

MATERIAL SAFETY DATA SHEET

ETCH BATH DIPPING SOLUTION, ARMOUR ETCH THINNER

SECTION I: CHEMICAL PRODUCT AND COMPANY IDENTIFICATION

Common Name : NOT APPLICABLE
 Chemical Name : CHEMICAL MIXTURE
 Formula : CHEMICAL MIXTURE
 Chemical CAS Number : CHEMICAL MIXTURE
 Product Use : FROSTING GLASS AND GLASSWARE
 Supplier : Armour Products
 Address : 176-180 Fifth Avenue
 City, State, Zip : Hawthorne, NJ 07506 USA
 Phone : 1-973-427-8787
 Fax : 1-973-427-8823

FOR CHEMICAL EMERGENCY CALL CHEMTREC (24 HOURS)
 1-800-424-9300 (US, Canada, Puerto Rico, Virgin Islands)
 1-703-527-3887 (Outside Above Area)

SECTION II: COMPOSITION/INFORMATION ON INGREDIENTS

Hazardous Ingredients:	CAS#	EINECS #	WT %	Hazard Symbol; Risk Phrases
Sodium Bifluoride	1333-83-1	215-608-3	0-2.0%	T, C; R: 25, 34
Sulfuric Acid	7664-93-9	231-639-5	1.0-12.0%	C; R: 35
Barium Sulfate	7727-43-7	231-784-4	9.0-15.0%	None Assigned
Ammonium Bifluoride	1341-49-7	215-676-4	26.0-35.0%	T, C; R: 25, 34
Water and other constituents. Each of the other constituents is present in less than 1 percent concentration (0.1% concentration for potential carcinogens, reproductive toxins, respiratory tract sensitizers, and mutagens).			Balance	Not Applicable

NOTE: ALL Canadian WHMIS required information is included in appropriate sections based on the ANSI Z400.1-1998 format. This product has been classified in accordance with the hazard criteria of the CPR and the MSDS contains all the information required by the CPR, EU Directives.

See Section XVI for full text of Ingredient Risk Phrases. See Section VIII for Exposure Limits and Section XI for Toxicological Information

SECTION III: HAZARD IDENTIFICATION

EMERGENCY OVERVIEW

Description: Odorless, tan, or tan liquid suspension.

Health Hazards: May be fatal if swallowed. Causes eye and skin burns. May cause respiratory tract irritation or burns. Burns to exposed tissue may not be immediately painful or visible.

Flammability Hazard: Not a fire or explosion hazard, however, upon contact with most metals, flammable hydrogen gas will be emitted. When involved in a fire, the solution will produce toxic fumes and gases (e.g. fluoride compounds and barium compounds).

Reactivity Hazards: Will react with most metals to produce flammable hydrogen gas.

Environmental Hazards: If released to terrestrial or an aquatic environment, this product may cause harm to plants and animals.

Emergency Response Considerations: Emergency responders must wear proper personal protective equipment for the incident to which they are responding. Runoff water must be contained and disposed of. Protection of the environment during spill response must occur.

ROUTES OF ENTRY

Eyes? YES Skin? YES Inhalation? YES Ingestion? YES

SECTION III: HAZARD IDENTIFICATION (Continued)

POTENTIAL HEALTH EFFECTS

EYE CONTACT may cause severe irritation with possible corneal burns.

SKIN CONTACT causes severe burns and fluoride-like burns, which may not be immediately evident. Skin contact may cause hypocalcemia by skin absorption. The fluoride components of this product can penetrate the skin and destroy the deep tissue layers, including bone tissue. This damage to the body's tissues may continue for days, as the fluoride ion reacts with the calcium in the skin and bone. Severe skin-contact exposures (especially when the skin contamination exceeds 160 cm²) can cause hypocalcemia, a life threatening lowering of serum calcium in the body.

INHALATION may cause irritation to the respiratory tract and lung damage if exposure is excessive. Inhalation may lead to hypercalcemia, due to absorption of the fluoride components. Chronic, low-level inhalation exposure may cause bronchitis, dental erosion and perforation of the nasal septum. Chronic, low-level inhalation may also cause baritosis, which is benign form of pneumoconiosis, due to the Barium Sulfate component. There are several reports of death due to acute hypersensitivity reaction and acute inflammation of the bronchi and peripheral airways after accidental inhalation of barium sulfate.

INGESTION can cause very serious damage to the mouth, esophagus, stomach, and other tissues with which contact is made. Reported symptoms of ingestion of fluoride salts, such as in this product include salivation, nausea. Repeated small doses may produce no other symptoms, but polyuria and polydipsia have also been reported. Large doses lead promptly to burning or crampy abdominal pain, intense vomiting and diarrhea, often with hematemesis and melena, dehydration and thirst, muscle weakness, tremors, and rarely transient epileptiform convulsions, preceded or followed by progressive central nervous depression (lethargy, coma and respiratory arrest, even in the absence of circulatory failure), shock characterized by pallor, weak and thready pulse (sometimes irregular), shallow unlabored respiration, weak heart sounds, wet cold skin, cyanosis, anuria, dilated pupils, followed almost invariably by death in 2 to 4 hours. Even in the absence of shock, arrhythmias may occur, especially multiple episodes of ventricular fibrillation leading eventually to cardiac arrest. If the victim survives a few hours, paralysis of the muscles of deglutition, carpopedal spasm, and painful spasms of the extremities, occasionally localized or generalized urticaria. The above signs and symptoms are related to a variety of metabolic disorders that may occur in acute fluoride poisoning, including hypocalcemia, hypomagnesaemia, metabolic and/or respiratory acidosis and sometimes hyperkalemia. Ingestion may be fatal.

CARCINOGENICITY

The fluoride components of this product are listed by agencies tracking the carcinogenic potential of chemical compounds as, "Fluorides, as F", as follows:

- | | |
|--|----------------|
| ACGIH TLV-A4: (Not Classifiable as a Human Carcinogen) | EPA: NO |
| IARC-3: (Unclassifiable as to Carcinogenicity in Humans) | GERMAN MAK: NO |
| NIOSH: NO | NTP? NO |
| | OSHA? NO |

The Sulfuric Acid component is listed by several agencies, but the carcinogenic classification only applies to sulfuric acid strong mists, which would not apply to the sulfuric acid in this product.

