Maximizing the Value of Flotation Chemicals Technology

SAFETY DATA SHEET

1. IDENTIFICATION

Product identifier used on the label

: **Flottec 534 Collector**

Recommended use of the chemical and restrictions on use

: Collectors for sulfide and industrial mineral applications

Chemical family : Formulated Dithiophosphate

Name, address, and telephone number of the chemical manufacturer, importer, or other responsible party:

Flottec, LLC
22505 Collingsworth Street, 2nd Floor
Houston, Texas 77026, U.S.A.
www.flottec.com

Information Telephone # : 1.713.425.7055

24 Hr. Emergency Tel # : Chemtrec 1.800.424.9300 (Within Continental U.S.); Chemtrec 1.703.527.3887 (Outside U.S.)

2. HAZARDS IDENTIFICATION

Classification of the chemical

Skin corrosion/irritation (Category 1)
Serious eye damage/eye irritation (Category 1)
Skin sensitizer (Category 1)

Label elements

Signal Word

Danger

Hazard statement(s)

H314: Causes severe skin burns and eye damage
H317: May cause an allergic skin reaction
H410: Very toxic to aquatic life with long lasting effects

Precautionary statement(s)

P260: Do not breathe mist, vapors and spray.
P264: Wash face, hands and any exposed skin thoroughly after handling.
P272: Contaminated work clothing should not be allowed out of the workplace.
P273: Avoid release to the environment.
P280: Wear protective gloves, protective clothing and eye protection.
P301+330+331: IF SWALLOWED: Rinse mouth. Do NOT induce vomiting.
P303+361+353: IF ON SKIN (or hair): Remove immediately all contaminated clothing. Rinse skin with water and soap or take a shower if necessary.
P363: Wash contaminated clothing before reuse.
P333+313: If skin irritation or a rash occurs: Get medical advice/attention.
P304+340: IF INHALED: Remove victim to fresh air and keep at rest in a position comfortable for breathing.
P305+351+338: IF IN EYES: Rinse continuously with water for several minutes. Remove contact lenses if present and easy to do. Continue rinsing.
P310: Immediately call a POISON CENTER or doctor/physician.
P391: Collect spillage.
P405: Store locked up.
P501: Dispose of contents and container to a licensed chemical disposal agency in accordance with local, regional and national regulations

Hazard pictogram(s)

Other hazards

Acute hazard to the aquatic environment (Category 1).
Long-term hazard to the aquatic environment (Category 1)

3. COMPOSITION/INFORMATION ON INGREDIENTS

Mixture

Common name	CAS #	Concentration / wt %
Sodium 2-mercaptobenzothiazole	2492-26-4	20 – 25
Sodium O,O-di-sec-butyl phosphorodithioate	33619-92-0	5 – 15
Sodium O,O-diisobutyl dithiophosphate	53378-51-1	5 – 15
Sodium hydroxide	1310-73-2	1.0

The exact concentrations of the above listed chemicals are being withheld as a trade secret.

4. FIRST-AID MEASURES

Description of first aid measures

Ingestion : DO NOT induce vomiting, unless recommended by medical personnel. Never give anything by mouth if victim is unconscious or convulsing. If spontaneous vomiting occurs, keep head below hips level to prevent aspiration into the lungs. Seek medical attention or contact a Poison Centre immediately. If victim is conscious wash out mouth with water and give 1-2 glasses of water to drink.

Inhalation : Move person to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen by trained personnel. If a problem develops or persists, seek medical attention.

Skin Contact : Flush with water for at least 15 minutes. Remove contaminated clothing and wash before reuse. Avoid touching eyes with contaminated body parts. Seek medical attention immediately.

Eye Contact : IMMEDIATELY flush with plenty of water. Remove contact lenses. Flush with water for at least 15 minutes. Hold eyelids apart to rinse properly. If a problem develops or persists, seek medical attention. Seek medical attention immediately.

Symptoms : May cause severe eye irritation or eye damage. May cause skin irritation and burns. May cause an allergic reaction of the skin. May cause burns to mouth, throat and stomach.

Notes to the physician : Treat according to person's condition and specifics of exposure. If lavage is performed, suggest endotracheal and/or esophageal control. Danger from lung aspiration must be weighed against toxicity when considering emptying the stomach. Treatment of exposure should be directed at the control of symptoms and the clinical condition of the patient.

5. FIRE-FIGHTING MEASURES

Extinguishing media

Suitable extinguishing media

: Dried powder, water spray, carbon dioxide (CO_2), chemical foam.

Unsuitable extinguishing media

: Do not use direct water jet.

Special hazards arising from the substance or mixture

: This product is an aqueous solution which does not support combustion unless the water has been evaporated. Emits toxic and corrosive fumes under fire conditions.

