TEXAS A&M UNIVERSITY ENVIRONMENTAL HEALTH & SAFETY
CHEMICAL FACT SHEET

ETHYL ETHER

FLAMMABILITY
4 = EXTREME

HEALTH HAZARD
2 = MODERATE

SYNONYMS: ETHER, ETHYL ETHER, DIETHYL ETHER, ETHOXYETHANE, ETHYL OXIDE, DIETHYL OXIDE, ANESTHETIC ETHER, AETHER

Ethyl ether is a colorless and highly flammable liquid with a characteristic odor. This chemical is a serious fire and explosion risk. Vapor may travel considerable distances to ignition sources (which may be a hot plate, steam pipe, etc., not necessarily an open flame). Vapor may be ignited by the static electricity which can build up when ether is being poured from one vessel to another. Ether is a common laboratory solvent often used for liquid-liquid extraction. It is also important in the production of cellulose plastics and is used as a starting fluid for diesel and gasoline engines.

SAFETY PRECAUTIONS

- **KEEP AWAY FROM IGNITION SOURCES.**
- **GROUND ALL EQUIPMENT CONTAINING SOLVENT.**
- **Ventilation** Work must be conducted in a fume hood. Wear an approved/ certified respirator in case of insufficient ventilation.
- **Eye Protection** Chemical splash goggles are required.
- **Body Protection** Lab coat, chemical resistant apron, gloves.
- **Eyewash/Shower Combination** Required to be nearby and accessible.
- **ONLY ELECTRICAL EQUIPMENT OF EXPLOSION PROOF TYPE (GROUP C) IS PERMITTED TO BE OPERATED IN ETHER AREAS.**

EYE AND SKIN EXPOSURE

- Causes skin irritation.
- Causes eye irritation. Causes redness and pain.
- Can cause slight, reversible eye injury from contact with liquid or vapor.

INGESTION

- May cause gastrointestinal tract irritation with nausea, vomiting.
- May cause central nervous system depression.
- **Aspiration hazard**. Aspiration into the lungs may cause chemical pneumonitis.

INHALATION OF VAPOR

- Rapidly absorbed through lungs.
- Vapor mist causes irritation of the respiratory tract and mucous membranes.
- Inhalation of vapors may cause drowsiness and dizziness.
- Exposure to high concentrations may produce nausea and loss of consciousness.
- Affects behavior, sense organs, peripheral and central nervous systems, liver, metabolism, and cardiovascular system.

CHRONIC EXPOSURE

- Repeated or prolonged exposure may cause drying and cracking of the skin.
- May affect genetic material (mutagenic), based on laboratory experiments.
- Prolonged or repeated inhalation or ingestion may result in liver and kidney changes.
- Prolonged or repeated exposure can cause anxiety, depression, and excitability.
- Advanced stages may cause collapse, unconsciousness, coma, and possible death due to respiratory failure.
- May be habit forming.

- **Can form explosive peroxides during prolonged storage or during evaporation to dryness. Ether peroxides are contact explosives when dry.**
- **Light-sensitive and sensitive to air. Vapor-air mixture is explosive.**
- **Auto-ignition temperature of ether is only 160 °C (320 °F), so it can be ignited by a hot surface without a flame or spark.**
- **Risks of explosion in the presence of mechanical impact. Highly explosive in the presence of open flames, sparks, and heat. Slightly explosive in the presence of oxidizing materials.**
- **Vapors are heavier than air and may travel to a source of ignition and flash back.**
- **Containers may explode when heated.**
- **Violent reaction or ignition on contact with halogens.**
- **May explode when brought in contact with anhydrous nitric acid.**
- **Vapor may be ignited by the static electricity which can build up when ether is being poured from one vessel into another.**

ADDITIONAL INFORMATION CAN BE FOUND AT :
www.osha.gov/SLTC/healthguidelines/ethylether/recognition.html

TRAINING

Employees must receive documented training on the hazards of Ethyl Ether and what to do in the event of an explosion or spill.

SPILLS

Small spill - Dilute with water and mop up, or absorb with an inert dry material and place in an appropriate waste disposal container.
Large spill - Keep away from heat. Keep away from sources of ignition. Stop leak if without risk. Absorb with DRY earth, sand, or other non-combustible material. Use a spark-proof tool. Prevent entry into sewers, basements, or confined areas. Dike if needed. Ensure that the product is not present at a concentration level above TLV (400 ppm as an 8 hour time-weighted average) and STEL (500 ppm for periods not to exceed 15 minutes).

