the study with rabbits was above 2000 mg/kg. No reliable animal data are available on the acute inhalation toxicity; however, in accordance with Column 2 of REACH Annex VIII, the study does not need to be conducted, as sufficient data are available on two other routes of exposure, oral and dermal. In the acute inhalation toxicity study with rats of limited reliability, signs of irritation of the respiratory tract were described at both exposure levels (40 and 160 mg/m3), suggesting that inhalation of calcium chloride can cause an irritation of the respiratory tract. As no deaths were observed, LC50 was established to exceed 160 mg/m3.

In addition, Vinnikov et al. (1962) reported treating tuberculosis patients with aerosol inhalations of 2 -5% aqueous calcium chloride. The number of inhalations varied from below 10 (24 patients), till over 30 (2 patients). Several patients reported irritation of mucos membranes of pharinx and throat and unpleasant sensation in mouth already after the first inhalations. However, the frequency of such cases was described as minor by the authors. Overall calcium chloride inhalations were said to have beneficiary effects on disease symptoms (improved quality of spatum, decreased amounts of spatum, improved ease of spatum expellance, decreased frequency of coughing). These data are considered to prove that calcium chloride is not acutely toxic by inhalation.

Skin Corrosion/irritation:

Calcium chloride was found to be not irritating to rabbit skin in the GLP-compliant study, performed according to OECD Guideline 404. No effects were noted in any of three rabbits at any observation time points (1, 24, 48 and 72 hours) following an application of the anhydrous substance under occlusive dressing for 4 hours. However, all long term exposure with water solution with mild irritants could give atopic dermatitis and skin irritations for sensitive individuals.

Serious Eye Damage/Irritation:

Eye irritation studies are available with anhydrous calcium chloride, calcium chloride dihydrate, calcium chloride hexahydrate and 33% aqueous solution, performed in accordance with OECD Guideline 405. In each study 100 mg of the material was instilled in an eye of three rabbits. No rinsing was performed. The results indicate that anhydrous calcium chloride is severely irritating to rabbit eyes. The cornea and conjunctiva were moderately to severely irritated in all rabbits from one hour till 14 days after treatment. Thereafter the eye of one rabbit recovered, but there was still a slight haze on the cornea, 21 days after treatment. In the two other rabbits the cornea and conjunctiva were still moderately irritated 21 days after treatment. The irritating properties of calcium chloride seem to diminish with a higher degree of hydratation: calcium chloride di- and tetrahydrates are irritating,

calcium chloride hexahydrate is moderately irritating.

Respiratory or Skin Sensitization:

Calcium chloride is not sensitizing to skin and respiratory tract. Calcium chloride is considered not to have any sensitising properties, based on the physiological role of both its constituent ions, as well as the fact that sensitising effects of both ions have never been reported, despite long term historical and wide dispersive use (e. g. via food and medication). In accordance with section 1`of REACH Annex XI, testing does not appear scientifically necessary.

Germ Cell Mutagenicity:

Based on the results of two bacterial mutation assays and an in vitro chromosome aberration test in Chinese hamster lung fibroblasts, calcium chloride is considered not to have a genotoxic potential. Calcium and chloride are normal constituents of the body.

Carcinogenicity:

Calcium chloride is not genotoxic in vivo. Calcium and chloride are both essential nutrients for humans and a daily intake of more than 1000 mg for each of the ions is recommended. Based on this information, it is concluded that the substance is not carcinogenic.

Reproductive Toxicity:

Effects on fertility: in accordance with section 1 of REACH Annex XI, testing does not appear scientifically necessary, as calcium chloride will usually not reach the foetus or the male and female reproductive organs when exposed orally, dermally or by inhalation, as it does not become available systemically.

Developmental toxicity: it can be stated that the substance will neither reach the foetus nor reach male and female reproductive organs (as it does not become systemically available), which shows that there is no risk for developmental toxicity and no risk for toxicity to reproduction. An oral developmental study was performed in 3 species (mouse, rat and rabbit). In all three species no maternal or teratogenic effects were noted, and NOAEL 's were above highest dose given.

Specific Target Organ Toxicity (STOT)-Single Exposure
Respiratory tract: Not irritating.

Specific Target Organ Toxicity (STOT)- Repeated Exposure
Respiratory tract: Not irritating.

Aspiration Hazard:

Experience of calcium chloride inhalation in humans. 65 tuberculosis patients (51 males, 14 females; age from below 30 till over 50) were treated with aerosol inhalations of 2 -5% aqueous calcium chloride. The number of inhalations varied from below 10 (24 patients), till over 30 (2patients). Several patients reported irritation of mucos membranes of pharinx and throat and unpleasant sensation in mouth already after the first inhalations. However, the frequency of such cases was described as minor by the authors. Overall calcium chloride inhalations were said to have beneficiary effects on disease symptoms (improved quality of spatum, decreased amounts of spatum, improved ease of spatum expellance, decreased frequency of coughing). These data are considered to prove that calcium chloride is not acutely toxic by inhalation.

Section 12: Ecological Information

Toxicity

Calcium chloride is not classified as hazardous for the environment. Calcium and chloride are normally occurring ions in the entire ecosystem and release to the environment is not to have any long term negative effects. High amounts of chloride ions however cause local disturbance and damage in a sensitive environment.

