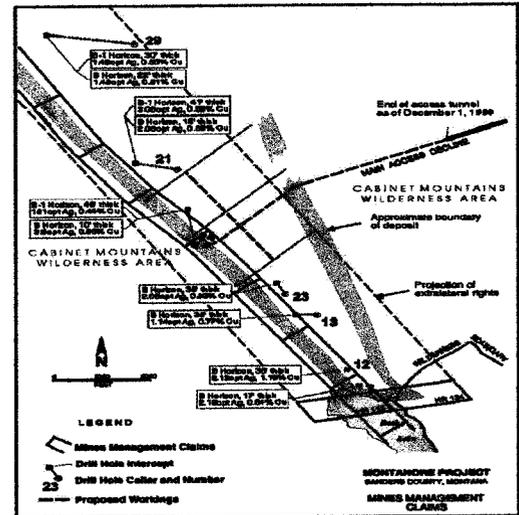


MONTANORE PROJECT

AMENDED APPLICATION HARD ROCK OPERATING PERMIT

AMENDED PLAN OF OPERATIONS



Appendix K – MSDS

Appendix L – Wilderness
Study

December 2004



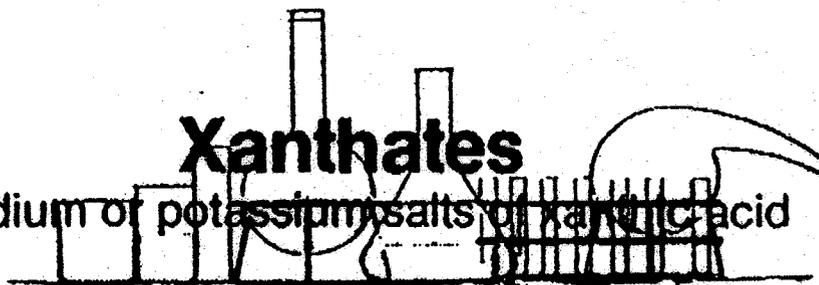
Mines Management, Inc.

REAGENT MSDS



Xanthates

Sodium or potassium salts of xanthic acid



Properties: These mining reagents are manufactured to exacting specifications and to a high degree of purity; supplied as 5/32" - dia pellets; colour varies from yellow to greenish-yellow; all have an unpleasant odour; are completely soluble in water; solubility ranges from 30 to 54% at 25C (77F); because of the tendency of xanthates to decompose in solution, xanthate solutions should be prepared within 24 hours prior to use; mechanical mixing is necessary to ensure complete and rapid solution; solutions must not be heated above ambient temperature since the rate of decomposition increases rapidly with temperature.

	CX-21*	CX-31*	CX-51*
Name	Sodium ethyl xanthate	Sodium isopropyl xanthate	Potassium amyl xanthate
Formula	$C_2H_5 O CS Na$	$C_3H_7 O CS Na$	$C_5H_{11} O CS SK$
Form	pellets 5/32" dia	pellets 5/32" dia	pellets 5/32" dia
Colour	greenish-yellow	yellowish	light yellow
Solubility in water at 25C (77F)	54% by wt approx	34% by wt approx	42% by wt approx
Bulk density	43 lb/cu ft approx	39 lb/cu ft approx	44 lb/cu ft approx
Containers	shipped in 250 lb net, steel drums and 1,750 lb net, poly- onal containers; products are also shipped as dry bulk in tank trucks and tank cars and are unloaded in solution form at destination.		

Fire hazards: Xanthates are flammable and will decompose when subjected to heat and/or moisture; decomposition products formed are hydrogen sulphide and carbon bisulphide which are flammable.

Health hazards: Xanthates are mildly irritating to skin, eyes, nose, throat; poisonous when absorbed through the skin or swallowed; gases formed by decomposition are toxic.

- Avoid breathing dust
- Avoid contact with skin or eyes
- Adequate ventilation systems should be provided

- Wear chemical goggles, rubber gloves and adequate protective clothing when handling the dry material or its solutions
- Clothing and shoes should be frequently cleaned of spilled xanthate
- Safety showers and eyewash fountains should be installed in storage and handling areas
- In case of contact with eyes, immediately flush eyes with plenty of water for at least 15 minutes
- Obtain medical help promptly

Storage: Store drums in a cool dry well-ventilated location; keep away from all direct sources of heat and open flames; dry forms will remain stable for periods of a year or more under proper storage conditions; keep drums well sealed when not in use; where it is necessary to store drums outdoors or in a damp location, they should be stacked horizontally to avoid water penetration; storage tanks for xanthate solutions should be vented outdoors; do not enter empty xanthate solution storage tanks unless adequate fresh air breathing equipment is worn.

Flammable gases may be present in storage tanks therefore care must be taken to keep sources of ignition away from storage tanks or other containers.