WASTE

Place all absorbent material used to contain a spill in a sealed bag or container. Label and dispose of as "Hazardous Waste".

HANDLING AND STORAGE

Store in a segregated and approved area. Keep container in a cool, well-ventilated area. Keep container tightly closed. Avoid all possible sources of ignition (spark or flame). Do not store above 86°F (30°C). Air sensitive. Light sensitive. Take precautionary measures against static discharges. No smoking. Avoid breathing vapor. Never distill to dryness.
Substances to be avoided include zinc, halogens and halogen compounds, nonmetals, non-metallic oxy-halides, strong oxidizing agents, chromyl chloride, turpentine oils, acids, nitrates, and metallic chlorides.

FIRST AID

- **Skin contact** - immediately flush skin with water for at least 15 minutes. Remove contaminated clothing and shoes.
  In the case of serious skin contact - wash with a disinfectant soap and cover the contaminated skin with an anti-bacterial cream.
- **Eye contact** - check for and remove any contact lenses. Immediately flush eyes with water for at least 15 minutes.
- **Ingestion** - DO NOT induce vomiting unless directed to do so by medical personnel. If large quantities of this material are swallowed, call a physician immediately. **Aspiration hazard.**
- **Inhalation** - evacuate victim to a safe area with fresh air. Loosen tight clothing. If not breathing, give artificial respiration. If breathing is difficult, give oxygen.

Note: In all cases, seek medical attention immediately.

SPECIAL NOTE: Stability will degrade during storage. Avoid storage for longer than 12 months.

TEXAS A&M UNIVERSITY ENVIRONMENTAL HEALTH & SAFETY
CHEMICAL FACT SHEET

HYDROFLUORIC ACID

HEALTH RATING 4 = EXTREME  CONTACT RATING 4 = EXTREME 

HYDROGEN FLORIDE; HF; FLUOROHYDRIC ACID; FLUORIC ACID; HF IN AQUEOUS SOLUTION

Hydrofluoric acid (HF) is an extremely corrosive acid used for many purposes including mineral digestion, surface cleaning, etching, and biological staining. The unique properties of HF make it significantly more hazardous than many of the other acids used on campus.

SAFETY PRECAUTIONS

- **Ventilation**

Concentrations of HF greater than 5% should always be handled inside a properly functioning chemical fume hood.

- **Eye Protection**

Always use chemical goggles together with a face shield when handling concentrated HF.

- **Body Protection**

Wear a laboratory coat with a chemical splash apron made out of natural rubber, neoprene, or viton. Never wear open-toed shoes or shorts when handling HF.

- **Gloves**

Wear medium or heavy-weight vitron, nitrile, or natural rubber gloves with a pair of nitrile gloves underneath to protect against leaks.

- **Eyewash/Shower Combination**

Required to be nearby and accessible.

EYE AND SKIN EXPOSURE

- Contact with eyes may result in blindness or permanent eye damage.
- HF readily penetrates human skin, allowing it to destroy soft tissues and decalcify bone.
- Chemical burns from HF are typically very painful and slow to heal.
- Skin exposure to highly concentrated HF (approximately 50% or greater) immediately results in serious and painful destruction of tissue.
- In concentrations of 20-50%, the burn becomes apparent 1-8 hours following the exposure; and in concentrations of less than 20%, symptoms may be delayed for as long as 24 hours.
- Not only can skin contact with HF cause burns, but systemic fluoride poisoning may also result.

INHALATION OF VAPOR

- Inhaling HF vapors can cause severe respiratory damage, including severe irritation of the nose, throat, and lungs.
- Delayed reactions up to and including fatal pulmonary edema (fluid build-up in the lungs) may not be apparent for hours after the initial exposure.
- Employees' exposure to airborne concentrations of HF should be limited to an average of 3 ppm over an 8-hour work day.
- Concentrations of 10 to 15 ppm will irritate the eyes, skin, and respiratory tract. At concentrations of 30 ppm HF is immediately dangerous to life and health, and may have irreversible health effects.
- At concentrations above 50 ppm, even brief exposure may be fatal.

