ANHYDROUS HYDROFLUORIC ACID

REVISION DATE: 09/17/2022

1. - PRODUCT AND COMPANY IDENTIFICATION

Product name: Anhydrous Hydrofluoric Acid
Internal Code of product identification: 104.60.7
Company name: USIQUÍMICA DO BRASIL LTDA.
Address: Rua da Lagoa, 431 - Cumbica - Guarulhos - SP.
Company Phone: + 5511 3821-7000 (PBX system) - + 5511 2481-3355.
Emergency phone: SUATRANS - COTEC - Environmental Emergency.
DDG (0800) 0111-767 - (0800) 7071-767 - 24 HOURS.
193 – Firefighters.

Main recommended uses for the substance: Surface treatment, electroplating, fluoride manufacturing, aluminum production, uranium and graphite processing, ceramics, fluorocarbons (freon, frigen, teflon), among others.

2. - HAZARD IDENTIFICATION

Classification of Substance:
Acute toxicity, Oral - category 2,
Acute toxicity, inhalation - category 2,
Acute toxicity, dermal - category 1,
Skin lesion, category 1A,

GHS label elements, including precautionary phrases:

LABEL ELEMENTS	DATA
Product identification and supplier emergency telephone number	Commercial Name: Anhydrous Hydrofluoric Acid Synonym: Anhydrous Hydrofluoric Acid, Anhydrous Hydrogen Fluoride. Emergency phone: SUATRANS - COTEC - Environmental Emergency. DDG (0800) 0111-767 - (0800) 7071-767 - 24 HOURS.
Hazard pictograms	
Warning words	DANGER
Danger phrases	- H300: Fatal if swallowed; - H310: Fatal in contact with skin; - H314: Causes severe skin burns and eye damage; - H330: Fatal if inhaled.
Caution Phrases	- P280 - Use protective gloves/protective clothing/eye protection/face protection. - P303+P361+P353 IN CASE OF CONTACT WITH SKIN (or hair): Immediately remove all contaminated clothing. Wash the skin with water/take a shower. - P304+P340+P310 IN CASE OF INHALATION: Remove the person to a ventilated area and keep the person in a rest position that does not make it difficult to breathe. Contact a TOXICOLOGICAL INFORMATION CENTER or physician immediately. - P305+P351+P338+P310 IN CASE OF EYE CONTACT: Rinse thoroughly with water for several minutes. If contact lenses are used, remove them if it is easy. Continue rinsing. Contact a TOXICOLOGICAL INFORMATION CENTER or physician immediately. - P308+P311 IF exposed or suspected of exposure: Contact a TOXICOLOGICAL INFORMATION CENTER/doctor.

Other hazards which do not result in classification: No information found

3. -COMPOSITION AND INFORMATION ON THE INGREDIENTS

Substance: Anhydrous Hydrofluoric Acid.
Common chemical name or generic name: Anhydrous Hydrofluoric Acid, Anhydrous Hydrogen Fluoride.
Chemical Abstract Service (CAS No): 7664-39-3.
Chemical composition of the substance:
Minimum, 99.95 % sulfuric acid.
There are no impurities that contribute to the danger.

4. -FIRST AID MEASURES

First aid measures:
- Inhalation: Exposure to fresh air. Consult a physician. Keep the respiratory system clear. In case of respiratory arrest: Proceed immediately to cardiopulmonary ventilation; eventually oxygen support.
- Skin contact: Rinse with plenty of water for at least 10 minutes. Immediately remove contaminated clothing. Apply gluconate or calcium gluconate gel.
Preparing: Boil 5 g of calcium gluconate in 85 ml of hot distilled water, add 10 g of glycerol. Allow 5 g of sodium caramelose to swell in the heated solution. Stable for 6 months, store in a cold place and massage into the skin until the pain subsides, meanwhile rinse with water and apply fresh gel. Continue gel therapy for another 15 minutes after pain has subsided. If sodium gluconate is not available, apply several compresses completely wet with a 20% calcium gluconate solution. Medical attention is absolutely required!
Note: Eventually, the gel containing calcium gluconate or gluconate can be purchased at compounding pharmacies through medical prescriptions.
- Eye contact: The eyes should be immediately flushed with water for 3 to 4 minutes, never more than 4 minutes, and then, quickly using cold compresses on the eyes, transport the patient to the nearest medical unit. Upon arrival at the medical unit, start the ophthalmic lavage with a 1% Calcium Gluconate solution in saline solution. Washing should be repeated 3 times a day for the next two days.
- Ingestion: Give plenty of water to drink, add calcium (in the form of calcium gluconate or calcium lactate). Warning: in case of vomiting risk of perforation! Administer more calcium gluconate solution. Seek medical assistance immediately. Ensure that injured persons remain calm and protect them from heat loss.
Actions to be avoided: Do not induce to vomiting.
GENERAL RECOMMENDATION: Countermeasures must be taken immediately. The first aid provider must protect himself.
Brief description of the main symptoms and effects: Very toxic by inhalation, in contact with skin and if swallowed. Causes severe burns. Inhalation of vapors in high concentration can cause shortness of breath (pulmonary oedema). Ingestion causes burns of the upper digestive and respiratory systems. They penetrate the skin and attack the underlying tissues and bone.
Most important symptoms and effects, acute or late:
Irritation and corrosion, bronchitis, bloody vomiting, cardiovascular disease, collapse, convulsions. Danger of blindness! Notes to the physician: It is recommended to consult a physician experienced in treating injuries caused by hydrofluoric acid. If a systemic action is suspected, it requires urgent treatment and monitoring in an intensive care unit. Caution, ventricular fibrillation due to electrolyte imbalance. The doctor should consult the instruction guide for injuries caused by hydrofluoric acid when caring for the victim.