Aquatic Toxicity, Acute:

Fish (Pimephales promelas):	LC50 (96h): 4630 mg/L
	LC50 (48h): >6560 mg/L
	LC50 (24h): >6660 mg/L
	Method: other (EPA/600/4-90/027,EPA/600/6-91/003)
Crustaceans (Daphnia Magna):	LC50 (48h): 2400 mg/L based on: mobility (static OECD 202)
Algea (Pseudokirchneriella subcapitata):	EC50 (72h): 2900 mg/L based on: biomass
	EC50 (72h): >4000 mg/L based on: growth rate
	EC20 (72h): 1000 mg/L based on: biomass
	OECD Guideline 201 (Alga, Growth Inhibition Test)

Aquatic Toxicity, Long Term

Fish:	No reliable studies available. Calcium and chloride are normally occurring ions in the entire ecosystem.
Crustaceans (Daphnia Magna):	EC50 (21d): 610 mg/L based on: reproductive impairment EC16 (21d): 320 mg/L based on: reproductive impairment LC50 (21d): 920 mg/L based on: mortality
	Method: Not mentioned
Algea:	EC10/LC10 or NOEC for freshwater algae: 1000 mg/L

Terrestrial Organisms:

Calcium chloride is easily dissociated into calcium and chloride ions. Chloride ions will not absorb on particulate matter. The calcium ion may bind to soil particulate or may form stable inorganic salts with sulphate and carbonate ions, but calcium is naturally present in soil.

Plants:

Calcium is well known as an essential nutrient for higher plants and has important roles for cell wall formation, cell division and cell elongation. Chloride is an essential micronutrient for plants and has an important role in regulating osmotic pressure of cells (SIDS, 2002). Damage to roadside vegetation has

been reported and is attributed largely to the absorption of salt splashed foliage. Sugar maples (*Acer saccharum*) were exposed to runoff of sodium chloride and calcium chloride for 6 winters (total treatment of 11.2 tonnes /ha per treatment and 15 treatments per winter at weekly intervals, equaling 11.2 kg/m^2 in total and 1.87 kg/m^2 in one season). Leaves of these maple trees contained 3 to 6 times the chloride concentration compared to a control stand. Damage to the maples varied but could be correlated with the chloride concentration in the leaf. From two field experiments with spruce tree (*Picea*sp.) carried out for ten weeks during a winter season, and a total dose of 1.5 kg/m2NaCl, $CaCl_2$ or a 75/25 NaCl/CaC_{l2} mixture, it was found that in the presence of calcium chloride the uptake of Cl-in the root was inhibited. Thus effects of calcium chloride are present but it depends on the amount of accumulated chloride.

Micro-Organisms Living Waste Water Treatment Plants:

No studies available. Calcium plays a crucial role in strengthening cell walls. Chloride is also an essential micronutrient for bacteria and plays an important role in photosynthesis and osmoregulation. No adverse effect is suspected for micro-organisms living in sewage water treatment plants.

Persistence and Degradability:

In accordance with column 2 of REACH Annex VII, the ready biodegradability test does not need to be conducted as the substance is inorganic.

Bio-accumulative Potential:

Calcium chloride is easily dissociated into calcium and chloride ions. Both ions are essential constituents of the body of all animals. No bioaccumulation or bio-magnifications are expected for calcium chloride.

Mobility in Soil:

Calcium chloride is easily dissociated into calcium and chloride ions. Chloride ions will not absorb on particulate matter. The calcium ion may bind to soil particulate or may form stable inorganic salts with sulphate and carbonate ions, but calcium is naturally present in soil.

Results of PBT and vPvB Assessment:

Not applicable for an inorganic substance. In accordance with REACH Annex XIII inorganic substances do not need to be subjected to a PBT assessment.

Section 13: Disposal Considerations

Waste treatment methods

If recycling or re-use of the product and/or packaging material is not practical, then the product/packaging material must be disposed of in accordance with local, state or national regulations. A suitable way of disposal is of calcium chloride landfill or controlled emission to a large recipient with naturally occurring levels of calcium and chloride ions, like the sea. Do not dispose of with acids or strong reducing or oxidizing agents.

Clean packaging material with water and dispose of the water in accordance with local regulations. Packaging material can be incinerated in a plant that has a permit from the competent authorities.

The waste codes of calcium chloride depend on where the waste is generated. As calcium chloride has a wide dispersive use in many areas, all relevant codes can not be given in this SDS.

European Waste Codes (EWC)for Packaging:

15 01 02 (plastic packaging)

15 01 05 (big bags of composite packaging)

Section 14: Transport Information

UN Number:	Not applicable
Shipping Name:	Not regulated
Class:	Not applicable
Packing Group:	Not applicable
Marine Pollutant:	Not available

Section 15: Other Regulatory Information

Text of H and R Phrases:

H314: Causes severe skin burns and eye damage.

H319 Causes serious eye irritation.

P280 Wear protective gloves/protective clothing/eye protection/face protection.

P305 + P351 IF IN EYES: Rinse cautiously with water for several minutes.

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

C = Corrosive

R34 Causes burns

R36 Irritating to eyes

Recommended Restrictions on Use: Further information

Section 16: Other Information

Other Special Considerations: Not available

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