Handling materials: Steel is satisfactory for handling pellets and xanthate solutions.

Handling procedures:

Warning! Harmful dust and vapours
Make sure drums are well sealed before moving; handling areas should be adequately ventilated; keep drums closed when not in use; refer all matters concerning handling of tank trucks and tank cars to Technical Sales section; spillage should be reclaimed immediately; if spillage is liable to affect environment, notify nearest pollution control authority promptly (mandatory in some provinces); empty drums must be thoroughly cleaned before disposal.

This product information is believed to be accurate but by its issuance Canadian Industries Limited assumes no responsibility nor does it guarantee any results.



Canadian Industries Limited
Industrial Chemicals



Mining Reagents

Potassium Amyl Xanthate CX-51*

POTASSIUM AMYL XANTHATE (CX-51) is a Canadian-made flotation agent. It is used in ore flotation processes where a high degree of mineral recovery is required. It is a highly concentrated product containing a maximum of active ingredient, providing optimum collectability of concentrate.

Potassium amyl xanthate contains five carbon atoms in the alcohol radical and possesses the greatest collecting power of the various types of xanthates commonly used. It is the preferred reagent for the recovery of minerals which are difficult to float, including ores containing the precious metals, silver and gold. Potassium amyl xanthate is also used where oxidation of sulphide minerals makes separation more difficult and is applicable to the ores of galena, sphalerite, chalcopyrite and pyrite. The oxide ores of copper and lead can also be concentrated using potassium amyl xanthate.

This reagent is commonly used in combination with a xanthate of a lower alcohol, (e.g. sodium isopropyl xanthate) in the lead circuit in lead-zinc mineral separation. It finds wide application in the flotation of ores containing cobalt, nickel (pentlandite) and copper sulphides.

PROPERTIES

- Form..... 5/32-inch-diameter pellets.
Colour..... light yellow.
Bulk Density..... approximately 44 lbs/cubic foot.
Solubility..... Dissolves in water, with slightly endothermic reaction, to a maximum concentration of approximately 54% at 25°C. Feed solutions of 5% to 10% in water are generally used in practice.
FORMULA..... $C_5H_{11} - O - CS - SK$. Molecular Weight: 202.4
PURITY..... Potassium amyl xanthate is manufactured to exacting specifications and to a high degree of purity.

STABILITY

When stored in a cool dry place, this product will remain unchanged for periods up to one year. Where it is necessary to store drums outdoors or in a damp location, they should be stacked horizontally to avoid water penetration.

Because of the tendency of xanthates to decompose in solution, xanthate solutions should be used as soon as possible. Mechanical mixing is necessary to ensure complete and rapid solution.

FLAMMABILITY

Potassium amyl xanthate is flammable and decomposition gases may be combustible; therefore, storage and handling should be isolated from naked flames.

TOXICITY

Potassium amyl xanthate is poisonous when absorbed through the skin or taken orally. Decomposition, resulting mainly from heat and/or moisture, causes it to give off the toxic gases of hydrogen sulphide and carbon disulphide. Therefore, the following precautions should be observed during handling of the product.

CAUTION! Avoid breathing dust. Avoid contact with eyes, or repeated or prolonged contact with skin or clothing. Flush eyes thoroughly with water in case of accidental contact, and obtain medical attention as soon as possible. Rubber gloves and adequate protective clothing should be worn when handling the dry material or its solutions. Clothing and shoes should be frequently cleaned of spilled xanthate. Handling areas should be adequately ventilated to remove dust and decomposition gas which may arise.

SHIPPING AND HANDLING

<u>Containers</u>	<u>Gross (lbs.)</u>	<u>Tare (lbs.)</u>	<u>Net (lbs.)</u>	<u>Displacement (ft³)</u>
Steel Drums	271	21	250	8.6

This information is intended to convey the best available data on these chemicals. No guarantee or warranty is implied or intended as to the suitability of any chemical for any particular use. Nothing herein is to be construed as advising or authorizing practise of any invention covered by patents without a license.

Canadian Industries Limited

P.O. Box 10, Montreal 101, P.Q.