HAZARDOUS MATERIAL IDENTIFICATION SYSTEM			
HEALTH HAZARD	(BLUE)	3*	
FLAMMABILITY HAZARD	(RED)	0	
PHYSICAL HAZARD	(YELLOW)	1	
PROTECTIVE EQUIPMENT			
EYES	RESPIRATORY	HANDS	BODY
SEE SECTION 8			
For Routine Industrial Use and Handling Applications			

Hazard Scale: 0 = Minimal 1 = Slight 2 = Moderate
3 = Serious 4 = Severe * = Chronic hazard

SECTION III: HAZARD IDENTIFICATION (Continued)

SUMMARY OF HEALTH EFFECTS OR RISKS FROM EXPOSURE (An explanation in lay terms).

ACUTE HEALTH HAZARDS

This product is corrosive. Depending on the duration of contact, overexposures can severely irritate or burn the eyes, skin, mucous membranes, and any other exposed tissue, by all routes of exposure. Due to the presence of the fluoride components of this product, overexposure by all routes may cause hypocalcemia, which can be fatal unless treated. Severe inhalation, skin and ingestion overexposure may be fatal.

CHRONIC HEALTH HAZARDS

Exposure to Fluorides over years may produce mottling of tooth enamel, embrittlement and decalcification of bones and increased calcification of ligaments and vertebrae resulting in spinal stiffness (fluorosis). Repeated exposure may cause dental erosion, jaw necrosis, nasal ulceration, asthma, bronchitis and other respiratory ailments.

TARGET ORGANS

ACUTE: Skin, eyes, respiratory system.

CHRONIC: Skin, respiratory system, bones

NOTE: See Section VIII for Exposure Limits, Section XI for Toxicological Information and Section XII for Ecological Information.

SECTION IV: FIRST AID MEASURES

RESCUERS SHOULD NOT ATTEMPT TO RETRIEVE VICTIMS OF EXPOSURE TO THIS PRODUCT WITHOUT ADEQUATE PERSONAL PROTECTIVE EQUIPMENT, OR BY THEMSELVES. If necessary, Self-Contained Breathing Apparatus and chemical-protective clothing should be worn.

Victims of chemical exposure must be taken for medical attention. Rescuers should be taken for medical attention if necessary. Take a copy of label and MSDS to health professional with victim.

INHALATION:

If inhaled, remove victim to fresh air. If necessary, use artificial respiration to support vital functions. Seek immediate medical attention.

SKIN CONTACT

If the product contaminates the skin, immediately begin decontamination with running water. Minimum flushing is for 15 minutes. Do not interrupt flushing. Remove exposed or contaminated clothing, taking care not to contaminate eyes. Do not reuse clothing or shoes until cleaned. Do not apply oils or ointments unless ordered to by a physician. Victim must seek immediate medical attention.

EYE CONTACT:

If product enters the eyes, open victim's eyes while under gently running water. Use sufficient force to open eyelids. Have victim "roll" eyes. Minimum flushing is for 15 minutes. Do not interrupt flushing. Seek immediate medical attention.

INGESTION

If this product is swallowed, CALL PHYSICIAN OR POISON CONTROL CENTER FOR MOST CURRENT INFORMATION. If professional advice is not available, do not induce vomiting. Rinse mouth with water immediately. Victim should drink large quantities of water. If milk is available, victim should drink it after drinking water. Never induce vomiting or give diluents (milk or water) to someone who is unconscious, having convulsions, or unable to swallow.

NOTE: In the event the symptoms of fluoride poisoning develop, refer to "Recommendations to Physicians" below.

MEDICAL CONDITIONS GENERALLY AGGRAVATED BY EXPOSURE

May aggravate existing medical conditions such as allergies, dermatitis, asthma, bronchitis or any other respiratory ailment.

SECTION IV: FIRST AID MEASURES (Continued)

RECOMMENDATIONS TO PHYSICIANS

Treat symptoms and eliminate overexposure. All personnel providing treatment must be gloved. If symptoms of fluoride poisoning develop, treatment recommendations for contamination are as follows:

Skin Contact: After 15 minute water flush (if flush has not yet been done), apply calcium gluconate gel (2.16.33% concentration) until pain has subsided, but not longer than 30 minutes. If pain lasts longer than 15 minutes, proceed with calcium gluconate injections.

Eye Contact: After 15 minutes water flush (if flush has not been done), flush eyes with 1% calcium gluconate gel in normal, sterile saline.

Inhalation: Provide 100% oxygen, followed by inhalation of a mist containing 2% calcium gluconate in saline solution. Watch for pulmonary edema.

Ingestion: Gastric lavage with lime water or milk.

Hazard Scale: 0 = Minimal 1 = Slight 2 = Moderate
3 = Serious 4 = Severe * = Chronic hazard

SECTION V: FIRE FIGHTING MEASURES

Flash Point: Not Applicable

Auto-Ignition: Not Applicable

LEL: Not Applicable

UEL: Not Applicable

EXTINGUISHING MEDIA

Water Spray: YES

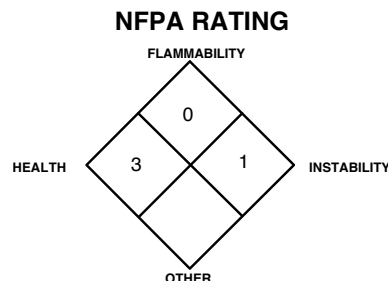
Foam: YES

Halon: YES

Carbon Dioxide: YES

Dry Chemical: YES

Other: Any "ABC" Class



SPECIAL FIRE FIGHTING PROCEDURES

Move containers from fire area if it can be done without risk to firefighters. Incipient fire responders should wear eye protection. Structural firefighters must wear Self-Contained Breathing Apparatus and full protective equipment. Chemical resistant clothing may be necessary, as specified in 29 CFR 1910.156. If this product is involved in a fire, fire run-off water should be contained to prevent possible environmental damage. All contaminated equipment must be thoroughly cleaned with a neutralizer suitable for acidic solutions and fluoride compounds and rinsed with water before such equipment is returned to service.