CHRONIC EXPOSURE

- The chronic inhalation of hydrofluoric acid can cause irritation and congestion of the nose and throat, and bronchitis.
- Studies have found that HF inhalation may also damage the liver and kidneys.
- Fingertip injuries from HF may result in persistent pain, bone loss, and injury to the nail bed.
- Occupational studies of women exposed to fluoride have identified HF as a possible teratogen (reproductive hazard).
- Long-term or chronic exposure to hydrofluoric acid may result in fluorosis; a syndrome characterized by weight loss, bone embrittlement, anemia, and general ill health.

Because of the ability of HF to produce severe delayed tissue damage without necessarily producing pain, all skin, eye, or tissue contact with HF should receive immediate first aid and medical evaluation, even if the injury appears minor or no pain is felt.

TRAINING

- Employees who handle HF MUST receive documented training on the hazards of HF and what to do in the event of an exposure or a spill.
- A Material Safety Data Sheet (MSDS) on HF should be kept in the immediate work area where HF is used.

SPILLS

- If HF is spilled outside a chemical fume hood, evacuate the area, close the doors, post the area to prevent others from entering, and call 911 (9-911).
- Small spills inside a fume hood can be cleaned by lab staff if they have had proper training on HF cleanup and waste disposal.
- Note: spill kits that contain Floor-dri, kitty litter, or sand should NOT be used because HF reacts with silica to produce a toxic gas.

STORAGE

- Glass, metal, and ceramic containers are NOT compatible with HF. Store in polyethylene or Teflon containers.
- Never store HF with incompatibles such as strong bases (i.e. Sodium Hydroxide and Potassium Hydroxide), or ammonia and other alkaline materials.

WASTE

All HF waste, including contaminated clothing and gloves used to apply calcium gluconate gel should be labeled and disposed of as "Hazardous Waste".

FIRST AID

- **Skin contact** - Immediately (within seconds) wash affected area for a minimum of 5 minutes. Have someone call 911 (9-911 from a campus phone). Remove all contaminated clothing. Using gloves, massage calcium gluconate gel into the affected area. Re-apply gel every 15 minutes until assistance arrives or pain completely stops. If calcium gluconate gel is not available, wash affected area for at least 15 minutes or until medical assistance arrives.
- **Eye contact** - Immediately (within seconds) rinse eyes for a minimum of 30 minutes. Do NOT apply calcium gluconate gel to eyes. Have someone call 911 (9-911).
- **Ingestion of HF** - Dilute the acid by drinking large quantities of milk (preferable) or water. Have someone call 911 (9-911). Do NOT induce vomiting.
- **Inhalation** - Immediately move to an area with fresh air. Call 911 (9-911).

Note: Provide medical personnel with an MSDS sheet for HF.

If you work with HF, please contact EHS Occupational Health Program for a pre-exposure medical consultation.
ehsd.occ.health@tamu.edu

TEXAS A&M UNIVERSITY ENVIRONMENTAL HEALTH & SAFETY
CHEMICAL FACT SHEET

PERCHLORIC ACID

HEALTH RATING
3 = SEVERE

REACTIVITY
3 = SEVERE

CORROSIVE

HYDRONIUM PERCHLORATE;
DIOXONIUM PERCHLORATE

Perchloric acid is considered one of the strongest superacids. It is highly reactive with metals, dangerously corrosive, and readily forms explosive mixtures. Perchloric acid is used for preparing perchlorate salts, especially ammonium perchlorate, an important rocket fuel. It is also used for electropolishing/etching of aluminum, molybdenum, and other metals.

SAFETY PRECAUTIONS

Ventilation **Work must be conducted in fume hoods with a wash-down capability to prevent accumulation of oxidizers in ductwork. Use proper enclosure and exhaust ventilation to control airborne levels.**

Eye Protection Splash goggles, face shield.

Body Protection Chemical apron, over lab coat. Appropriate clothing to minimize contact with skin (i.e. long pants, long-sleeve shirt, closed-toed shoes).

Gloves Chemical resistant (nitrile) gloves.

Respiratory Protection (For when ventilation is inadequate or a spill occurs) NIOSH/MSHA or European Standard EN 149 approved full-facepiece airline respirator in the positive pressure mode.