Sales offices:

Vancouver: 800 Terminal Rd.	(604) 685-1411
Edmonton: 10262 - 108th St.	(403) 439-3761
Calgary: 6940 Fisher Rd. S.E.	(403) 253-8261
Regina: 1221 Osler Street	(306) 525-5277
Winnipeg: 1199 St-James St.	(204) 775-0321
Toronto: 130 Bloor St.	(416) 925-9651
Sudbury: 1151 Lorne St.	(705) 674-1913
Halifax: 3699 Commission St.	(902) 755-1785



MSDS NO. 0290-01
 CAS NO.
 DATE: 08/14/82

MATERIAL SAFETY DATA

PRODUCT IDENTIFICATION

TRADEMARK: **AERO® 350 Xanthate**
 SYNONYMS: None
 CHEMICAL FAMILY: Alkyl xanthate salt
 MOLECULAR FORMULA: n-C5H11OC(S)SK
 MOLECULAR WGT.: 210

WARNING

CAUSES EYE AND SKIN IRRITATION

HAZARDOUS INGREDIENTS

COMPONENT	CAS. NO.	%	TWA/CEILING	REFERENCE
No Permissible Exposure Limits (PEL), have been established by OSHA				

NFPA HAZARD RATING

Not Established

HEALTH HAZARD INFORMATION

EFFECTS OF OVEREXPOSURE:

Acute oral (rat) LD50 value is between 1.0 and 2.0 g/kg. Skin or eye contact with solutions of the product may cause primary irritation. Airborne dust may cause significant eye and skin irritation or irritation of the respiratory tract. Overexposure to carbon disulfide may produce the following effects: eye or respiratory tract irritation, skin irritation or sensitization, dizziness, headache, degeneration of peripheral nerves, manic depressive psychosis and cardiovascular disorders.

FIRST AID:

In case of skin contact, remove contaminated clothing without delay. Flush skin thoroughly with water. Do not reuse clothing without laundering. In case of eye contact, immediately irrigate with plenty of water for 15 minutes. Refer to a physician if irritation persists. If vapor of AERO 350 Xanthate is inhaled, remove from exposure. Administer oxygen if there is difficulty in breathing.

Manufacturers: **CYANAMID CANADA INC.**
 P.O. BOX 240
 NIAGARA FALLS, ONTARIO, CANADA L2E 6T4
 Emergency Telephone No.: 416-356-8310

MSDS NO. 0290-01
AERO® 350 Xanthate

EXPOSURE CONTROL METHODS

Utilize a closed system process where feasible. Where a closed system is not used, good enclosure and local exhaust ventilation should be provided to minimize exposure. Food, beverages, tobacco products should not be carried, stored or consumed where this chemical is in use. Before eating, drinking or smoking wash face and hands with soap and water. Shower after completion of workshift. Launder work clothing at end of workshift prior to reuse. Store street clothing separately from work clothing and protective equipment. Work clothing and shoes must not be taken home. Where engineering controls are effective, respiratory protection is generally not required. If certain operations require respiratory protection, use a NIOSH approved respirator recommended by an industrial hygienist. Material causes eye or skin irritation on contact. A full facepiece respirator will provide eye and face protection. Wear the following as necessary to prevent skin contact; work pants, long sleeve work shirt and work gloves. For operations where eye or face contact can occur wear respiratory protection outlined above, (full facepiece) or dust proof goggles.

**FIRE AND
EXPLOSION
HAZARD
INFORMATION**

FLASH POINT:	This product has no flash point or explosive limits. Carbon disulfide may be evolved; however, (see Reactivity Data) with a flash point of -22 F.
FLAMMABLE LIMITS (% BY VOL):	1.25 lower; 50.0 upper (residual carbon disulfide)
AUTOIGNITION TEMP:	248 F; 120 C (residual carbon disulfide)
DECOMPOSITION TEMP:	491-536 F; 255-280 C (residual carbon disulfide)
FIRE FIGHTING:	Use carbon dioxide or dry chemical to extinguish fires. Do not use water. Do not flush to sewers. Wear self-contained, positive pressure breathing apparatus and full firefighting protective clothing. See Exposure Control Methods for special protective clothing. Dust may be explosive if mixed with air in critical proportions and in the presence of a source of ignition. Liberates carbon disulfide slowly in aqueous solution, when heated, or in presence of moisture. Due to its high vapor density (2.2 @ 100 F) carbon disulfide may accumulate in the bottom of tanks or drums containing this product or solutions of it and create a fire or explosion hazard.

REACTIVITY DATA

STABILITY:	Unstable
CONDITIONS TO AVOID:	Heat or moisture will liberate carbon disulfide which is toxic and explosive.
POLYMERIZATION:	Will Not Occur
CONDITIONS TO AVOID:	None known
INCOMPATIBLE MATERIALS:	Acids, strong oxidizing agents, water (including atmospheric moisture).
HAZARDOUS DECOMPOSITION PRODUCTS:	Heat or moisture will liberate carbon disulfide. Thermal decomposition may produce carbon monoxide, carbon dioxide, sulfur oxides and/or carbon disulfide.

