



SAFETY DATA SHEET

According to Chinese National Standard GB/T 16483-2008

1. IDENTIFICATION OF THE SUBSTANCE/PREPARATION AND OF THE COMPANY/UNDERTAKING

Product name: Cesium Formate Solution
Product code: CESFORMSOL
Synonyms: CsCOOH-H₂O Cesium Formate Brine
Recommended use: Drilling & completion fluids: Industrial Products
Restrictions on use: Not Applicable

Supplier:

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US: CHEMTREC: +1-703-527-3887 or 1-800-424-9300

E-mail address: SDS@cabotcorp.com

2. HAZARDS IDENTIFICATION

GHS - Classification

A hazardous mixture according to Chinese National Standard GB 13690-2009: General rules for classification and hazard communication of chemicals.

Acute toxicity - Oral	Category 4
Serious eye damage/eye irritation:	Category 2A
Reproductive toxicity	Category 2
Specific target organ toxicity (repeated exposure)	Category 2

Label Elements:



Signal Word:
WARNING

Hazard statements:

H302 - Harmful if swallowed

H319 - Causes serious eye irritation

H361f - Suspected of damaging fertility

H373 - May cause damage to organs (kidneys, adrenals, nervous system, blood) through prolonged or repeated exposure

Precautionary Statements -
Prevention

- Obtain special instructions before use
- Do not handle until all safety precautions have been read and understood
- Do not breathe mist/vapors/spray
- Wear protective gloves/protective clothing/eye protection/face protection
- Wash face, hands and any exposed skin thoroughly after handling
- Do not eat, drink or smoke when using this product

Precautionary Statements - Response • IF exposed or if you feel unwell: Call a POISON CENTER or doctor/physician

Eyes

- IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing
- If eye irritation persists: Get medical advice/attention

Ingestion

- IF SWALLOWED: Call a POISON CENTER or doctor/physician if you feel unwell
- Rinse mouth

Precautionary Statements - Storage

- Store locked up

Precautionary Statements - Disposal

- Dispose of contents/container in accordance with local, regional, national, and international regulations

Hazards not otherwise classified (HNOC)

Please refer to hazard and precautionary statements above.

Potential health effects

Principle Routes of Exposure:

Eye contact, Skin Contact, Inhalation

Skin Contact:

May cause irritation. Avoid contact with skin.

Inhalation:

Due to its liquid state, this material is not expected to be a significant inhalation hazard. Aerosols or dried product may be irritating to respiratory tract. Do not breathe dust, vapors or mist.

Ingestion:

Adverse effects on multiple organ systems were observed in animals following repeated oral exposure to cesium formate. However, these effects would not be expected under normal handling conditions. See Section 11.

Reproductive Effects:

Male Reproductive System. See Section 11.

Carcinogenicity:

Does not contain any substances listed by IARC (International Agency for Research on Cancer), NTP (National Toxicology Program), OSHA (Occupational Safety and Health Administration), ACGIH (American Conference of Governmental Industrial Hygienists) or EU (European Union). See also Section 11.

Target Organ Effects:

Eyes, Skin, Respiratory system, Kidney, Adrenal gland

Medical Conditions Aggravated by Exposure: Respiratory disorder, Adrenal gland disorders

Potential Environmental Effects: None known. See Section 12.

3. COMPOSITION/INFORMATION ON INGREDIENTS

Chemical substance / mixture: Mixture
Synonyms: CsCOOH-H₂O, Cesium Formate Brine

Chemical name	CAS No	weight-%
Cesium Formate	3495-36-1	60-84
Water	7732-18-5	16-40
Carbonate and bicarbonate salts of sodium and/or potassium	VARIOUS	0-5

Other Information:

Cesium Formate may contain up to 5% of "other alkali formates" as impurities resulting from our production process. Those alkali formates are not intentionally added in our cesium formate brine but are part of our substance "Cesium Formate" (per the definition of a substance in National Chemical Substance Control Law) and cannot be removed from the material. Those impurities have been tested as part of our product.

4. FIRST AID MEASURES

FIRST AID MEASURES

Skin Contact Wash thoroughly with soap and water. Remove contaminated clothing and shoes. Seek medical attention if redness, swelling, itching, or burning occurs.

Eye contact Flush eyes immediately with large amounts of water for 15 minutes. Seek medical attention if redness, swelling, itching, burning or visual disturbances occur.

