SAFE USE OF HYDROFLUORIC ACID

Essential guidelines for handling hazardous chemicals safely

Document Owner: Associate Director, Health, Safety and Wellbeing
Content Manager: Manager, Hazards and Containment

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INTRODUCTION TO HYDROFLUORIC ACID

OVERVIEW AND HAZARDS

Corrosive Nature of HF

HF penetrates deeply into tissues causing progressive and severe burns with delayed symptoms, even from dilute solutions.

Health Risks and Complications

Exposure to HF can cause systemic toxicity, cardiac arrhythmia, pulmonary oedema, and requires urgent medical care.

Disruption of Electrolyte Balance

HF disrupts calcium and magnesium levels causing metabolic imbalances and intense nerve pain.

Safety Protocols Importance

Strict safety protocols and emergency preparedness are essential when handling hydrofluoric acid in labs.

CHEMICAL PROPERTIES AND HAZARDS

PHYSICAL AND CHEMICAL CHARACTERISTICS

Physical Properties

Hydrofluoric acid is a colourless, clear liquid with density close to water and unique glass-etching ability.

Chemical Reactivity and Hazards

HF reacts with metals releasing hydrogen gas, posing explosion risks and aggressively attacks multiple materials.

Toxicity and Health Risks

Fluoride ion is highly toxic causing deep burns, respiratory irritation, eye damage, and can be fatal if untreated.

Safety and Handling

Specialised storage, handling, and emergency measures are essential to prevent accidents with hydrofluoric acid.

STORAGE AND HANDLING

SAFE STORAGE PRACTICES

Specialised Container Materials

Use polyethylene, polypropylene, or Teflon containers to safely store hydrofluoric acid, avoiding glass and metals. Secondary containment is highly recommended

Clearly Labelled and Secure Storage

Store HF in designated cabinets with prominent hazard warnings and restricted access for trained personnel.

Safety and Emergency Preparedness

Maintain emergency equipment like 2.5% calcium gluconate gel, safety showers, and eyewash stations near storage areas.

Environmental Controls and Inspections

Keep storage area cool and ventilated, conduct regular inspections to ensure container integrity and safety compliance.

PERSONAL PROTECTIVE EQUIPMENT AND PROTOCOLS

Strict Safety Protocols

Hydrofluoric acid work must be done with a trained colleague and inside a **certified fume cupboard with scrubbers** installed to minimise exposure.

Essential Protective Gear

Use of face shield, enclosed goggles, **acid-resistant** gloves (such as Viton or neoprene), apron, and rubber boots is mandatory for HF handling.

Additional Safety Measures

Double gloving with an inner layer of nitrile or neoprene and availability of **2.5% calcium gluconate gel** enhance protection against HF exposure.

Spill Response and Warnings

Calcium carbonate spill neutralisers and warning signs or lights must be accessible to ensure immediate response and alert others.

EMERGENCY AND SPILL RESPONSE

IMMEDIATE ACTIONS FOR EXPOSURE AND SPILLS

Skin Exposure Response

Immediately go to a safety shower and flush the affected area with large amounts of cold water for at least 1 minute. While flushing, remove any contaminated clothing, shoes and jewellery, removing goggles last. Flush affected skin with cool water for five minutes, apply **2.5% calcium gluconate gel**, and seek emergency care immediately.

Eye Exposure Response

Flush eyes with water for at least five minutes and call emergency services without delay.

Inhalation and Spill Management

Move victim to fresh air when inhaling vapours and use proper neutralisers such as **calcium carbonate or calcium hydroxide**; or specialised HF spill kits for small spills.

Large Spill Precautions

Evacuate area immediately for large or concentrated chemical spills and contact emergency services. Always have the **HF Safety Data Sheet** and **Emergency Procedures** available for emergency services personnel.

DISPOSAL GUIDELINES

SAFE DISPOSAL PRACTICES

Regulated Chemical Disposal

Hydrofluoric acid must be disposed through approved channels with compliance to regulations.

Qualified Personnel Handling

Qualified personnel should perform disposal to ensure safety and environmental protection.

Avoid Dangerous Reactions

Never pour HF down drains or mix with incompatible chemicals to prevent contamination.

Documentation and Compliance

Maintain disposal records and follow legal guidelines with support from hazards manager.

TRAINING AND COMPETENCY

REQUIREMENTS FOR PERSONNEL HANDLING HF

Specialized Safety Training

Personnel must complete training on hydrofluoric acid properties, hazards, and safe handling protocols.

Declaration and Competency

A declaration of understanding SMOU is required, with optional assessments verifying competency.

Emphasis on PPE and Emergency Preparedness

Training highlights PPE use, proper storage, and emergency response readiness for HF handling.

Authorized Handling and Refresher Courses

Only authorized personnel should handle HF, with regular refresher courses to maintain safety standards.