**PHYSICAL
PROPERTIES**

APPEARANCE AND ODOR:	Yellow pellets or powder; slight, disagreeable odor
BOILING POINT:	Not Applicable
MELTING POINT:	491-536 F; 255-280 C
VAPOR PRESSURE:	Not Applicable
SPECIFIC GRAVITY:	Not Available
VAPOR DENSITY:	Not Applicable
% VOLATILE (BY VOL):	< 15.0
OCTANOL/H₂O PARTITION COEF.:	Not Available
pH:	Not Applicable
SATURATION IN AIR (BY VOL):	Not Applicable
EVAPORATION RATE:	Not Applicable
SOLUBILITY IN WATER:	Appreciable

MSDS NO. 0290-01
 AERO® 350 Xanthate

SPILL OR LEAK PROCEDURES

STEPS TO BE TAKEN IN CASE MATERIAL IS RELEASED OR SPILLED:

Wear NIOSH approved air purifying cartridge or canister respirator. Same protective clothing/equipment as in Exposure Control Methods. Vacuum spill instead of sweeping.

WASTE DISPOSAL

Disposal must be made in accordance with applicable governmental regulations.

SPECIAL PRECAUTIONS

HANDLING AND STORAGE/OTHER:

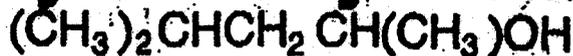
Store in a cool, dry, well-ventilated area. Maintain good housekeeping to control dust accumulations. Areas where handling or use may result in the evolution of carbon disulfide should have fire safe practices and electrical equipment in accordance with Electrical and Fire Protection Codes (NFPA-30) governing Class I Flammable Liquids.

Marvin A. Friedman

Marvin A. Friedman, Ph.D., Director of Toxicology and Product Safety

This information is given without any warranty or representation. We do not assume any legal responsibility for same nor do we give permission, inducement, or recommendation to practice any patented invention without a license. It is offered solely for your consideration, investigation and verification. Before using any product read its label.

Methyl Isobutyl Carbinol



Methyl Amyl Alcohol; MIBC

Properties: A clear, colourless alcohol possessing a faint, pleasant odour; slightly soluble in water and miscible with many organic compounds; exhibits good solvency for oils, waxes and some resins; is a latent solvent for nitrocellulose and in combination with aromatic diluents is a good solvent for ethyl cellulose resins, urea formaldehyde and alkyd type surface coatings; widely used as a frother in the flotation of lead, zinc, copper, iron and molybdenum ores; also widely used in the flotation of potash and in removal of coal fines.

- Specific gravity at 20/20C 0.8079
- Boiling point 131.63C
- Freezing point -90C
- Vapour pressure at 20C (68F) 2.2 mm Hg
- Solubility in water at 25C (77F) 6.35% by wt
- Flash point, Tag open cup 131F

Specification:	Methyl isobutyl carbinol
Purity	97.5% min
Specific gravity at 20/20C	0.807-0.809
Distillation range	130-133C
Water	0.1% max
Acidity (as acetic acid)	0.005% max
Colour (APHA)	15 max

Containers: MIBC is shipped in non-returnable steel drums, 370 lb net; also available in tank trucks and tank cars in many locations.

Fire hazards: Fire hazard moderate when exposed to heat and flame, eliminate all possible sources of ignition; can also react with oxidizing agents.

Health hazards: As with most organic solvents, care should be taken to avoid prolonged breathing of vapour; MIBC is not readily absorbed through the skin but it can defat and dry the skin on prolonged contact.

- Do not get in eyes, on skin, on clothing.
- Adequate ventilation systems should be provided; threshold limit value 25 ppm; vapours are heavier than air; vapour density 3.53.
- Wear industrial goggles and rubber gloves when handling.

Storage: Bulk storage should provide for a dry air or dry nitrogen blanket to prevent moisture pick up; tank should be grounded and all sources of ignition removed via explosion proof electrical equipment, etc.; drums should be stored in a dry, well-ventilated space away from sources of ignition.

Handling materials: Generally speaking, MIBC is not corrosive to metals; iron, mild steel, copper or aluminum is suitable for plant equipment or containers.

Handling procedures: Keep drums tightly closed; keep material away from heat, open flame, sparks, and other sources of ignition.

This product information is believed to be accurate but by its issuance Canadian Industries Limited assumes no responsibility nor does it guarantee any results.



Canadian Industries Limited
Industrial Chemicals
 P.O. Box 10, Montreal 101, Quebec

METHYL ISOBUTYL CARBINOL

<u>CHARACTERISTICS</u>	<u>SPECIFICATIONS</u>	<u>TYPICAL PROPERTIES</u>
Specific Gravity @ 20/20°C	0.807 - 0.809	0.8079
Distillation Range °C (D-1078)	130 - 133	131-133
Acidity %W as Acetic	0.002 max	
Purity % W	98.5 min.	98.6
Colour Pt./Co.	10 max.	5
Water Content (5% in n-Heptane)	No Turbidity	Pass
Flash Tag O.C. °F		131
Tag C.C. °F		102
Water Content	0.1 max.	
Non-Volatile Matter %W	0.005 max.	