Inhalation If cough, shortness of breath or other breathing problems occur, move to fresh air. Seek medical attention if symptoms persist. If necessary, restore normal breathing through standard first aid measures.

Ingestion Do not induce vomiting. If conscious, give several glasses of water. Never give anything by mouth to an unconscious person. Seek medical attention.

Self-protection of the first aider: Use personal protective equipment as required.

Most important symptoms and effects, both acute and delayed

Symptoms: The most important known symptoms and effects are described in Section 2 and/or in Section 11.

Indication of any immediate medical attention and special treatment needed

Note to physicians: Treat symptomatically.

5. FIRE-FIGHTING MEASURES

Suitable Extinguishing Media:

Use extinguishing measures that are appropriate to local circumstances and the surrounding environment. Use foam, carbon dioxide (CO₂), dry chemical or water spray. A fog is recommended if water is used.

Unsuitable Extinguishing Media:

None known.

Specific hazards arising from the chemical:

Burning produces irritant fumes.

Hazardous combustion products:

Carbon monoxide (CO). Carbon dioxide (CO₂). Oxides of Cesium.

Explosion data

Sensitivity to Mechanical Impact: None.

Sensitivity to Static Discharge: None.

Protective equipment and precautions for firefighters:

In the event of fire, wear self-contained breathing apparatus. Wear suitable protective equipment.

Risk of Dust Explosion: Not Applicable: Cesium Formate Brine is an aqueous solution

6. ACCIDENTAL RELEASE MEASURES

Personal precautions, protective equipment and emergency procedures

Personal precautions: Avoid formation of dust and aerosols. Ensure adequate ventilation. Use personal protective equipment. See also Section 8.

Environmental Precautions:

Environmental Precautions: Contain spill if safe to do so. Local authorities should be advised if significant spillages cannot be contained. See also Section 13.

Methods and material for containment and cleaning up

Methods for containment: Prevent further leakage or spillage if safe to do so.

Methods for cleaning up: Soak up with inert absorbent material. Pick up and transfer to properly labelled containers. See Section 13.

7. HANDLING AND STORAGE

Precautions for safe handling

Advice on safe handling: Avoid contact with skin and eyes. Avoid formation of dust and aerosols. Do not breathe aerosols or dust from dried material. Provide appropriate exhaust ventilation at machinery and at places where dust, aerosol, or mist can be generated. Avoid ingestion. Avoid prolonged or repeated exposure.

General hygiene considerations: Wash the hands and the face carefully after handling. Contaminated clothes have to be changed and washed before reuse.

Conditions for safe storage, including any incompatibilities

Storage Conditions: Keep containers tightly closed in a dry, cool and well-ventilated place. Keep in properly labeled containers. Do not store together with strong oxidizing agents.

Incompatible materials: Strong oxidizing agents, Platinum catalysts. NBR or Viton type elastomers at high temperature and long exposure times.

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

Exposure guidelines: There are no exposure limits identified for this product.

Engineering Controls: Ensure adequate ventilation to minimize exposures.

Personal protective equipment [PPE]

Respiratory Protection: Approved respirator may be necessary if local exhaust ventilation is not adequate. Respiratory protection in accordance with EN 149 and OSHA 1910.134.

Hand Protection: Wear suitable gloves (in accordance with EN 374 and OSHA 1910.138): Impervious gloves. Nitrile rubber gloves. PVC or rubber gloves. PVC or other plastic material gloves.

Eye/face Protection: Eye / face protection in accordance with EN 166 and OSHA 1910.133: Wear safety glasses with side shields (or goggles). Wear face-shield if splashes are likely to occur.

Skin and Body Protection: Wear chemical impervious protective clothing if skin contact may occur.

Other: Handle in accordance with good industrial hygiene and safety practice. Emergency eyewash and safety shower should be located nearby.

Environmental exposure controls: In accordance with all local legislation and permit requirements.