5. -FIREFIGHTING MEASURES

Suitable extinguishing measures: Adapt firefighting measures to local conditions and the surrounding environment.
Not suitable: No limitations of extinguishing agents are given for this substance/mixture.
Specific hazards: Not combustible. Possibility of formation of dangerous fumes in case of fire in nearby areas. A fire may increase the emission of toxic and corrosive acidic gases.
Fire fighter Protection: Special protective equipment for personnel assigned to fight fires. Do not stay in the danger zone without self-contained breathing apparatus suitable for breathing independently of the environment. To avoid skin contact, maintain a safe distance and wear suitable protective clothing. Refresh closed containers exposed to fire with water spray. Suppress (slaughter) with jets of water (mist) the gases,

vapors and mists. Avoiding contamination of surface water and groundwater with fire fighting water.

6. - CONTROL MEASURES FOR SPILLING OR LEAKING

Personal precautions, protective equipment and emergency procedures:
Personnel who are not part of the emergency services: Do not breathe vapors or aerosols. Avoiding contact with the substance. Ensuring adequate ventilation. Evacuating the danger area, observe emergency procedures. If necessary, consult an expert.
Emergency service personnel: Protective equipment: "Full face" face mask with filter for acid gases in small leaks. Depending on the situation, use a "full face" face mask attached to a cylinder containing breathable air. As a complement to the information, neoprene or PVC gloves (lined internally and of the long barrel type), rubber or leather boots, trevira overalls, tyvec or, preferably, level A or B must be used.
Precautions to the environment: Do not dump waste down the sewer.
Methods and materials for containment and cleaning: Cover drains. Collect, mend and pump leaks.
Neutralization: Carefully dissolve the material in water. Neutralize immediately with sodium carbonate or 10% diluted caustic soda. Add excess calcium chloride until the fluoride and/or carbonate precipitates. Separate the insoluble for disposal in landfill. Monitoring by a specialist from the environmental agency is recommended.
Note: Additionally, waste material such as calcium oxide (quicklime) can be neutralized. The calcium contained in the solution will sequester the residual fluorine forming a precipitate called calcium fluoride (water-insoluble material that can be separated by filtration).
Disposal: Waste must be disposed of in accordance with current Environmental Legislation. Keep chemicals in their original containers. Do not mix with other waste. Handling dirty containers must be carried out in the same way as the product itself. An MSDS of the waste generated must be generated.
Differences in the action of large and small leaks: There is no differentiation.

7. - HANDLING AND STORAGE

Handling:
Technical measures Using only in areas provided with adequate exhaust ventilation. Providing the product handling area with a set of emergency shower and eye wash. Handling must only be done with the indicated PPE and under safe conditions.
Prevention of worker's exposure: Avoiding the formation of vapors/aerosols. Working with exhaust / chimney. Do not inhale the substance/mixture. Using specific PPE's - splash goggles, face shield, PVC gloves and protective clothing. Avoid inhaling alkaline vapors.
Wash after handling and decontaminate PPE's after use. PPE's must be approved for use only with the respective CAs – Certificates of Approval.
Precautions and guidelines for safe handling: Handle containers and packages using the appropriate PPE. Make sure that the packages are identified and free of contaminants. Avoid breathing the vapor produced by the product.