UNUSUAL FIRE AND EXPLOSION HAZARDS

This product is corrosive and presents a severe contact hazard to firefighters. When involved in a fire, this material may decompose and produce irritating vapors, and toxic gases (e.g., fluorine and other fluoride compounds). This solution can give off a small amount of heat when mixed with water. Contact with some metals may produce flammable hydrogen gas.

EXPLOSION SENSITIVITY TO MECHANICAL IMPACT: Not sensitive.

EXPLOSION SENSITIVITY TO STATIC DISCHARGE: Not sensitive.

SECTION VI: ACCIDENTAL RELEASE MEASURES

All persons responding to spills of this product must be adequately trained to respond to chemical spills and must wear appropriate personal protective equipment. Contain spillage, absorb spilled liquid on material appropriate for acidic materials and scoop into a container for disposal, avoiding generation of dusts. Decontaminate the area thoroughly. Neutralize residue with sodium bicarbonate or other neutralizing agent for acids. Test area with litmus paper to ensure neutralization is complete. Place all spill residue in a suitable container and seal. **DO NOT STORE WASTE IN GLASS CONTAINERS.** Notification of the National Response Center (800-424-8002) may be required. Refer to U.S. EPA, DOT and applicable U.S. state and local regulations, as well as applicable regulations of Canada and EU Member States for current response information. It is recommended that each user establish a spill prevention, control and countermeasure plan (SPCC). Such a plan should include procedures applicable to proper storage, clean-up of spills, including reuse or disposal as appropriate (See Section XI: Disposal Considerations).

SECTION VI: ACCIDENTAL RELEASE MEASURES (Continued)

****NOTE**** In the event of accidental release of this material, the above procedures should be followed. Additionally, proper exposure controls and personal protective equipment should be utilized (See Section VIII: Exposure Control/Personal Protection) and disposal of the material should be in accordance with Section XI: Disposal Considerations.

SECTION VII: HANDLING AND STORAGE

WORK PRACTICES AND HYGIENE PRACTICES

Avoid all contact with this material. All employees who handle this material should be trained to handle it safely. Avoid breathing mists or sprays generated by this material. Wash thoroughly after handling this material. All personal protective equipment, tools, etc. should be neutralized thoroughly with sodium carbonate or dilute ammonia after each use. Check gloves DAILY for pinhole leaks. Discard defective gloves. Never touch outer surfaces of gloves after use. Wash contaminated clothing before reuse. Destroy contaminated shoes. Do not eat or drink while handling this material. All work practices should minimize the release of this material. Eyewash stations and safety showers should be in areas of use of this material. **Calcium gluconate gel should be readily accessible in areas where potential exposure to this product exists.**

STORAGE AND HANDLING PRACTICES

All employees who handle this material should be trained to handle it safely. Avoid breathing mists or sprays generated by this product. Use in a well-ventilated location. Open containers slowly on a stable surface. Containers of this product must be properly labeled. Empty containers may contain residual product; therefore, empty containers should be handled with care. Store containers in a cool, dry location, away from direct sunlight, sources of intense heat, or where freezing is possible. **DO NOT STORE IN GLASS CONTAINERS.** Store away from incompatible materials (see Section X, Stability and Reactivity). Material should be stored in secondary containers or in a diked area, as appropriate. Keep container tightly closed when not in use. Storage areas should be made of fire and corrosion resistant materials. If appropriate, post warning signs in storage and use areas. Inspect all incoming containers before storage to ensure containers are properly labeled and not damaged.

PROTECTIVE PRACTICES DURING MAINTENANCE OF CONTAMINATED EQUIPMENT

Follow practices indicated in Section VI (Accidental Release Measures). Make certain that application equipment is locked and tagged-out safely. Always use this product in areas where adequate ventilation is provided. Decontaminate equipment using neutralizing agent suitable for acids and follow with a triple-rinse with water before maintenance begins. Collect all rinsates and dispose of according to applicable U.S. Federal, State, or local procedures, or applicable standards of Canada and its Provinces and those of EU Member States.

SECTION VIII: EXPOSURE CONTROLS/PERSONAL PROTECTION

VENTILATION AND ENGINEERING CONTROLS

Use with adequate ventilation. Follow standard medical product handling procedures. During decontamination of work surfaces, workers should wear the same equipment recommended in Section VI (Accidental Release Measures) of this MSDS.

EXPOSURE LIMITS

CHEMICAL NAME	CAS #	EXPOSURE LIMITS IN AIR									
		ACGIH-TLV		OSHA-PEL		NIOSH-RELS		AIHA WELs		NIOSH IDLH	DFG MAK ^s
		TWA mg/m ³	STEL mg/m ³	TWA mg/m ³	STEL mg/m ³	TWA mg/m ³	STEL mg/m ³	TWA mg/m ³	STEL mg/m ³		
Ammonium Bifluoride, Sodium Bifluoride Exposure limits are for Fluorides, as F		2.5	NE	2.5	NE	2.5	NE	NE	NE	NE	TWA = 2.5 (inhalable fraction) PEAK = 2•MAK 15 min. average value, 1-hr interval

NE = Not Established. T = Measured as Thoracic fraction of the aerosol.