9. PHYSICAL AND CHEMICAL PROPERTIES

Physical State:	Liquid	Odor:	None
Appearance:	Colorless Liquid	Odor threshold:	Not Applicable
Color:	Colorless		
<u>Property</u>	<u>Values</u>	<u>Remarks • Method</u>	
pH:	9 - 11	(measured in 1:10 dilution with water)	
Melting point/freezing point:	0 - 5.1 °C	According to OECD 102/EU Method A.1	
Boiling point / boiling range:	112 °C - 145 °C	See Cabot Specialty Fluid's Formate Technical Manual	
Evaporation Rate:	< 0	@ 20 °C	
Vapor pressure:	400 - 2250 Pa	acc. to OECD 104	
Vapor Density:		No information available	
Density:	1.05-2.40 g/cm ³		
Bulk Density:		No information available	
Specific Gravity at 20°C:	1.05-2.40	@ 15.6 °C See Cabot Specialty Fluid's Formate Technical Manual	
Water solubility:	84.6 - 86.6%	@ 20+/- 0,5 °C	
Solubility(ies):		See Cabot Specialty Fluid's Formate Technical Manual	
Partition Coefficient (n-octanol/water):	< -2.20	No potential to bioconcentrate	

Decomposition temperature:	200 °C	See Cabot Specialty Fluid's Formate Technical Manual
Viscosity:	1.7 - 10 cP	@ 20 °C
Kinematic viscosity:		No information available
Dynamic viscosity:		No information available
Oxidizing Properties:	Mild reducing agent, which when in contact with oxidants, can react vigorously	
Softening point:		Not Applicable
VOC content (%):		Not Applicable
% Volatile (by Volume):		No information available
% Volatile (by Weight):		No information available
Surface Tension:	72.4 mN/m	at 21.0 ± 0.5°C for a 1.04 g/l solution.
Explosive properties:		Not Applicable. Aqueous solution with low vapour pressure No chemical groups associated with flammable or explosive properties
Flash Point:		Not Applicable.
Flammability (solid, gas):		Not Applicable
Flammability Limit in Air:		Not flammable
Explosion Limits in Air - Upper (g/m ³):		Not Applicable
Explosion Limits in Air - Lower (g/m ³):		Not Applicable
Autoignition Temperature:		Not Applicable.
Minimum Ignition Temperature:		Not Applicable
Minimum Ignition Energy:		Not Applicable
Ignition Energy:		No information available
Maximum Absolute Explosion Pressure:		Not Applicable
Maximum Rate of Pressure Rise:		Not Applicable
Burn Velocity:		Not Applicable
Kst Value:		Not Applicable
Dust Explosion Classification:		Not Applicable

10. STABILITY AND REACTIVITY

Reactivity:	Reacts with strong oxidizers.
Stability:	Stable under recommended handling and storage conditions.
Explosion data	See also Section 9.
Sensitivity to Mechanical Impact:	None.
Sensitivity to Static Discharge:	None.
Possibility of hazardous reactions:	None under normal processing.
Hazardous polymerization:	Hazardous polymerization does not occur.
Conditions to avoid:	Avoid contact with strong oxidizing agents. During long exposures to high temperatures, and in contact with certain catalysts, some liberation of gasses (H ₂ and CO) might occur. The greatest risk exists when dry formate powder is contacted by a platinum catalyst. Users are advised to obtain the Cabot Specialty Fluid's (CSF) Formate Technical Manual, Section A13 from a CSF representative for more detailed information on conditions to

avoid. CSF does not recommend retorting formate solutions to determine solids content as temperatures may exceed 500 °C. The use of rupture disks is recommended as a precautionary measure when conducting heat aging of formate solutions at temperatures above 150 °C.

Incompatible materials: Strong oxidizing agents, Platinum catalysts. NBR or Viton type elastomers at high temperature and long exposure times.

Hazardous decomposition products: Carbon dioxide (CO₂). Carbon monoxide (CO). Oxides of Cesium.

11. TOXICOLOGICAL INFORMATION

Information given is based on data obtained from this substance or from similar substances.

Acute toxicity

Oral LD50: LD50/oral/rat > 300 mg/kg and < 2000 mg/kg. (OECD 401 and OECD 420).

Inhalation LC50: No data are available on the product itself

Dermal LD50: LD50/dermal/rat = >2000 mg/kg. (OECD 402).

Skin corrosion/irritation: Skin irritation test, rabbit (OECD 404): Not irritating

Serious eye damage/eye irritation: Primary eye irritation test in rabbit (OECD 405): Irritating to eyes.

Sensitization: Not sensitizing based on Local Lymph Node Assay (OECD 429).

Mutagenicity: Not mutagenic in Ames test. (OECD 471). Negative in chromosome aberration test in human lymphocytes. (OECD 473). Negative in mouse lymphoma assay. (OECD 476).

Carcinogenicity: Does not contain any substances listed by IARC (International Agency for Research on Cancer), NTP (National Toxicology Program), OSHA (Occupational Safety and Health Administration), ACGIH (American Conference of Governmental Industrial Hygienists) or EU (European Union).