Special protective equipment and precautions for firefighters

Protective equipment for fire-fighters

: Firefighters must wear self contained breathing apparatus with full face mask. Firefighting suit may not be efficient against chemicals..

Special fire-fighting procedures

: Use water spray to cool fire-exposed containers. Prevent run-off from fire control or dilution from entering streams, sewers or drinking water supply.

6. ACCIDENTAL RELEASE MEASURES

Personal precautions, protective equipment and emergency procedures

: Do not touch spilled material. Make sure to wear personal protective equipment mentioned in this Safety Data Sheet.

Environmental precautions : Prevent entry in sewer and other enclosed area. For a large spillage, consult the Department of Environment or the relevant authorities.

Methods and material for containment and cleaning up

: Ventilate the area well. Stop leak, if it's possible to do so without risk. Absorb with inert material (soil, sand, vermiculite) and place in an appropriate waste disposal clearly identified. Finish cleaning by rinsing with water contaminated surface. Dispose via a licensed waste disposal contractor.

7. HANDLING AND STORAGE

Precautions for safe handling : This product should not be mixed with acids since evolution of toxic and flammable hydrogen sulfide gas could result. This precaution does not, of course, apply to addition of this reagent to flotation pulps in amounts customarily used for flotation. Use only in well ventilated area. Avoid all contact with skin, eyes and clothing. Do not breathe vapors, mists or aerosols. Wear eye protection, gloves and other protective clothing that are adapted to the task being performed and the risks involved. Keep in the workplace only the quantities necessary for the work being performed. Keep containers tightly closed when not used. Do not eat, do not drink and do not smoke during use. Wash hands, forearms and face thoroughly after handling this compound and before eating, drinking or using toilet articles. Remove contaminated clothing and wash before reuse.

Conditions for safe storage : Store tightly close and in properly labelled containers in a cool, dry and well ventilated place. Containers that have been opened must be carefully resealed and kept upright to prevent leakage. Store away from acids and from incompatible materials (see section 10). Keep away from direct sunlight and heat.

Storage temperature : 5 to 40°C (41 to 104°F)

8. EXPOSURE CONTROLS / PERSONAL PROTECTION

Immediately Dangerous to Life or Health

Sodium hydroxide : 10 mg/m^3

Hydrogen sulfide : 100 ppm

Exposure limits

Sodium hydroxide :	Ceiling		2mg/m^3	ACGIH , BC, ON, RSST
	TWA (8h)		2mg/m^3	OSHA
Hydrogen sulfide :	Ceiling	10 ppm		BC
	STEL	5 ppm		ACGIH
		15 ppm		ON
		15 ppm	21 mg/m^3	RSST
	TWA (8h)	1 ppm		ACGIH
		10 ppm		ON
		10 ppm	14 mg/m3	RSST

Exposure controls

Appropriate engineering controls : Provide sufficient mechanical ventilation (general and/or local exhaust) to keep the airborn concentrations of vapors, mists, aerosols or dust below their respective occupational exposure limits.

Respiratory protection : Respiratory protection is not required in normal use. Respiratory protection equipment (PPE) must be selected, fitted, maintained and inspected in accordance with regulations and CSA Standard Z 94.4 and approved by NIOSH / MSHA. In case of insufficient ventilation or in confined or enclosed space and for an assigned protection factor (APF) up to 10 times the exposure limit: wear a half mask respirator with appropriate cartridges fitted with P100 filters. For

an APF until maximum 100 times of exposure limit, wear a full face respirator mask with appropriate cartridges and P100 filters.

Skin protection : Personal protective equipment for the body should be selected based on the task being performed and the risks involved. Wear normal work clothing covering arms and legs as required by employer code. Wear an apron or long-sleeve protective coverall suit.

Eye protection : Wear chemical splash goggles. If risk of contact with eyes or the face, wear a face shield.

Hands protection : Wear nitrile or neoprene gloves. Chemical-resistant, impervious gloves should be worn at all times when handling this chemical product. Before using, user should confirm impermeability. Discard gloves that show tears, pinholes, or signs of wear. Gloves must only be worn on clean hands. Wash gloves with water before removing them. After using gloves, hands should be washed and dried thoroughly.

Other protective equipment : Wear safety shoes. Wear rubber boots to clean up a spill.