SECTION VIII: EXPOSURE CONTROLS/PERSONAL PROTECTION (Continued)

EXPOSURE LIMITS (continued)

CHEMICAL NAME	CAS #	EXPOSURE LIMITS IN AIR									
		ACGIH-TLV		OSHA-PEL		NIOSH-RELs		AIHA WEELs		NIOSH IDLH mg/m ³	DFG MAKs mg/m ³
		TWA mg/m ³	STEL mg/m ³	TWA mg/m ³	STEL mg/m ³	TWA mg/m ³	STEL mg/m ³	TWA mg/m ³	STEL mg/m ³		
Barium Sulfate	7727-43-7	10	NE	5 (resp. fract.); 15 (total dust)	NE	5 (resp. fract.); 10 (total dust)	NE	NE	NE	NE	TWA = 4 (inhalable fraction); 1.5 (resp. fraction)
Sulfuric Acid	7664-93-9	0.2 (T)	NE	1	NE	1	NE	NE	NE	15	TWA = 0.1 (inhalable fraction) PEAK = 1 • MAK 15 min. average value, 1-hr interval; 0.2 (ceiling) DFG MAK Pregnancy Risk Classification: C

NE = Not Established. T = Measured as Thoracic fraction of the aerosol.

INTERNATIONAL OCCUPATIONAL EXPOSURE LIMITS

Currently the following international exposure limits are established for the components of this product.

AMMONIUM BIFLUORIDE & SODIUM BIFLUORIDE:

Belgium: TWA = 2.5 mg(F)/m³, JAN 1993
 Finland: TWA = 2.5 mg(F)/m³, JAN 1993
 France: VME = 2.5 mg(F)/m³, JAN 1999
 Germany: MAK = 2.5 mg(F)/m³, JAN 1999
 Hungary: TWA = 1 mg(F)/m³, STEL = 2 mg(F)/m³, JAN 1993
 The Netherlands: MAC-K = 3.5 mg(F)/m³, JAN 1999
 Norway: TWA = 0.6 mg(F)/m³, JAN 1999
 The Philippines: TWA = 2.5 mg(F)/m³, JAN 1993
 Poland: MAC(TWA) = 1 mg(HF)/m³, MAC(STEL) = 3 mg(HF)/m³, JAN 1999
 Russia: TWA = 0.2 mg/m³, STEL = 1 mg/m³, JAN 1993
 Sweden: NGV = 2 mg(F)/m³, JAN 1999
 Switzerland: MAK-W = 1.8 ppm (1.5 mg(F)/m³), KZG-W = 3.6 ppm (3.0 mg(F)/m³), JAN 1999
 Thailand: TWA = 2.5 mg(F)/m³, JAN 1993
 Turkey: TWA = 2.5 mg(F)/m³, JAN 1993
 United Kingdom: TWA = 2.5 mg(F)/m³, SEP 2000
 In Argentina, Bulgaria, Colombia, Jordan, Korea, New Zealand, Singapore, Vietnam, New Zealand, Singapore, Vietnam check ACGIH TLV

BARIUM SULFATE:

Australia: TWA = 10 mg/m³, JAN 1993
 Austria: MAK = 0.5 mg(Ba)/m³, JAN 1999
 Belgium: TWA = 10 mg/m³ (resp. dust), JAN 1993
 Denmark: TWA = 0.5 mg(Ba)/m³, JAN 1999
 Finland: TWA = 0.5 mg(Ba)/m³, JAN 1999
 Germany: MAK = 0.5 mg(Ba)/m³, JAN 1999
 Norway: TWA = 0.5 mg(Ba)/m³, JAN 1999

BARIUM SULFATE (continued):

Sweden: TWA = 0.5 mg(Ba)/m³, JAN 1999
 Switzerland: MAK-W = 0.5 mg(Ba)/m³, JAN 1999
 United Kingdom: TWA = (Respirable dust) 4 mg(Ba)/m³, SEP 2000
 United Kingdom: TWA = 10 mg(Ba)/m³ (total dust), SEP 2000
 In Argentina, Bulgaria, Colombia, Jordan, Korea, New Zealand, Singapore, Vietnam, New Zealand, Singapore, Vietnam check ACGIH TLV

SULFURIC ACID:

ARAB Republic of Egypt: TWA = 1 mg/m³, JAN 1993
 Australia: TWA = 1 mg/m³, JAN 1993
 Austria: MAK = 1 mg/m³, JAN 1999
 Belgium: TWA 1 mg/m³, STEL = 3 mg/m³, JAN 1993
 Denmark: TWA = 1 mg/m³, JAN 1999
 Finland: TWA = 1 mg/m³, STEL 3 mg/m³, Skin, JAN 1999
 France: VME = 1 mg/m³, VLE = 3 mg/m³, JAN 1999
 Germany: MAK = 1 mg/m³, JAN 1999
 Hungary: STEL = 1 mg/m³, JAN 1993
 Japan: OEL = 1 mg/m³, JAN 1999
 The Netherlands: MAC-TGG = 1 mg/m³, JAN 1999
 Norway: TWA = 1 mg/m³, JAN 1999
 Poland: MAC(TWA) = 1 mg/m³, MAC(STEL) = 3 mg/m³, JAN 1999
 Russia: STEL = 1 mg/m³, Skin, JAN 1993
 Sweden: NGV = 1 mg/m³, TKV 3 mg/m³, JAN 1999
 Switzerland: MAK-W = 1 mg/m³, KZG-W = 2 mg/m³, JAN 1999
 Thailand: TWA = 1 mg/m³, JAN 1993
 Turkey: TWA = 1 mg/m³, JAN 1993
 United Kingdom: TWA = 1 mg/m³, SEP 2000
 In Argentina, Bulgaria, Colombia, Jordan, Korea, New Zealand, Singapore, Vietnam check ACGIH TLV

RESPIRATORY PROTECTION

Maintain airborne contaminant concentrations below exposure limits listed in Section XIII (Exposure Controls/Personal Protection-Exposure Limits), if applicable. If respiratory protection is needed, use only protection authorized in the U.S. Federal OSHA Standard (29 CFR 1910.134), equivalent U.S. State standards, Canadian CSA Standard Z94.4-93, the European Standard EN149, and EC member states. Oxygen levels below 19.5% are considered IDLH by OSHA. In such atmospheres, use of a full-facepiece pressure/demand SCBA or a full facepiece, supplied air respirator with auxiliary self-contained air supply is required under OSHAs Respiratory Protection Standard (1910.134-1998).