Storage:
Appropriate: Keep container tightly closed in a dry, cool and well-ventilated area. Never expose the container containing the product directly to sunlight.
To avoid: Contact with the following incompatible materials: metals, alkaline metals, permanganates, glass, concrete, alkaline hydroxides (solutions) in addition to the information contained in the emergency sheet for this product.
Hygiene measures:
Appropriate: Always sanitize your hands before handling any food, as there is a risk of food contamination. Contaminated clothing must be washed and sanitized before use. Always keep gloves free from moisture and decontaminated.
Inappropriate: Direct contact with the product and/or its residues.
Technical measures
Suitable conditions: Provide the storage area with containment capable of supporting the stored capacity. Avoid the percolation of the product through the soil, in order to reach the subterranean layers of the soil. The tanks must have a capacity containment dike above the capacity of the storage tank. 1.5 times is suggested.
Safe materials for packaging:

Recommendations: Synthetic materials, e.g. high-density polyethylene (group I or X approved packaging).

8. - EXPOSURE CONTROLS AND PERSONAL PROTECTION

Parameters of specific control:
Occupational exposure limits: LT: Brazil - Average Value 48h: 2.5 ppm (HYDROFLUORIC ACID)
LT: Brazil - Ceiling Value: 5.0 ppm
LT: USA - TWA: 3 ppm (AS FLUORIDE)
LT: USA - STEL: 3 ppm (AS FLUORIDE)

Biological indicators: Fish (species undetermined) = lethal at 60 ppm, period unspecified.
Other limits and values: N.A.
Measures of engineering control: Handling the product in a place with good natural or mechanical ventilation, in order to keep the concentration of vapors/dust below the tolerance limit. Provide mechanical ventilation and direct exhaust system to the outside environment. These measures help to reduce exposure to the product. It is recommended to make emergency showers and eye washes available in the work area. Engineering control measures are most effective in reducing product exposure.
Appropriate Personal Protective Equipment:
Respiratory protection: Use a respirator with air supply, positive pressure and face protection (PA mask) in case of product leakage or large gas emissions, or even a full face mask with a filter for acidic gases.

Attention: masks with mechanical filters do not protect workers exposed to oxygen deficient atmosphere.

Hand protection: Gloves resistant to hydrofluoric acid (nitrile, viton, pvc or neoprene).
Eye protection: Chemical type safety glasses for handling closed drums or panoramic mask when handling the product.
Protection of the skin and body: Complete set (rubber or leather boots and tyvec or similar overalls).
Thermal hazards: N.A.
Special precautions: Equip the hydrofluoric acid handling sites with an emergency shower and eye wash set. Never eat, drink or smoke in the work area. Practice good personal hygiene, especially before eating and drinking. If possible, avoid smoking. Separate contaminated clothing, ensuring that it is effectively washed before reuse. Chemical products must only be handled by trained and qualified people. All PPE, according to NR-6 must have the CA (Certificate of Approval). Strictly follow the operational and safety procedures recommended by the organization for work. In places where chemical products are handled, monitoring of workers' exposure must be carried out, according to PPRA (Environmental Risk Prevention Program) Ordinance 3.214/78 of MTB-NR-09).
Hygiene measures: Avoid contact with skin, eyes and clothing. Clothing contaminated at work must not be taken off site.

9. - PHYSICAL AND CHEMICAL PROPERTIES

Aspect (physical state, shape and color): Liquid under pressure. Gas at room temperature. Colorless.
Odor: Extremely Pungent.
Odour threshold: Unknown.
pH: Not available.
Specific temperatures or temperature ranges at which physical state changes occur:
Boiling point: 19.5° C
Freezing Point / Range: -83.4° C.
Decomposition temperature: Not available.
Flash point: Does not apply.
Auto-ignition temperature: Does not apply.
Explosive Limits: Does not apply.
LEI: (lower explosion limit): Does not apply.
LES: (upper explosive limit): Does not apply.
Vapor pressure: 103 kPa to 20° C.
Vapor Density: (air = 1): 0.99 at 14°C.

Density: 0.975 to 20° C.
Solubility: Soluble in water. Releases heat on dilution.
Partition coefficient - n-octanol / water: Not available.
Viscosity: Not available.