(The formulae and statements herein are accurate to the best of our knowledge. However, since application in the users plant is under conditions beyond our control, suggestions and recommendations are made without warranty or guarantee of any kind and Buyer assumes all risks and liability of such use. Nothing contained herein shall be construed as a recommendation to use any product or process in conflict with existing patents covering material or its use.)

MATERIAL SAFETY DATA SHEET

EMERGENCY TELEPHONE NUMBERS

Toronto, Ont. (416) 226-8117
Montreal, Que. (514) 861-1211
Winnipeg, Man. (204) 843-8827
Edmonton, Alta. (403) 424-1754
Vancouver, B.C. (604) 686-6036

PRODUCT IDENTIFICATION

Product Name: *Methyl Isobutyl Carbinol*
Chemical Name: *Methyl Amyl Alcohol*
Synonyms: *MIBC*
Chemical Family: *Alcohols*
Molecular Formula: $(CH_3)2CHCH_2CH(CH_3)OH$
Product Use: *Industrial Solvent*

HAZARDOUS INGREDIENTS OF MATERIAL

Hazardous Ingredients	%	ACGIH TLV (skin)	CAS No.
Methyl Isobutyl Carbinol	60-100	25 ppm	108-11-2

PHYSICAL PROPERTIES

Physical State: *Liquid*
Appearance And Odour: *A colourless stable liquid with a sharp odour*
Odour Threshold: *No data*
Boiling Range (°C): *130-132°C*
Melting/Freezing Point (°C): *No data*
Vapour Pressure: *2.2 mmHg at 20°C*
Specific Gravity: *0.808 (20/20°C)*
Vapour Density: *3.5 (air = 1)*
Bulk Density: *No data*
Evaporation Rate: *0.27 (n-butyl acetate = 1)*
Solubility: *Soluble in water*
% Volatile by Volume: *100%*
pH: *No data*
Coefficient of water/oil distribution: *No data*
Sensitivity to Mechanical Impact: *No data*
Rate of Burning: *No data*
Explosive Power: *No data*
Sensitivity to Static Discharge: *No data*

REACTIVITY DATA

Stability: *Stable*
Under Normal Conditions: *Stable*
Under Fire Conditions: *Flammable*
Hazardous Polymerization: *Will not occur*
Conditions to Avoid: *Avoid excessive amounts of heat and all possible ignition sources.*
Materials to Avoid: *Avoid contact with strong oxidizing materials.*
Hazardous Decomposition or Combustion Products: *Carbon monoxide and carbon dioxide are produced on combustion.*

SHIPPING DESCRIPTION (Under the TDG Act)

Shipping Name: *Not Regulated*
Shipping Class/Division: *Not Regulated*
Product Identification No (PIN): *Not Regulated*
Packing Group: *Not Regulated*

FIRE AND EXPLOSION DATA

Flash Point (method): *44°C (Tag Closed Cup)*
Autoignition Temperature: *No data*
Flammability Limits in air (%): *UEL: 5.6 LEL: 1.0*

Fire Extinguishing Media: *Apply aqueous film forming foam (AFFF) according to manufacturer's recommended techniques for large fires. Use carbon dioxide or dry chemical media for small fires. Use water only in the form of a fog.*

Fire Fighting Procedures: *Use water spray to cool fire-exposed containers or structures. Use water spray to disperse vapours; re-ignition is possible. Use self-contained breathing apparatus and protective clothing.*
Other Fire or Explosion Hazards: *Vapours from this product are heavier than air, and may "travel" to a source of ignition (eg. pilot lights, heaters, electric motors) some distance away, and then "flash back" to the point of product discharge causing an explosion and fire.*

TOXICOLOGICAL AND HEALTH DATA

Recommended Exposure Limit:
ACGIH TLV/TWA: *25 ppm - skin*

Toxicological Data:
LD50 (oral, rat) = *2590 mg/kg (1)*
LD50 (dermal, rabbit) = *2560 mg/kg (1)*
LC50 (Inhalation, rat) = *16 mg/l (2)*

Carcinogenicity Data: *The ingredients of this product are not listed as carcinogens by NTP, (National Toxicology Program), not regulated as carcinogens by OSHA, (Occupational Safety and Health Administration), and have not been evaluated by IARC, (International Agency for Research on Cancer) or ACGIH (American Conference of Governmental Industrial Hygienists).*

Reproductive Effects: *No information is available and no adverse reproductive effects are anticipated.*

Mutagenicity Data: *No information is available and no adverse mutagenic effects are anticipated.*

Teratogenicity Data: *No information is available and no adverse teratogenic effects are anticipated.*

Synergistic Materials: *None known*

Effects of exposure when:

Inhaled: *Vapours are irritating to the eyes and respiratory tract. May cause systemic poisoning and central nervous system (CNS) depression. (See "Other Health Effects")*

In contact with the skin: *Prolonged and repeated contact may cause mild skin irritation. May be absorbed through intact skin causing systemic poisoning and central nervous system (CNS) depression. (See "Other Health Effects")*

In contact with the eyes: *May cause irritation, corneal burns, conjunctivitis, and possible corneal damage.*

Ingested: *May cause mild gastrointestinal discomfort and central nervous system (CNS) depression. (See "Other Health Effects")*

Other Health Effects: *CNS depression is characterized by headache, dizziness, drowsiness, nausea, vomiting, abdominal pain and incoordination. Severe overexposures may lead to coma and possible death due to respiratory failure.*

First Aid Procedures when:

Inhaled: *Move victim to fresh air. Give artificial respiration ONLY if breathing has stopped. Give cardiopulmonary resuscitation (CPR) if there is no breathing AND no pulse. Obtain medical attention IMMEDIATELY.*

In contact with the skin: *Flush skin with running water and wash affected areas thoroughly with soap and water. Start flushing while removing contaminated clothing. Obtain medical attention IMMEDIATELY.*

In contact with the eyes: *Immediately flush eyes with running water for minimum of 20 minutes. Hold eyelids open during flushing. If irritation persists, repeat flushing. Obtain medical attention IMMEDIATELY.*

Stanchem

Ingested: If victim is alert and not convulsing, give 1/2 to 1 glass of water to dilute material. DO NOT induce vomiting. If spontaneous vomiting occurs, have victim lean forward with head down to avoid breathing in of vomitus, rinse mouth and administer more water. Obtain medical attention IMMEDIATELY.

Emergency Medical Care: This product contains materials that may cause severe pneumonitis if aspirated. If ingestion has occurred less than 2 hours earlier, carry out careful gastric lavage; use endotracheal cuff if available, to prevent aspiration. Observe patient for respiratory difficulty from aspiration pneumonitis. Give artificial resuscitation and appropriate chemotherapy if respiration is depressed.

PREVENTATIVE MEASURES

Recommendations listed in this section indicate the type of equipment which will provide protection against overexposure to this product. Conditions of use, adequacy of engineering or other control measures, and actual exposures will dictate the need for specific protective devices at your workplace.

Engineering Controls: Local exhaust ventilation required.

Respiratory Protection: A NIOSH/MSHA approved air-purifying respirator equipped with organic vapour cartridges for concentrations up to 250 ppm. An air-supplied respirator if concentrations are higher or unknown.

Skin Protection: Protective clothing and gloves made from rubber may be impervious under conditions of use.

Eye Protection: Use chemical safety goggles when there is potential for eye contact.

Other Personal Protective Equipment: Impervious apron and boots. Safety shower and eye bath located close to chemical exposure area.

Handling Procedures and Equipment: Ground and bond equipment and containers to prevent a static charge buildup. Use spark-resistant tools and avoid "splash-filling" of containers.

Storage Temperature (°C): Not applicable.

The information contained herein is offered only as a guide to the handling of this specific material and has been prepared in good faith by technically knowledgeable personnel. It is not intended to be all-inclusive and the manner and conditions of use and handling may involve other and additional considerations. No warranty of any kind is given or implied and C-I-L Inc. will not be liable for any damages, losses, injuries or consequential damages which may result from the use or reliance on any information contained herein. This Material Safety Data Sheet is valid for three years.

Date issued: 88 06 17

Date revised: 88 06 17

MSDS index no: GCD 0968188

Prepared by:

The Occupational Health Department (416) 229-8252

Methyl Isobutyl Carbinol

Storage Requirements: Store in a cool, well ventilated area. Do not expose sealed containers to temperatures above 49°C (120°F). Keep away from heat, sparks and flame. Keep containers closed.

Other Precautions: Use only with adequate ventilation. Avoid breathing vapour. Avoid contact with eyes, skin or clothing. Wash thoroughly with soap and water after handling. Wash contaminated clothing thoroughly before re-use.

ENVIRONMENTAL PROTECTION DATA

Steps to be taken in the event of a spill or leak: Stop and contain discharge by constructing barriers (dykes, lagoons) or applying inert sorbent (eg. sand, earth) for release to land, or by damming and water diversion if possible for release to water. Collect product and contaminated soil and water for recovery or disposal. Eliminate all sources of ignition.

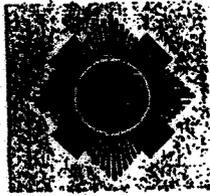
Environmental Effects: Harmful to aquatic life at low concentrations. No quantitative data are available.

Deactivating Chemicals: None known

Waste Disposal Methods: Dispose of waste materials in an approved incinerator or waste treatment/disposal facility in accordance with applicable regulations. Do not dispose of wastes in local sewer or with normal refuse.