SECTION VIII: EXPOSURE CONTROLS/PERSONAL PROTECTION (Continued)

EYE PROTECTION

Splash goggles or safety glasses with side shields. If necessary, refer to U.S. OSHA 29 CFR 1910.133, the European Standard EN166 and appropriate Standards of Canada for further information.

HAND PROTECTION

Use butyl rubber, Teflon, Viton, Saranex, or Responder gloves for routine industrial use. Check gloves for leaks. Wash hands before putting on gloves and after removing gloves. Gloves should cover the gown cuff. If necessary, refer to U.S. OSHA 29 CFR 1910.138, and appropriate Standards of the EC and Canada for further information.

BODY PROTECTION

Use body protection appropriate for task. An apron or other impermeable body protection is suggested. Full-body chemical protective clothing is recommended for emergency response procedures. If a hazard of injury to the feet exists due to falling objects, rolling objects, where objects may pierce the soles of the feet or where employee's feet may be exposed to electrical hazards, use foot protection, as described in U.S. OSHA 29 CFR 1910.136.

PERSONAL SAMPLING PROCEDURES

For FLUORIDE COMPOUNDS: Refer to NIOSH Manual of Analytical Methods, 3rd Edition, Volume 1, Method 7902.

SECTION IX: PHYSICAL AND CHEMICAL PROPERTIES

Boiling Point: Not Applicable

Specific Gravity (H₂O=1): Not Determined

Melting Point: Not Determined

Vapor Pressure (mm Hg): Not Applicable

Vapor Density (Air=1): Not Applicable

Evaporation Rate (Butyl Acetate=1): Not Applicable

% Solubility in Water: Soluble

Appearance: Tan or blue liquids, or tan liquid suspension.

Odor: Odorless

pH: Acidic.

SECTION X: STABILITY AND REACTIVITY

STABILITY

Stable at standard temperature and pressure.

INCOMPATIBILITIES (Materials to Avoid)

Carbides, chlorates, cyanides, metal powders, nitrates, acids, bases, aluminum, phosphorous, glass and most metals.

HAZARDOUS DECOMPOSITION OR BY-PRODUCTS

If heated to decomposition, this product may produce sulfur oxides, nitric oxides, ammonia, barium oxides and hydrogen fluoride. This product may react with acids to liberate hydrogen fluoride and may react with basic materials to release ammonia. Solutions of the product can corrode glass, cement and most metals.

POLYMERIZATION

Hazardous polymerization is not expected to occur.

CONDITIONS TO AVOID

Avoid contact with incompatible chemicals and excessive heat.

SECTION XI: TOXICOLOGICAL INFORMATION

GENERAL TOXICITY INFORMATION

This product contains fluoride compounds which are toxic by all routes of exposure. Contact via skin, inhalation and ingestion can cause hypocalcemia, a life-threatening lowering of serum calcium in the body. Chronic, low-level inhalation may also cause baritosis, which is benign form of pneumoconiosis, due to the Barium Sulfate component.

IRRITANCY OF PRODUCT

This product can severely irritate or burn contaminated tissue by all routes of exposure. Burns may not be immediately visible or painful.

SENSITIZATION OF PRODUCT

There are several reports of death due to acute hypersensitivity reaction and acute inflammation of the bronchi and peripheral airways after accidental inhalation of Barium Sulfate.

TOXICITY DATA

The following are toxicity data currently available for the components of this product listed in Section II (Composition/Information on Ingredients). No data are available for the fluoride components. Data is available for other components no listed in Section II, but are not presented in this MSDS.

BARIUM SULFATE:

LD (Intratracheal-Mouse) > 600 µL/kg: Lungs, Thorax, or Respiration: other changes

TDLo (Intraleural-Rat) 200 mg/kg Tumorigenic: equivocal tumorigenic agent by RTEC criteria; Lungs, Thorax, or Respiration: tumors

LDLo (Intratracheal-Rat) 250 mg/kg Lungs, Thorax, or Respiration: fibrosis (interstitial); Lungs, Thorax, or Respiration: other changes

TCLo (Inhalation-Mammal-Species Unspecified) 250 mg/m³/1 hour/24 weeks-intermittent: Lungs, Thorax, or Respiration: structural or functional change in trachea or bronchi

TCLo (Inhalation-Mammal-Species Unspecified) 40 mg/m³/8 weeks-intermittent: Lungs, Thorax, or Respiration: structural or functional change in trachea or bronchi

SULFURIC ACID:

Standard Draize Test (Eye-Rabbit) 250 µg: Severe

Rinsed with Water (Eye-Rabbit) 5 mg/30 seconds: Severe

TCLo (Inhalation-Human) 0.6 mg/m³: Lungs, Thorax, or Respiration: cough

TCLo (Inhalation-Human) 0.73 mg/m³: Sense Organs and Special Senses (Eye): effect, not otherwise specified

TCLo (Inhalation-Human) 0.63 mg/m³: Brain and Coverings: changes in surface EEG

TCLo (Inhalation-Human) 3 mg/m³/5 minutes: Lungs, Thorax, or Respiration: dyspnea

TCLo (Inhalation-Human) 3 mg/m³/24 weeks: Musculoskeletal: changes in teeth and supporting structures

TCLo (Inhalation-Human) 1 mg/m³/3 hours: Lungs, Thorax, or Respiration: other changes

LDLo (Unreported-Man) 135 mg/kg

LD₅₀ (Oral-Rat) 2140 mg/kg

LC₅₀ (Inhalation-Rat) 510 mg/m³/2 hours

LC₅₀ (Inhalation-Rat) 510 mg/m³

LC₅₀ (Inhalation-Mouse) 320 mg/m³/2 hours

LC₅₀ (Inhalation-Mouse) 320 mg/m³

LC₅₀ (Inhalation-Guinea Pig) 18 mg/m³: Lungs, Thorax, or Respiration: other changes