10. - STABILITY AND REACTIVITY

Specific conditions:
Reactivity: It can attack glass, concrete and other metals containing silica, as well as those that melt iron. Will attack natural rubber, leather and many organic materials. May generate flammable hydrogen in contact with some metals. **Chemical stability:** Stable if kept in suitable packaging and stored in an airy environment and away from heat sources.
Possibility of hazardous reactions: Risk of ignition or formation of flammable gases or vapors in contact with: metals, alkali metals.
Condition to be avoided: Strong heating.
Incompatible materials: glass, metals, quartz and silicate ceramics. Releases hydrogen due to reaction with metals. Hazardous decomposition products: Hydrogen by reaction with metals and silicon by reaction with fluoride from silicates, e.g. glass or sand.
Explosion hazard/exothermic reaction with: Potassium permanganate, silicon compounds, alkali hydroxides, phosphorus oxides, bismutic acid, strong solutions of alkali hydroxides.

11. - TOXICOLOGICAL INFORMATION

Information according to the different routes of exposure: Acute toxicity: LC_{50}/inhalation/lh/rat = 1276 ppm.
LC_{50}/inhalation/lh/mouse = 342 ppm.

Skin corrosion/irritation: Mixture causes severe skin burns and symptoms may be delayed.
Ingestion: Severe burns to the mouth and throat, as well as perforation of the esophagus and stomach. Vomiting with blood.
Inhalation: Burning of the mucous membranes. Airway injury. The resulting lesions can cause bronchitis, pneumonia and pulmonary edema.
Severe ocular lesions/eye irritation: Causes serious eye damage. **Danger of blindness!**
Respiratory or skin sensitization: If inhaled, it causes burns to the mucous membranes, damage to the respiratory tract. The resulting injuries can affect the following: Bronchitis, Pneumonia, Pulmonary edema. Mixture causes severe skin burns and symptoms may be delayed. Possible consequences: Necrosis after substance penetration is difficult for wounds to heal
Germ cell mutagenicity: Such an effect is not expected.
Carcinogenicity: No such effect is expected
Reproductive toxicity: Such an effect is not expected.
Specific target organ toxicity- single exposure: The substance or mixture is not classified as a specific target organ toxicant, single exposure.
Specific target organ toxicity - repeated exposure: The substance or mixture is not classified as specific target organ toxicant, repeated exposure.
Aspiration hazard: Classification criteria were not satisfied with respect to available data.

12. - ECOLOGICAL INFORMATION

- Environmental effects, behaviors and impacts of the product:
Ecotoxicity: There is no information available.
Persistence and degradability: There is no information available.
Bioaccumulative potential: There is no information available.
Mobility in soil: There is no information available.
Other adverse effects: Danger in drinking water supply if permitted due to entry into soil or aquifers. Harmful effect due to pH change. Although diluted, it forms toxic and corrosive mixtures with water. Additional information on ecology. Discharge into the environment must be avoided.

13. - CONSIDERATIONS ON FINAL DISPOSAL

Recommended methods for final disposal:
The treatment and disposal of product residues must be done in a suitable environment, by people trained in the use of special equipment and the recommended PPE's to avoid contact with the product, its vapors or mists. Leaks must be contained and collected for later disposal after neutralization.
Product:
Ensure all Federal, State and local agencies receive proper notice of spills and disposal methods. CONAMA Resolution 005/1993, Law No. 12,305, as of August 2, 2010 (National Solid Waste Policy). Neutralize slowly and carefully with lime if possible.
Product waste:
Consult environmental regulatory agencies for advice on acceptable regulatory practices. Come in contact with relevant local authorities. It can be incinerated when in compliance with local regulations. Or dispose of in an approved chemical waste landfill.
Used Package:
Empty containers must be drained and covered before handling and transport operations. If the package is not properly washed and decontaminated, it is considered to contain the product.

14. - TRANSPORT INFORMATION

National and International Regulations
Land:
Resolution No. 5947/2021 of the Brazilian National Land Transport Agency (ANTT), Approves the Complementary Instructions to the Regulation of Land Transport of Dangerous Goods and its amendments.
UN number: 1052.
Appropriate name for shipment: HYDROGEN FLUORIDE, ANHYDROUS.
Risk class: 8 (corrosive).
Risk subclass: 6.1 (toxic).
Risk number: 886.
Packing group: I

Waterway:
DPC – Directorate of Ports and Coasts (Transport in Brazilian waters) Maritime Authority Regulations (NORMAM) NORMAM 01/DPC: Vessels Used in Open-seas Navigation
UN number: 1052.
Appropriate name for shipment: HYDROGEN FLUORIDE, ANHYDROUS.
Risk class: 8 (corrosive).
Risk subclass: 6.1 (toxic).
Risk number: 886.
Packing group: I