Reproductive Toxicity: Effects observed in ovaries and testes at 500 mg/kg/d in a 28-day oral repeated dose study in rats. No effects were observed on reproductive organs at the two lower doses (150 and 15 mg/kg/d).

Based on a 90-day oral repeated dose toxicity study (OECD 408) on a similar substance (cesium chloride), this product is classified as Reproductive Toxicity Category 2 - suspected of damaging fertility. Male and female rats were used in the study. Effects on reproductive organs and reproductive cycles were seen only in males. The reproductive effects were generally secondary to other toxic effects on adrenals and kidneys. The No Observed Adverse Effect Level (NOAEL) for reproductive effects is equivalent to 10 mg Cs/kg bodyweight/day.

Developmental toxicity: Based on the results of a Prenatal Developmental Toxicity Study (OECD 414) on a similar substance (cesium hydroxide), this product is not considered a developmental toxicant.

STOT - single exposure: Effects on the central nervous system were observed in rats following a single oral exposure to 1250 mg/kg and higher.

STOT - repeated exposure: In a 28-day oral study in rats, effects were observed in multiple organ systems at the high

dose (500 mg/kg/d). Signs of neurotoxicity were also observed. Elevated reticulocyte count and effects on the heart, liver, spleen and serum biochemistry were observed at the middle dose (150 mg/kg/d). Elevated reticulocyte count was the only effect observed at the low dose (15 mg/kg/d). (OECD 407).

Based on a 90-day oral repeated dose toxicity study (OECD 408) on a similar substance (cesium chloride), this product is classified as STOT-RE Category 2 - may cause damage to multiple organs (kidneys and adrenals) through prolonged or repeated exposure. The No Observed Adverse Effect Level (NOAEL) for kidney and adrenal effects is equivalent to 10 mg Cs/kg bodyweight/day.

Aspiration Hazard: Based on industrial experience and available data, no aspiration hazard is expected.

12. ECOLOGICAL INFORMATION

Aquatic Toxicity:

MARINE

Pacific oyster (*Crassostrea gigas*) EC50 (24 hr) = 1200 mg/l

Marine copepod (*Acartia tonsa*) EC50 (48 hr) = 340 mg/l

Marine algae (*Skeletonema costatum*) EbC50 (72 hr) = 710 mg/l; ErC50 (0-72hr) = 1600 mg/l; NOEC = 320mg/l

Brown shrimp (*Crangon crangon*) LC50 (96 hr) = 875 mg/l

Juvenile turbot (*Scophthalmus maximus*) LC50 (96 hr) = 260 mg/l

Ctenogobius gymnauchen LC50 (96 hr) = 861.5 mg/l

Amphipod (*Corophium volutator*) LC50 (10 day) = 6653 mg/kg

Mysid shrimp (*Mysidopsis bahia*) LC50 (48 hr) = 521 mg/l

Mysid shrimp (*Mysidopsis bahia*) IC25 growth (7 day) = 260 mg/l, NOEC growth = 252 mg/l; IC25 survival (7 day) = 359 mg/l, NOEC survival = 420 mg/l

Inland Silverside (*Menidia beryllina*) LC50 (96 hr) = 787 mg/l

Inland Silverside (*Menidia beryllina*) IC25 growth (7 day) = 440 mg/l, NOEC growth = 252 mg/l; IC25 survival (7 day) = 471 mg/l, NOEC survival = 420 mg/l

FRESHWATER

Zebra fish (*Brachydanio rerio*) LC50 (96 hr) >100 mg/l

Rainbow trout (*Oncorhynchus mykiss*) LC50 (96 hr) = 2100 mg/l

Water flea (*Daphnia magna*) EC50 (48 hr) > 100 mg/l

Freshwater algae (*Desmodesmus subspicatus*, formerly *Scenedesmus subspicatus*) ErC50 (0-72 hr) = 110 mg/l; NOEC = 56 mg/l

Freshwater algae (*Pseudokirchneriella subcapitata*, formerly *Selenastrum capricornutum*) ErC50 (0-72 hr) = 110 mg/l; NOEC = 18 mg/l

Other Information:

In the majority of marine species, this material has not demonstrated toxicity and has received a rating of GOLD/SILVER/SILVER for drilling products and GOLD for Completion/Workover products under the PARCOM Harmonized Offshore and Chemical Notification Format (HOCNF).