LC₅₀ (Inhalation-Guinea Pig) 18 mg/m³/8 hours

LCLo (Inhalation-Guinea Pig) 65 mg/m³/30 minutes: Lungs, Thorax, or Respiration: bronchiolar constriction

LCLo (Inhalation-Mouse) 461 mg/m³/7 hours

SULFURIC ACID (continued):

LCLo (Inhalation-Rat) 461 mg/m³/7 hours

LCLo (Inhalation-Rabbit) 461 mg/m³/7 hours

LCLo (Inhalation-Cat) 461 mg/m³/7 hours

TCLo (Inhalation-Rat) 784 µg/m³/24 hours/84 days-continuous: Behavioral: muscle contraction or spasticity; Kidney, Ureter, Bladder: other changes in urine composition; Biochemical: Enzyme inhibition, induction, or change in blood or tissue levels: true cholinesterase

TCLo (Inhalation-Rat) 1.8 mg/m³/24 hours/65 days-continuous: Peripheral Nerve and Sensation: recording from peripheral motor nerve; Kidney, Ureter, Bladder: changes in both tubules and glomeruli

TCLo (Inhalation-Rat) 0.3 mg/m³/6 hours/5 days-intermittent: Sense Organs and Special Senses (Olfaction): effect, not otherwise specified; Lungs, Thorax, or Respiration: other changes

TCLo (Inhalation-Rat) 0.2 mg/m³/6 hours/4 weeks-intermittent: Lungs, Thorax, or Respiration: other changes

TCLo (Inhalation-Guinea Pig) 30 mg/m³/7 days-continuous: Lungs, Thorax, or Respiration: acute pulmonary edema; Related to Chronic Data: death

TCLo (Inhalation-Guinea Pig) 4 mg/m³/24 hours/18 days-continuous: Lungs, Thorax, or Respiration: fibrosis (interstitial), acute pulmonary edema

TCLo (Inhalation-Guinea Pig) 8 mg/m³/5 days: Behavioral: food intake (animal), changes in motor activity (specific assay); Lungs, Thorax, or Respiration: acute pulmonary edema

TCLo (Inhalation-Monkey) 2 mg/m³/23 hours/78 weeks-intermittent: Lungs, Thorax, or Respiration: other changes

TCLo (Inhalation-Monkey) 2.4 mg/m³/24 hours/78 weeks-continuous: Lungs, Thorax, or Respiration: other changes

TCLo (Inhalation-Monkey) 2.4 mg/m³/24 hours/78 weeks-continuous: Lungs, Thorax, or Respiration: respiratory depression

TCLo (Inhalation-Horse, Donkey) 0.1 mg/m³/5 days/26 weeks-intermittent: Lungs, Thorax, or Respiration: other changes

TCLo (Inhalation-Dog) 900 µg/m³/21 hours/89 weeks-intermittent: Cardiac: changes in heart weight; Lungs, Thorax, or Respiration: other changes, changes in lung weight

TCLo (Inhalation-Dog) 0.9 mg/m³/21 hours/620 days-intermittent: Lungs, Thorax, or Respiration: respiratory depression

TCLo (Inhalation-Rabbit) 20 mg/m³/7 hours female 6-18 day(s) after conception: Reproductive: Specific Developmental Abnormalities: musculoskeletal system

SECTION XI: TOXICOLOGICAL INFORMATION (Continued)

REPRODUCTIVE TOXICITY INFORMATION

Listed below is information concerning the effects of this product and its components on the human reproductive system.

Mutagenicity: The components of this product are not reported to be mutagenic in humans. The following animal test data are available for the Barium Sulfate and Sulfuric Acid components: Barium Sulfate: Micronucleus Test (Intraperitoneal-Mouse) 12,500 µg/kg. Sulfuric Acid: Cytogenetic Analysis (Hamster-Ovary) 4 mmol/L

Embryotoxicity: The components of this product are not reported to be embryotoxic in humans.

Teratogenicity: The components of this product are not reported to be teratogenic in humans.

Reproductive Toxicity: The components of this product are not reported to be a reproductive toxin in humans.

*A **mutagen** is a chemical that causes permanent changes to genetic material (DNA) such that the changes will propagate through generation lines. An **embryo toxin** is a chemical that causes damage to a developing embryo (i.e. within the first eight weeks of pregnancy in humans), but the damage does not propagate across generational lines. A **teratogen** is a chemical that causes damage to a developing fetus, but the damage does not propagate across generational lines. A **reproductive toxin** is any substance that interferes in any way with the reproductive process.*

ACGIH BIOLOGICAL EXPOSURE INDICES (BEIs): Currently, ACGIH Biological Exposure Indices (BEIs) have been determined for the fluoride components of this product, as follows:

CHEMICAL DETERMINANT	SAMPLING TIME	BEI
FLUORIDES: Fluorides in urine	Prior to shift	3 mg/g creatinine
	End of shift	10 mg/g creatinine

NOTE: see Sections III, VIII, XII for additional information.

SECTION XII: ECOLOGICAL INFORMATION

ENVIRONMENTAL FATES/STABILITY

This product's components will react with other substances in the environment to generate a variety of inorganic compounds over time. This product is not expected to biodegrade or bioconcentrate.

EFFECT OF MATERIAL ON PLANTS or ANIMALS

Due to the corrosive nature of this product, this solution can be harmful or fatal to plant and animal life if released into the environment, especially in large quantities.

EFFECT OF CHEMICAL ON AQUATIC LIFE (ECOTOXICITY)

This product can substantially lower the pH of an aquatic environment and can be extremely toxic to fish and aquatic plants.

SECTION XIII: DISPOSAL CONSIDERATIONS

US EPA Waste Number: D002

U.S. Federal, state and local disposal laws and regulations will determine proper waste disposal/recycling/reclamation procedure. All waste materials should be reviewed to determine applicable hazards (testing may be necessary). Any material classified as a DOT Corrosive or any waste solution with a pH of ≤ 2 or ≥ 12.5 are hazardous wastes under US EPA hazardous waste regulations. Disposal requirements are dependent on the hazard classification and will vary by location and type of disposal selected.

