Technical Data Sheet (TDS) - Ammonium Fluoride

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Product Name

Ammonium Fluoride 氟化铵**CAS Number**: 12125-01-8**MDL Number**: MFCD00011420**Formula**: NH_4F**Molecular Weight**: 37.04 g/mol**Form**: White hygroscopic crystalline powder

1. Product Overview

Ammonium Fluoride is a high-purity industrial grade **inorganic fluoride salt** with typical ionic compound properties. It is a white crystalline powder with strong hygroscopy, easily soluble in water, slightly soluble in ethanol, and its aqueous solution is weakly acidic due to hydrolysis. It reacts with strong acids to generate hydrofluoric acid, and decomposes into ammonia and hydrogen fluoride gas when heated to above 100℃. It has good complexing ability with metal ions (e.g., Fe^{3+} , Al^{3+}) and is a key raw material widely used in electronic etching, chemical synthesis, metallurgical beneficiation, glass processing and other industrial fields, with the functions of etching, complexing, fluxing and anti-rust.

2. Technical Specifications (Complies with Industrial Grade Standard)

Item	Specification
Appearance	White crystalline powder, no visible impurities
Assay (NH_4F, dry basis)	≥ 98.0%
Water Insoluble Matter	≤ 0.05%
Chloride (Cl^-)	≤ 0.01%
Sulfate (SO_4^{2-})	≤ 0.01%
Heavy Metals (Pb)	≤ 5 ppm
Iron (Fe)	≤ 0.005%
Loss on Drying (105℃, 2h)	≤ 1.0%
pH Value (5% aq. solution, 25℃)	4.0 ~ 6.0
Fluorosilicate (SiF_6^{2-})	≤ 0.5%
Solubility	Freely soluble in water (83 g/100mL, 25℃); slightly soluble in ethanol
Hygroscopy	Strongly hygroscopic, deliquescent in humid air
Thermal Stability	Decomposes at >100℃, no melting point (sublimes under vacuum)

3. Product Advantages

1. **High Purity**: NH_4F content ≥98.0%, low impurity content (chloride, sulfate, heavy metals), meets strict industrial production requirements.
2. **Strong Reactivity**: Excellent complexing ability with metal ions, fast etching speed for silicate and metal oxides, high industrial application efficiency.
3. **Good Solubility**: Freely soluble in water, easy to prepare aqueous solutions of various concentrations, convenient for on-site use.
4. **Stable Quality**: No batch-to-batch variation under sealed and dry storage conditions, consistent physical and chemical properties.
5. **Multi-functional Application**: Can be used as etching agent, flux, complexing agent and rust inhibitor, covering multiple industrial fields.
6. **Compliant with Standards**: Meets national and international industrial fluoride salt quality standards, suitable for industrial large-scale production and use.

4. Application Fields

- **Electronic & Semiconductor Industry**: Etching agent for silicon wafer, glass substrate and ceramic circuit board; cleaning agent for electronic components (removes metal oxide impurities).
- **Chemical Industry**: Raw material for fluorine-containing compound synthesis (e.g., ammonium fluorosilicate); complexing agent for metal ion separation in hydrometallurgy; catalyst for organic synthesis reactions.

- **Metallurgical Industry**: Flux for non-ferrous metal smelting (reduces melting point of ore); beneficiation agent for rare metal separation; rust inhibitor for iron and steel surface treatment.
- **Glass & Ceramic Industry**: Etching agent for frosted glass and patterned glass; flux for ceramic sintering (improves ceramic compactness); surface treatment agent for ceramic products.
- **Other Fields**: Mordant for textile printing and dyeing; anti-mold agent for wood processing; analytical reagent for laboratory fluoride ion detection.

5. Usage Methods

Dosage (Adjust according to application field and process requirements)

- **Electronic Etching**: Prepare 5~20% aqueous solution, adjust pH to 4.0~5.0 with acetic acid, etching time 1~10 min (depending on substrate thickness).
- **Chemical Complexing**: 0.5~5.0% of the total reaction system, stir evenly in aqueous phase reaction.
- **Metallurgical Flux**: 2~8% of the ore mass, mix with ore before smelting.
- **Glass Etching**: 10~30% aqueous solution, add a small amount of ammonium bifluoride (1~3%) to improve etching effect.

Key Processing Requirements

- **Operation in dry environment**: Strictly avoid contact with humid air to prevent hygroscopy and deliquescence.

6. Packaging & Storage

Packaging Specifications

- 500 g / HDPE plastic bottle (sealed, laboratory/ small-batch use)
- 25 kg / HDPE plastic drum (double-sealed, industrial small-scale use)
- 100 kg / HDPE plastic drum (sealed with inner plastic bag, bulk industrial use)
- 1000 kg / IBC tote (HDPE material, anti-corrosion, large-scale production use)
- Custom anti-corrosion packaging available for special industrial requirements.

Storage Conditions

- **Core Requirement**: Store in a **dry, cool, well-ventilated warehouse** at 0~30℃; relative humidity ≤60%, strictly avoid humid air and water contact.
- Keep the container tightly sealed (double-sealed for bulk packaging) to prevent hygroscopy, deliquescence and decomposition; use anti-corrosion HDPE packaging only (avoid glass/metal containers).
- Store separately from strong acids, strong bases, oxidizing agents, metals, food and feed raw materials; isolation distance ≥1.5m, no mixed storage.

7. Safety & Protection

- The product is corrosive and hygroscopic; wear **full set of anti-corrosion PPE** during all handling and operation processes, no direct contact with skin, eyes and mucous membranes.
- **Mandatory PPE**: Acid and alkali resistant nitrile rubber gloves (thickness ≥0.2mm), chemical safety goggles/face shield, anti-corrosion protective clothing, acid and alkali resistant boots; wear a gas mask (HF type) in poorly ventilated areas.
- **Skin Contact**: Immediately rinse the affected area with **plenty of running water** for 15~20 minutes; remove contaminated clothing and shoes, and consult a physician immediately (may cause chemical burns).
- **Eye Contact**: Immediately pry open the eyelids and rinse with plenty of running water/normal saline for 20~30 minutes; do not rub eyes, and consult an ophthalmologist immediately (may cause severe eye damage).
- **Accidental Ingestion**: Rinse mouth with water immediately, **do not induce vomiting**; drink a small amount of milk or egg white (neutralize fluoride ions), and call a poison center/physician immediately.
- **Inhalation**: Move to fresh air immediately, keep breathing unobstructed; if breathing is difficult, give oxygen and consult a physician immediately (avoid inhaling dust and decomposition gas).