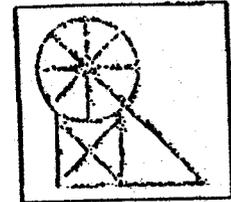
ADDITIONAL INFORMATION AND SOURCES USED

1. RTECS-Registry of Toxic Effects of Chemical Substances, Vol I-III, and the 1983 supplement to the 1981-1982 Edition, Volumes I & II, Richard J. Lewis Sr., Doris V. Sweet, ed., National Institute for Occupational Safety and Health, U.S. Dept. of Health and Human Services, Cincinnati, 1984.
2. Patty's Industrial Hygiene and Toxicology, Vol I, IIA, B, C and Vol IIIA, B, Lewis J. Cralley, Lester V. Cralley, ed., John Wiley & Sons, New York, 2nd ed., 1985.
3. Supplier's Data Sheet



Allied Colloids

Mineral Processing Division



Technical and Processing Data

MPD 1008

PERCOL 352

CATIONIC FLOCCULANT

DESCRIPTION:

PERCOL 352 is a high molecular weight cationic polyacrylamide flocculant supplied as a free flowing granular powder.

PRINCIPAL USES:

PERCOL 352 has found application in a wide variety of mineral processing operations including the following:

1. Acid leach (copper).
2. Acid leach (zinc).
3. Metal hydroxide thickening and filtration.
4. Base metal concentrates thickening and filtration.

Dosage depends upon the application but normally lies in the range 2 gm to 200 gm per tonne of dry substrate flocculated.

TYPICAL PROPERTIES:

Physical form.....white granular powder
 Particle Size.....98% < 750 μ
 Bulk Density.....0.5-0.55
 pH of 1% solution at 25°C.....3.5-4.0
 Viscosity at 25°C....see graph and table

APPLICATION AND STORAGE:

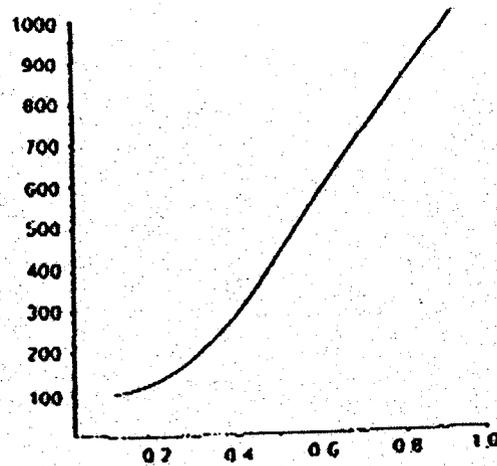
Recommended solution concentrations:
 Stock solution.....0.25-0.5% max.
 Feed solution.....0.025-0.05% max.

Recommended storage periods:
 Solid.....up to two years
 Stock solution.....3-6 days

Storage of polymer should be in a cool, dry place.

Details on preparation and feeding can be obtained from an Allied Colloids representative.

Apparent Viscosity - Concentration Graph
Cps (Fann Viscometer - Shear Rate 4.95 sec⁻¹)



PERCOL 352 concentration (%)

(Fann Viscometer -- 25°C -- solvent -- deionised water)

PERCOL 352 concentration (%)	Shear rate (sec ⁻¹)	4.95	9.90	165	330	495	989
	Viscosity (Cps)						
10		1099	700	111	76	64	49
0.5		399	250	45	33	29	23
0.25		150	125	22	16	14	10
0.10		100	75	12	9	7	5

SHIPPING AND HANDLING:

PERCOL 352 is supplied in 25 Kg polyethylene-lined, multi-walled bags. PERCOL 352 has a low order of toxicity and no special precautions are necessary in handling.

Corrosivity towards most standard material of construction is low, but aluminum and galvanized equipment should be avoided.

TECHNICAL SERVICE:

Advice and assistance in the running of laboratory and plant tests to select the correct flocculant and determine the best application is given by representatives of Allied Colloids, who are experienced in mineral processing applications.

PERCOL is the registered trade name of Allied Colloids.

HEALTH AND SAFETY INFORMATION:

PERCOL 352 exhibits a very low order of oral toxicity and does not present any abnormal problems in its handling or general use.

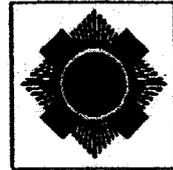
Full details on Health and Safety aspects are available on request.

WARRANTY:

The information contained in this leaflet is given in good faith, but no liability is assumed nor is freedom from any patent owned by Allied Colloids or others implied.