****NOTE**** Chemical additions, processing or otherwise altering this material may make the waste management information presented above incomplete, inaccurate or otherwise inappropriate.

As local regulations vary; all wastes must be disposed/recycled/reclaimed in accordance with applicable U.S. Federal, state and local environmental control regulations, those of Canada and its Provinces, and those of EU

Member States.

SECTION XIV: TRANSPORTATION INFORMATION

UNITED STATES

This product is hazardous as defined by 49 CFR 172.101 by the U.S. Department of Transportation.

PROPER SHIPPING NAME: Corrosive liquid, acidic, inorganic n.o.s. (Ammonium Bifluoride, Sulfuric Acid)

HAZARD CLASS NUMBER and DESCRIPTION: 8 (Corrosive)

UN IDENTIFICATION NUMBER: UN 3264

PACKING GROUP: PG II

DOT LABEL(S) REQUIRED: Class 8 (Corrosive)

EMERGENCY RESPONSE GUIDEBOOK NUMBER (2004): 154

MARINE POLLUTANT: The components of this product are not classified by the DOT as a Marine Pollutants (as defined by 49 CFR 172.101, Appendix B).

CANADA

This product is considered as Dangerous Goods, per regulations of Transport Canada. The use of the above U.S. DOT information from the U.S. 49 CFR regulations is allowed for shipments that originate in the U.S. For shipments via ground vehicle or rail that originate in Canada, the following information is applicable.

PROPER SHIPPING NAME: Corrosive liquid, acidic, inorganic n.o.s. (Ammonium Bifluoride, Sulfuric Acid)

HAZARD CLASS NUMBER and DESCRIPTION: 8 (Corrosive)

UN IDENTIFICATION NUMBER: UN 3264

PACKING GROUP: II

HAZARD LABEL(S) REQUIRED: Class 8 (Corrosive)

SPECIAL PROVISIONS: 16

EXPLOSIVE LIMIT & LIMITED QUANTITY INDEX: 1

ERAP INDEX: None

PASSENGER CARRYING SHIP INDEX: None

PASSENGER CARRYING ROAD OR RAIL VEHICLE INDEX: 1

MARINE POLLUTANT: Not applicable.

AIR TRANSPORT

This product is classified as Dangerous Goods, by rules of the International Air Transport Association (IATA)

PROPER SHIPPING NAME: Corrosive liquid, acidic, inorganic n.o.s. (Ammonium Bifluoride, Sulfuric Acid)

HAZARD CLASS NUMBER and DESCRIPTION: 8 (Corrosive)

UN IDENTIFICATION NUMBER: UN 3264

PACKING GROUP: II

HAZARD LABEL(S) REQUIRED: Class 8 (Corrosive)

SPECIAL PROVISIONS: A3

ERG CODE: 8L

PASSENGER AND CARGO AIRCRAFT				CARGO AIRCRAFT ONLY	
Limited Quantity		Packing Instruction	Max. Qty per Pkg	Packing Instruction	Max. Qty per Pkg
Packing Instruction	Max. Qty per Pkg				
Y808	0.5 L	808	1 L	812	30 L

SECTION XIV: TRANSPORTATION INFORMATION (Continued)

SEA TRANSPORT

This product is considered as Dangerous Goods, per rules of the International Maritime Organization (IMO).

UN IDENTIFICATION NUMBER: UN 3264
PROPER SHIPPING NAME: Corrosive liquid, acidic, inorganic n.o.s (Ammonium Bifluoride, Sulfuric Acid)
HAZARD CLASS NUMBER and DESCRIPTION: 8 (Corrosive)
PACKING GROUP: II
SPECIAL PROVISIONS: 274, 944
HAZARD LABEL(S) REQUIRED: Class 8 (Corrosive)
LIMITED QUANTITIES: 1 L
PACKING INSTRUCTION: P001
EmS: F-A, S-B
STOWAGE AND SEGREGATION: Category B – Clear of Living Quarters.

EUROPEAN

This product is considered as Dangerous Goods, per regulations of the U.N. Economic Commission for Europe [European Agreement Concerning the International Carriage of Dangerous Goods by Road (ADR)]:

UN NUMBER: UN 3264
NAME AND DESCRIPTION: Corrosive liquid, acidic, inorganic n.o.s (Ammonium Bifluoride, Sulfuric Acid)
CLASS: 8
CLASSIFICATION CODE: C1
PACKING GROUP: II
LABELS: 8
SPECIAL PROVISIONS: 274
LIMITED QUANTITIES: LQ22
PACKING INSTRUCTION: P001
MIXED PACKING INSTRUCTION: MP15
HAZARD IDENTIFICATION NUMBER: 80

SECTION XV: REGULATORY INFORMATION

US FEDERAL REGULATIONS

SARA 311 AND 312 HAZARD CATEGORIES

IMMEDIATE (Acute) Health Hazard: YES DELAYED (Chronic) Health Hazard: YES
 FIRE Hazard: NO REACTIVITY Hazard: NO
 SUDDEN RELEASE of PRESSURE: NO

U.S. SARA SECTION 302 EXTREMELY HAZARDOUS THRESHOLD PLANNING QUANTITY:

Sulfuric Acid = 1000 lb (454 kg)

U.S. SARA SECTION 304 EXTREMELY HAZARDOUS REPORTABLE QUANTITY:

Sulfuric Acid = 1000 lb (454 kg)

U.S. SARA SECTION 313 NOTIFICATION

This product does not contain toxic chemicals subject to the reporting requirements of Section 313 of Title III of the Superfund Amendments and Reauthorization Act of 1986 and 40 CFR Part 372. The sulfuric acid component of the product has requirements in aerosol forms only.

U.S. CERCLA REPORTABLE QUANTITY (RQ)

Ammonium Bifluoride = 100 lb (45.4 kg); Sodium Bifluoride = 100 lb (45.4 kg); Sulfuric Acid = 1000 lb (454 kg)

U.S. TSCA INVENTORY STATUS

The components of this product are listed on the TSCA Inventory.