ENVIRONMENTAL FATE

Persistence and degradability

READILY BIODEGRADABLE. Ready Biodegradability in Sea Water - Closed Bottle Test (OECD Method 306) = 79% degradation after 28 days. Ready Biodegradability in Sea Water - Closed Bottle Test (OECD Method 306) = 66% degradation after 28 days. Ready Biodegradability in Freshwater - Closed Bottle Test (OECD Method 301D) = 83%

degradation after 28 days. Ready Biodegradability in Freshwater - Closed Bottle Test (OECD Method 301D) = 79% degradation after 28 days.

Bioaccumulation Log Pow = < - 2,20 (no potential to bioconcentrate). See also Section 9.

Mobility: No information available.

Other adverse effects: No other data are available.

13. DISPOSAL CONSIDERATIONS

Disclaimer: Information in this section pertains to the product as shipped in its intended composition as described in Section 3 of this SDS. Contamination or processing may change waste characteristics and requirements. Regulations may also apply to empty containers, liners or rinsate. State/provincial and local regulations may be different from federal regulations. The person generating waste must determine its proper classification

Unused and Uncontaminated Product: Waste codes should be assigned by the user based on the application for which the product was used. The unused material would be considered a hazardous waste.

Disposal considerations: Product, as supplied, should be disposed of in accordance with the regulations issued by the appropriate federal, state and local authorities. Same consideration should be given to containers and packaging.

14. TRANSPORT INFORMATION

IMDG

14.1 UN/ID no	Not regulated
14.2 Proper Shipping Name	Not regulated
14.3 Hazard Class	Not regulated
14.4 Packing group	Not regulated

RID

14.1 UN/ID no	Not regulated
14.2 Proper Shipping Name	Not regulated
14.3 Hazard Class	Not regulated
14.4 Packing group	Not regulated

ADR

14.1 UN/ID no	Not regulated
14.2 Proper Shipping Name	Not regulated
14.3 Hazard Class	Not regulated
14.4 Packing group	Not regulated

ICAO (air)

14.1 UN/ID no	Not regulated
14.2 Proper Shipping Name	Not regulated
14.3 Hazard Class	Not regulated
14.4 Packing group	Not regulated

IATA

14.1 UN/ID no	Not regulated
14.2 Proper Shipping Name	Not regulated
14.3 Hazard Class	Not regulated

14.4 Packing group Not regulated

IMO IBC Code: Cesium Formate - Provisionally assessed as: Pollution Category Z, Ship Type 3, with additional requirement 15.19.6.

15. REGULATORY INFORMATION

National regulations

The following laws/regulations/standards specify corresponding provisions on the safe use, storage, transportation, loading and unloading, classification and labelling of the chemicals:

Rules for classification and labelling of chemicals (GB30000.2~29-2013);

General rules for the classification and hazard communication of chemicals (GB 13690-2009);

General rules for preparation of precautionary label of chemicals (GB 15258-2009);

Hazardous Chemical Inventory: Not Listed

List of Acute Toxic Chemicals: The mixture is not regulated and does not contain any regulated component above the declaration threshold.

List of Dangerous Goods: Not Listed

International Inventories

TSCA - United States Toxic Substances Control Act Section 8(b) Inventory Complies

DSL/NDSL - Canadian Domestic Substances List/Non-Domestic Substances List Complies

EINECS/ELINCS - European Inventory of Existing Chemical Substances/European List of Complies

Notified Chemical Substances

ENCS - Japan Existing and New Chemical Substances Does not comply

IECSC - China Inventory of Existing Chemical Substances Does not comply

KECL - Korean Existing and Evaluated Chemical Substances Does not comply

PICCS - Philippines Inventory of Chemicals and Chemical Substances Does not comply

AICS - Australian Inventory of Chemical Substances Complies

NZIoC - New Zealand Inventory of Chemicals Does not comply

TCSI - Taiwan Chemical Substance Inventory Complies

16. OTHER INFORMATION

References:

MARPOL 73/78, Latest edition of Marine Environment Protection Committee (MEPC) Circulars MEPC.2/Circular, IBC Code, IMO Resolution A.673(16) Guidelines for the Transport and Handling of Limited Amounts of Hazardous and Noxious Liquid Substances in bulk on Offshore Support Vessels.

Contacts: See Section 1

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Prepared by: Cabot Corporation - Safety, Health and Environmental Affairs

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End of Safety Data Sheet