9. PHYSICAL AND CHEMICAL PROPERTIES

Physical state	: Liquid	**Flammability limits (% by vol.)**	: N/Av
Color	: Yellow-green clear	**Flash point**	: > 93.4°C (200.1°F) SETA
Odor	: Sulfur odor	**Auto-ignition temperature**	: N/Av
Odor threshold	: N/Av	**Sensibility to electrostatic charge**	: No
pH	: >12	**Sensibility to sparks/friction**	: No
Melting/Freezing point	: N/Av	**Vapor density (Air = 1)**	: N/Av
Boiling point/range	: 103°C (217.4°F)	**Relative density (Water = 1)**	: 1.165 kg/L @ 25°C (77°F)
Solubility in water	: Soluble	**Partition coefficient (n-octanol/water)**	
Evaporation rate (BuAc = 1)	: N/Av		: < 2
Vapor pressure	: N/Av	**Decomposition temperature**	: N/Av
Volatiles (% by weight)	: <64%	**Viscosity**	: N/Av
Flammability (solid, gas)	: Not flammable	**Molecular mass**	: N/Ap

10. STABILITY AND REACTIVITY

Reactivity : May release hydrogen sulfide in contact with acids.

Chemical stability : Stable under recommended storage conditions.

Possibility of hazardous reactions (including polymerizations)

: Hazardous polymerization will not occur.

Conditions to avoid : Avoid contact with incompatible materials

Incompatible materials : Strong acids, strong oxidizing agents (such as nitric acid, perchloric acid, peroxides, chlorates and perchlorates).

Hazardous decomposition products

: Under normal conditions of storage and use, hazardous decomposition products should not be produced.

11. TOXICOLOGICAL INFORMATION

Toxicological data

Chemical name	LC_{50} (Inhalation, Rat)	LD_{50} / mg/kg (Oral, Rat)	LD_{50} / mg/kg (Dermal, Rabbit)
Sodium 2-mercaptobenzothiazole	>82000 mg/m^3/6h	2100	>7940
Sodium O,O-di-sec-butyl phosphorodithioate	N/Av	>2000	>2000
Sodium O,O-diisobutyl dithiophosphate	N/Av	>3000	>2000
Sodium hydroxide	N/Av	>140	1350
Hydrogen sulfide	444 mg/l/4h	N/Av	N/Av

Likely routes of exposure

Skin : Yes

Eye : Yes

Inhalation : Yes

Ingestion : Yes

Potential Health Effects:

Signs and symptoms of delayed, immediate and chronic effects

Skin	:	May cause skin irritation and burns. The application of sodium 2-mercaptobenzothiazole on rabbit skin gave not reversible depth injuries (in vivo skin irritation study). The sodium O,O-alkyl dithiophosphate family compound is corrosive to rabbit skin, causing edema, erythema, tissue sloughing and necrosis (OECD 404).
Eye	:	May cause severe eye irritation or eye damage. In vivo eye irritation study with sodium 2-mercaptobenzothiazole on rabbit gave corneal opacity, severe erythema, very slight edema in less than 24 hours.
Inhalation	:	Inhalation of vapors/mists can cause burns to nose, throat and respiratory tract
Ingestion	:	May cause burns to mouth, throat and stomach.
Sensitization to material	:	Sodium 2-mercaptobenzothiazole is well known as a skin sensitizer (Guinea pig, OECD Guideline 406). This product is not a respiratory sensitizer.
IRAC/NTP Classification	:	No ingredients listed
Carcinogenicity	:	Ingredients present at levels greater than or equal to 0.1% of this product are not listed as a carcinogen by IARC, ACGIH, NIOSH, NTP or OSHA.
Mutagenicity	:	Ingredients in this product present at levels greater than or equal to 0.1% are not known to cause mutagenic effect.
Reproductive Effects	:	Ingredients in this product present at levels greater than or equal to 0.1% are not known to cause effects on reproduction.
Specific target organ effects – single exposure		
	:	No target organ is listed.
Specific target organ effects – repeated exposure		
	:	No target organ is listed.
Other information	:	The oral and skin acute toxicity estimates (ATE) of the mixture were calculated to be greater than 2000 mg/kg. The acute toxicity estimate (ATE) by inhalation (dust/mist) of the mixture was calculated to be greater than 5 mg/L/4h. These values are not classified according to WHMIS 2015 and OSHA HCS 2012.

12. ECOLOGICAL INFORMATION

Ecotoxicity :

Fish - Oncorhynchus mykiss - Rainbow trout	LC_{50}	1.8 mg/L; 96 h (Sodium 2-mercaptobenzothiazole)
Aquatic Invertebrate - Daphnia magna (static)	EC_{50}	0.71 mg/L; 48 h (Sodium 2-mercaptobenzothiazole) OECD 202
Aquatic Plant - Algea, Pseudokirchnerilla subcapitata	ECr_{50}	0.3 mg/L; 96 h (Sodium 2-mercaptobenzothiazole)
Fish - Oncorhynchus mykiss - Rainbow trout	NOEC	0.041 mg/L; 89 days (Sodium 2-mercaptobenzothiazole)
Aquatic Invertebrate - Daphnia magna	NOEC	0.08 mg/L; 21 days (Sodium 2-mercaptobenzothiazole) OECD 211
Fish - Danio rerio (static)	LC_{50}	>791 mg/L; 96 h (Sodium diisobutyl dithiophosphate) OECD 203
Aquatic Invertebrate - Daphnia magna (static)	EC_{50}	>1020 mg/L; 48 h (Sodium diisobuyl dithiophosphate) OECD 202
Aquatic Plant - Algea, Desmodesmus subspicatus	EC_{50}	261 mg/L; 72 h (Sodium diisobutyl dithiophosphate) OECD 201