SECTION XV: REGULATORY INFORMATION (Continued)

US FEDERAL REGULATIONS (continued)

OZONE DEPLETING SUBSTANCES (ODS)

This product neither contains or is manufactured with an ozone depleting substance subject to the labeling requirements of the Clean Air Act Amendments 1990 and 40 CFR Part 82.

VOLATILE ORGANIC COMPOUNDS (VOC)

Not Determined

CANADIAN REGULATIONS

CANADIAN DSL/NDSL INVENTORY STATUS

The components of this product are on the DSL Inventory.

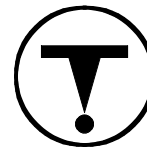
CANADIAN ENVIRONMENTAL PROTECTION ACT (CEPA) PRIORITIES SUBSTANCES LISTS:

The fluoride components of this product are on the CEPA Priorities Substances Lists, as fluoride compounds are considered "Toxic" and on the First Priorities Substance List.

CANADIAN WHMIS REGULATIONS

This product is classified as Hazard Classes E (Corrosive Material), D1A and D2A (Toxic Material/Immediate and Serious Effects-Acute and Chronic Effects), as per the Controlled Product Regulations (CPR).

CANADIAN WHMIS CLASSIFICATION SYMBOLS:



EUROPEAN REGULATIONS

EINECS INVENTORY

The components of this product are on the EINECS European Inventory

EC LABELING AND CLASSIFICATION

This product is classified as follows, as defined by the European Union Council Directives.

EC CLASSIFICATION

[T]: Toxic. [C]: Corrosive.

EC RISK PHRASES

[R: 25]: Toxic if swallowed. [R: 34]: Causes burns.

EC SAFETY PHRASES

[S: 2]: Keep out of reach of children. (*This safety phrase can be omitted from the label when the substance or preparation is sold for industrial use only.*) [S: 24/25]: Avoid contact with skin and eyes. [S: 26]: In case of contact with eyes, rinse immediately with plenty of water and seek medical advice. [S: 27]: Take off immediately, all contaminated clothing. [S: 28]: After contact with skin, wash immediately with plenty of water. [S: 36/37/39]: Wear suitable protective clothing, gloves and eye/face protection. [S: 38]: In case of insufficient ventilation, wear suitable respiratory protection. [S: 45]: In case of accident or if you feel unwell, seek medical advice immediately (show label where possible). [S: 53]: Avoid exposure- obtain special instructions before use.

EUROPEAN COMMUNITY ANNEX II HAZARD SYMBOLS:



SECTION XV: REGULATORY INFORMATION (Continued)

EUROPEAN REGULATIONS (continued)

EU INFORMATION FOR COMPONENTS:

Ammonium Bifluoride: EU EINECS/ELINCS NUMBER: 215-676-4

EU CLASSIFICATION: [T] Toxic. [C] Corrosive.

EU RISK PHRASES: [R: 25]: Toxic if swallowed. [R: 34]: Causes burns.

EU SAFETY PHRASES: [S: 2_-]: Keep locked-up and out of reach of children. (*This safety phrase can be omitted from the label when the substance or preparation is sold for industrial use only.*) [S: 7/9]: Keep container tightly closed and in a well-ventilated place. [S: 26]: In case of contact with eyes, rinse immediately with plenty of water and seek medical advice. [S: 36/37]: Wear suitable protective clothing and gloves. [S: 45]: In case of accident or if you feel unwell, seek medical advice immediately (show label where possible).

Barium Sulfate: EU EINECS/ELINCS NUMBER: 231-784-4

EU CLASSIFICATION: An official classification for this substance has not been published in Commission Directives.

Sodium Bifluoride: EU EINECS/ELINCS NUMBER: 215-608-3

EU CLASSIFICATION: [T] Toxic. [C] Corrosive.

EU RISK PHRASES: [R: 25]: Toxic if swallowed. [R: 34]: Causes burns.

EU SAFETY PHRASES: [S: 2_-]: Keep locked-up and out of reach of children. (*This safety phrase can be omitted from the label when the substance or preparation is sold for industrial use only.*) [S: 7/9]: Keep container tightly closed and in a well-ventilated place. [S: 26]: In case of contact with eyes, rinse immediately with plenty of water and seek medical advice. [S: 36/37]: Wear suitable protective clothing and gloves. [S: 45]: In case of accident or if you feel unwell, seek medical advice immediately (show label where possible).

Sulfuric Acid: EU EINECS/ELINCS NUMBER: 231-639-5

EU CLASSIFICATION: [C] Corrosive.

EU RISK PHRASES: [R: 35]: Causes severe burns.

EU SAFETY PHRASES: [S: 2_-]: Keep locked-up and out of reach of children. (*This safety phrase can be omitted from the label when the substance or preparation is sold for industrial use only.*) [S: 26]: In case of contact with eyes, rinse immediately with plenty of water and seek medical advice. [S: 30]: Never add water to this product. [S: 45]: In case of accident or if you feel unwell, seek medical advice immediately (show label where possible).

SECTION XVI: OTHER INFORMATION

REVISIONS

Revision Number: 4

This MSDS has been revised in the following section(s):

PREPARATION INFORMATION

Prepared By: Chemical Safety Associates, Inc., PO Box 3519, La Mesa, CA 91944-3519, 619-670-0609

The information in this Material Safety Data Sheet should be provided to all who will use, handle, store, transport, or otherwise be exposed to this product. This information has been prepared for the guidance of plant engineering, operations, management and for persons working with or handling this product. The information presented in the MSDS is premised upon proper handling and anticipated uses and is for the material without chemical additions/alterations. We believe this information to be reliable and up-to-date as of the date of publication, but make no warranty that it is. Additionally, if this Material Safety Data Sheet is more than three years old, please contact ARMOUR at the phone number listed in SECTION I to make certain that this sheet is current. END OF MSDS.....

DISCLAIMER:

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Etch Bath dipping solution, Armour Etch thinner

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