- Air Transport:
ANAC - National Civil Aviation Agency - Resolution No. 129 as of January 8, 2009
RBAC N°175 - (BRAZILIAN CIVIL AVIATION REGULATION) - TRANSPORTATION OF DANGEROUS ITEMS IN CIVIL AIRCRAFT
IS No. 175-001 - SUPPLEMENTARY INSTRUCTION - IS
ICAO - "International Civil Aviation Organization" - Doc 9284-NA/905
IATA - "International Air Transport Association"
Dangerous Goods Regulation (DGR)
UN number: 1052.
Appropriate name for shipment: HYDROGEN FLUORIDE, ANHYDROUS.
Risk class: 8 (corrosive).
Risk subclass: 6.1 (toxic).
Risk number: 886.
Packing group: I

15. – REGULATORY INFORMATION

Specific regulations for the chemical product:

Federal Decree No. 2,657, as of July 3, 1998;
Standard ABNT-NBR 14725:2014;
Ordinance No. 229, of May 24, 2011 - Amends Regulatory Standard No. 26.
Ordinance No. 1,274, of August 25, 2003: Product subject to control and inspection by the Ministry of Justice - Federal Police Department - MJ/DPF, in the case of import, export and re-export, being essential Prior Authorization from the DPF to carry out these operations.

16. - OTHER INFORMATION

The information on this sheet corresponds to the current state of our knowledge and experience of the product and is not exhaustive. It applies to the product under the conditions specified, unless otherwise stated. In case of combinations or mixtures, make sure that no new danger can appear. This information does not, in any case, exempt the user of the product from complying with all legislative, regulatory and administrative texts relating to the product, safety, hygiene and protection of human and environmental health.

Bibliographical References:

AMERICAN CONFERENCE OF GOVERNMENTAL INDUSTRIALS HYGIENISTS. TLVs® and BEIs®: Based on "Documentation" of Occupational Exposure Limits (TLVs®) for Chemical Substances and Physical Agents & Biological Exposure Indices (BEIs®). Translation Brazilian Association of Occupational Hygienists. São Paulo, 2016.

BRAZIL. MINISTRY OF LABOR AND EMPLOYMENT (MTE). Regulatory Standard (NR) No. 7: Occupational Health Medical Control Program. Brasília, DF. Jun. 1978.

BRAZIL. MINISTÉRIO DO TRABALHO E EMPREGO (MTE). Regulatory Standard (NR) No. 15: Unhealthy activities and operations. Brasília, DF. Jun. 1978.

US EPA. 2011. EPI Suite ™ for Microsoft ® Windows, v 4.10. United States: Environmental Protection Agency, Washington. 2011. Available at:
< http://www.epa.gov/oppt/exposure/pubs/episuite.htm>. Accessed on: September, 2022.

Globally Harmonized System of Classification and Labelling of Chemicals (GHS). 7. rev. United Nations, 2017.

HSDB - HAZARDOUS SUBSTANCES DATA BANK. Available at: <http://toxnet.nlm.nih.gov/cgi- bin/sis/htmlgen?HSDB>. Accessed on: September, 2022.

IARC- INTERNATIONAL AGENCY FOR RESEARCH ON CANCER. Available at:
<http://monographs.iarc.fr/ENG/Classification/index.php>. Accessed on: September, 2022.

IPCS - INTERNATIONAL PROGRAMME ON CHEMICAL SAFETY - INCHEM. Available at: <http://www.inchem.org/>. Accessed on: September, 2022.

IUCLID - INTERNATIONAL UNIFORM CHEMICAL INFORMATION DATABASE. [S.l.]: European chemical Bureau. Available at:
<http://ecb.jrc.ec.europa.eu>. Accessed on: September, 2022.

NIOSH - NATIONAL INSTITUTE OF OCCUPATIONAL AND SAFETY. International Chemical Safety Cards. Available at:
<http://www.cdc.gov/niosh/>. Accessed on: September, 2022.

NITE-GHS JAPAN - NATIONAL INSTITUTE OF TECHNOLOGY AND EVALUATION. Available at:
<http://www.safe.nite.go.jp/english/ghs_index.html>. Accessed on: September, 2022.

U.S. ENVIRONMENTAL PROTECTION AGENCY. ECOSAR - Ecological Structure-Activity Relationships. Version 1.11 Available at: <http://www.epa.gov/oppt/newchems/tools/21ecosar.htm>. Accessed on: September, 2022.