Persistence	:	No information available for this product. May be persistent in aquatic environment.
Degradability	:	No data are available on the product itself. Sodium 2-mercaptobenzothiazole is not readily biodegradable, 1% to 5% after 35 days (OECD TG 301B) but it photolyzes in water fast with a half-life under one hour. Sodium O,O-diisobutyl dithiophosphate was found to be not ready biodegradable (30.6%) within the 28-day exposure period (OECD Guideline 301D). Moreover, it was found not to hydrolyse neither at pH 4; 7 nor 9. The half-life is expected to be greater than 1 year at 25°C.

Bioaccumulation potential : No data are available on the product itself. Sodium 2-mercaptobenzothiazole has a Bioconcentration Factor (BCF) value <8, and its Log Kow value is 0.34, indicating that its potential to bioaccumulate is low. Sodium diisobutyl dithiophosphate has a low potential to bioaccumulate (log Koe of 1.2 to 2.1).

Mobility in soil : No information available for this product. Based on the high solubility in water, a high mobility in soil is to be expected.

Other adverse environmental effects

: Toxic effect on aquatic organisms due to pH change. This chemical does not deplete the ozone layer.

13. DISPOSAL CONSIDERATIONS

Handling for Disposal : Important! Prevent waste generation. Use in full. DO NOT throw residual to sewer, streams, sewers or drinking water supply. Residues and empty containers must be considered as hazardous waste. Return empty container properly labeled to supplier or everywhere there is a recovery program. Dispose via a licensed waste disposal contractor. Observe all federal, state/provincial and municipal regulations. If necessary consult the Department of Environment or the relevant authorities..

14. TRANSPORTATION INFORMATION

Regulatory Information	UN Number	UN proper shipping name	Transport hazard class(es)	Packing Group	Label
DOT	UN1719	CAUSTIC ALKALI LIQUID, N.O.S. (DITHIOPHOSPHATE SALT)	8	II	Corrosive
Additional Information		This material is not listed as a marine pollutant. Permit required for transportation with proper placards displayed on vehicle.			
TDG	UN1719	CAUSTIC ALKALI LIQUID, N.O.S. (DITHIOPHOSPHATE SALT)	8	II	Corrosive
Additional Information		Emergency response guidebook 2012 – 154 Permit required for transportation with proper placards displayed on vehicle.			
IMO/IMDG	UN1719	CAUSTIC ALKALI LIQUID, N.O.S. (DITHIOPHOSPHATE SALT)	8	II	Corrosive
Additional Information		Emergency schedules (EmS-No) F-A, S-B			
IATA	UN1719	CAUSTIC ALKALI LIQUID, N.O.S. (DITHIOPHOSPHATE SALT)	8	II	Corrosive
Additional Information					

15 - REGULATORY INFORMATION

US Federal Information:

- Toxic Substance Control Act (TSCA) :
  All ingredients are listed in the TSCA Inventory or otherwise comply with TSCA requirements.
- EPCRA Section 313 Toxic Chemicals:
  Sodium hydroxide (CAS no 1310-73-2).
- CERCLA (Comprehensive Environmental Response, Compensation, and Liability Act):
  Sodium hydroxide (CAS no 1310-73-2).
- EPCRA Section 302/304 Extremely Hazardous Substances:
  No material is listed.
- Clean Water Act (CWA) 311 Hazardous Substances:
  Sodium hydroxide (CAS no 1310-73-2).
- Clean Water Act (CWA) Priority Pollutants:
  No material is listed.
- Clean Air Act (CAA) 111:
  No material is listed.
- Clean Air Act (CAA 112b) HON - Hazardous Organic National Emission Air Pollutants:
  No material is listed.
- Clean Air Act (CAA 112b) HAP - Hazardous Air Pollutants:

No material is listed.
- CAA 112(r) Regulated Chemicals for Accidental Release Prevention:
No material is listed.
- California Proposition 65:
No material is listed.

Canadian Information:

- Canada DSL and NDSL:
All ingredients are listed in the Domestic Substances List (DSL).
- Canadian National Pollutant Release Inventory Substances (NPRI):
No material is listed

WHMIS 1988:

Class E : Corrosive material

NFPA

16. OTHER INFORMATION

Other special considerations for handling : Provide adequate information, instruction and training for operators.

Prepared by: Flottec, LLC	**Revised by:** C. Yuen
REASON FOR REVISION: Section 1: updated Flottec address	

DISCLAIMER

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