Eyewash/Shower Combination Required to be nearby and accessible.

EYE AND SKIN EXPOSURE

Liquid or spray mist may produce tissue damage on mucous membranes of eyes. Inflammation of the eye is characterized by redness, watering, and itching. Can lead to loss of vision or blindness.

Skin contact may produce burns. Skin inflammation is characterized by itching, scaling, reddening, or occasionally, blistering. Prolonged exposure may result in skin burns and ulcerations.

INHALATION OF VAPOR

Inhalation of spray mist may produce severe irritation of the respiratory tract, characterized by sore throat, coughing, choking, or shortness of breath. Over-exposure by inhalation may cause respiratory irritation.

Inhalation may be fatal as a result of spasm, inflammation, edema of the larynx and bronchi, and pulmonary edema.

INGESTION

Causes intestinal tract burns (corrosion or burns of the mouth, throat, esophagus).

May also affect behavior, metabolism, liver, kidneys, and cardiovascular system.

CHRONIC EXPOSURE

The substance is toxic to lungs.

Repeated or prolonged inhalation may cause nosebleeds, nasal congestion, erosion of teeth, perforation of the nasal septum, and chest pain.

Repeated or prolonged contact with spray mist may produce chronic eye irritation and may cause conjunctivitis.

Repeated or prolonged exposure to spray mist may produce respiratory tract irritation leading to frequent attacks of bronchial infection.

Repeated or prolonged skin contact may cause skin sensitization, an allergic reaction, and possible destruction and/or ulceration.

- **Perchloric acid is unstable (volatile) in concentrated form. It may undergo spontaneous and explosive decomposition.**
- **Above concentrations of approximately 70%, the speed of oxidizing reactions rapidly increases with increasing acid concentration.**
- **Explosive in the presence of open flames/sparks, heat, combustible materials, organic materials, acids, and/or alkalis. Unstable if in contact with moisture.**
- **May ignite other combustible materials. Will increase the intensity of a fire.**
- **Decomposes when distilled at atmospheric pressure, sometimes with explosive violence.**

TRAINING - Employees who work with Perchloric Acid must consult a full MSDS datasheet and MUST receive documented training on the hazards of Perchloric Acid and what to do in the event of an explosion or spill.

SPILLS - Remove all sources of ignition.

- **Small spill**: Dilute with water and mop up, or absorb with an inert dry material (sand, dry lime, or soda ash) and place in an appropriate, closed, waste disposal container. Tag container and dispose of as Hazardous Waste. Best disposed by stirring gradually with enough water to make the concentration less than 0.1%.

- **Large spill**: Stop leak if without risk. Call for assistance on cleanup or disposal. Absorb with DRY earth, sand, or other non-combustible material. Do not get water inside container. Avoid contact with combustible materials (wood, paper, oil, clothing, etc.) Keep substance damp using water spray. Do not touch spilled material. Use water spray curtain to divert vapor drift. Prevent entry into sewers, basements, or confined areas; dike if needed.

STORAGE - Keep container dry, tightly closed, and in a cool, well-ventilated area. Use secondary containment (i.e. glass pan).

- Separate from acids, alkalis, and reducing agents.

- Keep away from heat, combustible material (paper, cardboard, wooden shelves, etc.), and sources of ignition.

- Do not freeze.

- Storage code: YELLOW (Reactive and Oxidizing)

FIRST AID

Skin contact: Immediately rinse skin with water for at least 15 minutes while removing contaminated clothing and shoes. Cover the irritated skin with an anti-bacterial cream.

Eye contact: Check for and remove any contact lenses. Do NOT allow victim to rub or keep eyes closed. Extensive irrigation is required. Immediately flush eyes with water for at least 30 minutes.

Ingestion: Do NOT induce vomiting unless directed to do so by medical personnel. If victim is conscious and alert, give 2-4 cupfuls of milk or water.

Inhalation: Evacuate the victim to a safe area with fresh air as soon as possible. Loosen tight clothing such as a collar, tie, belt, or waistband. If breathing is difficult, administer oxygen. If the victim is not breathing, give artificial respiration. Do NOT use mouth-to-mouth respiration.

Note: In all cases, get medical attention immediately!