Allied Colloids



Technical and Processing Data

Page 1 of 1

Master No.: 01

MSDS No.: 0002

I. PRODUCT IDENTIFICATION

Manufacturer:

ALLIED COLLOIDS LTD.
P.O. Box 38,
Low Moor, West Yorkshire,
Bradford, BD12 0JZ
ENGLAND Tel.: 011-44-274-671267

Distributor:

ALLIED COLLOIDS (CANADA) INC.
11 Automatic Road,
Brampton, Ontario
L6S 4K6
Emergency Tel.: (416) 793-9473

Product Name: PERCOL 352

Product Type: Copolymer of a quaternary acrylate salt and acrylamide

II. HAZARDOUS INGREDIENTS

Ingredients:
CAS NUMBER:
CONCENTRATION:
LD50:
LC50:

No hazardous ingredients as per WHMIS regulations.

III. PHYSICAL PROPERTIES

Odour and Appearance: White free flowing powder

Density (Water = 1): less than one (1)

Odour Threshold: not available

Vapour Density: not available

Evaporation Rate: not available

Boiling Point: not available

Freezing Point: not available

pH Value: not available

Coeff. of water/oil dist.: not available

Vapour Pressure: not available

Specific Gravity: not available

Solubility (in water): soluble

IV. FIRE AND EXPLOSION HAZARD

Conditions of Flammability: Very low risk.

Flash Point (method of determination) - none exhibited

LEL, UEL - not applicable

Auto-ignition temperature: not available

Flammability Classification: not applicable

Hazardous Combustion Products: none

Explosion Data: not applicable

EXTINGUISHING MEDIA and SPECIAL FIRE FIGHTING PROCEDURES

Carbon dioxide, dry chemical, foam

V. REACTIVITYMaterials to Avoid:

Avoid contact with strong oxidants.

Stability:

This product is stable and will not react violently with water. Hazardous polymerization will not occur.

Hazardous Decomposition Products:

none

VI. TOXICOLOGICAL PROPERTIES OF PRODUCTHAZARD STATEMENTSNature of Hazards:

Eye irritant.

Primary routes of entry:

Ingestion, inhalation

Effects of Acute Exposure: (Signs and symptoms of exposure)

Contact with the eye may produce irritation and redness.

Effects of Chronic exposure:

None

Exposure Limit:

ACGIH: none OSHA PEL: none NIOSH recommended: none

Carcinogenicity Determination by NTP, IARC, OSHA: None

Sensitization of Product: not as sensitizer

Synergistic Materials: none reported

Reproductive Toxicity: not available

Teratogenicity: not available

Mutagenicity: not available

VII. PREVENTIVE MEASURESI. PROTECTIVE EQUIPMENTEye Protection:

Use splash goggles or face shield when eye contact may occur.

Skin Protection:

Use gloves, if needed, to avoid prolonged or repeated skin contact.

Respiratory Protection:

Normally not needed, use dust mask if needed to prevent inhalation of airborne particles.

Ventilation:

Provide adequate ventilation to minimize dust inhalation.

2. PERSONAL HYGIENE

Minimize breathing dust. Avoid prolonged or repeated breathing of dust and contact with skin. Remove contaminated clothing; launder or dry-clean before reuse. Cleanse skin thoroughly after contact, before breaks and meals and at end of work period. Product is readily removed from skin by washing thoroughly with soap and water.

3. PRECAUTIONARY STATEMENTS

Product may create a slip hazard when mixed with water. Spills should be dealt with immediately. Dust generated in handling of this product can be explosive if sufficient quantities are mixed in air in which case ignition sources should be avoided.

4. SPILLS, LEAKS

Spills of dry product present a slip hazard when wet and should be cleaned up immediately. Do not wet spills of dry product. Sweep up dry and flush spill area with water. Spills of dilute solutions may be flushed with copious amounts of water, or alternatively, they may be absorbed with an inert material such as earth or speedi-dry and contained for disposal. The product or its solutions should not be allowed to enter waterways without treatment. Product should be disposed of in accordance with applicable federal, provincial and local regulations.

VIII. EMERGENCY AND FIRST AID PROCEDURES

EYE CONTACT

If splashed into the eyes, flush with clear water for 15 minutes or until irritation subsides. If irritation persists, call a physician.

INGESTION

If ingested, do not induce vomiting; remove product from mouth and call a physician.

IX. PREPARATION INFORMATION

Person to contact: Tracie Schultz, Occupational Health and Safety Department

Prepared by: Tracie Schultz

Date Revised: 11-03-89

The information and recommendations contained herein are, to the best of Allied Colloids' knowledge and belief, accurate and reliable as of the date issued. Allied Colloids does not warrant or guarantee their accuracy or reliability, and Allied Colloids shall not be liable for any loss or damage arising out of their use thereof.

The information and recommendations are offered for the users' consideration and examination, and it is the users' responsibility to satisfy itself that they are suitable and complete for its particular use.

WILDERNESS PLAN

