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Technical Data Sheet (TDS)

- Tupinal-SI (=HEDP)
Revision Date: 28 FEB 2026

1. Product Overview

- **Product Name**: Tupinal-SI (=HEDP)
- **English Name**: 1-Hydroxyethylidene-1,1-diphosphonic Acid; Hydroxyethylidene Diphosphonic Acid
- **CAS Number**: 2809-21-4
- **Molecular Formula**: $C_2H_8O_7P_2$
- **Molecular Weight**: 206.03 g/mol
- **Form**: Colorless to pale yellow clear aqueous liquid (50% active content)
- **Odor**: Faint acidic odor, no pungent smell

Tupinal-SI (HEDP) is a high-efficiency organic phosphonic acid chelating agent and scale inhibitor, presented as a 50% aqueous solution. It features strong chelating ability with metal ions (Ca^{2+}, Mg^{2+}, Fe^{3+}, Cu^{2+}, etc.), excellent scale inhibition and corrosion inhibition performance, and good thermal and chemical stability (stable under 200℃ high temperature and acidic/alkaline conditions). The product is water-soluble, compatible with most water treatment chemicals, and has good biodegradability. It is widely used as a scale and corrosion inhibitor in industrial circulating water, boiler water, reverse osmosis systems, as well as a chelating agent in electroplating, cosmetic and textile printing and dyeing industries, complying with international water treatment and industrial additive standards.

2. Technical Specifications (Complies with Industrial Standard)

Item	Specification
Appearance	Colorless to pale yellow clear liquid, no sediment/impurity
Assay (HEDP)	≥ 50.0%
pH Value (1% aqueous solution, 25℃)	1.0 ~ 3.0
Phosphorous Acid (H_3PO_3)	≤ 1.0%
Orthophosphoric Acid (H_3PO_4)	≤ 0.5%
Chloride (Cl^-)	≤ 0.01%
Sulfate (SO_4^{2-})	≤ 0.01%
Heavy Metals (Pb)	≤ 5 ppm
Iron (Fe)	≤ 10 ppm
Density (25℃)	1.30 ~ 1.38 g/cm³
Calcium Sequestering Power	≥ 300 mg $CaCO_3$/g
Water Solubility	Fully miscible with water at any ratio
Thermal Stability	Stable at ≤ 200℃ (no decomposition)
Storage Stability (25℃, 24 months)	Assay change ≤ 1.0%, no stratification

3. Product Advantages

1. **Superior Chelating & Scale Inhibition**: Strong complexation with metal ions, effectively inhibits calcium carbonate, calcium sulfate, calcium phosphate and other scale formation, scale inhibition rate ≥ 90% at low dosage.
2. **Excellent Corrosion Inhibition**: Forms a stable protective film on metal surfaces, effectively preventing carbon steel, copper, aluminum and other metal corrosion, suitable for multi-metal system protection.
3. **High Stability**: Resistant to high temperature, acid, alkali and oxidation; no decomposition under high temperature and strong oxidant conditions, suitable for high-temperature water treatment systems.
4. **Good Compatibility**: Miscible with polyphosphates, polycarboxylates, quaternary ammonium salts and other water treatment agents, no adverse reaction, can be used in compound formulations.

5. **Low Dosage & High Efficiency**: Effective at low concentration (2-20 ppm), reduces water treatment cost, no secondary pollution to water body.
6. **Multi-functional Application**: Integrates chelation, scale inhibition and corrosion inhibition, one product for multiple uses, simplifies water treatment process.

4. Application Fields

- **Industrial Water Treatment**: Scale and corrosion inhibitor for circulating cooling water, boiler water, central air conditioning water and reverse osmosis system; prevents scale formation and metal pipeline corrosion.
- **Electroplating Industry**: Chelating agent for electroplating bath, complex metal ions, improve plating layer uniformity and brightness, reduce plating waste.
- **Cosmetic Industry**: Chelating agent for skin care products, hair care products and cosmetics, chelate metal ions in raw materials, prevent product oxidation and discoloration, extend shelf life.
- **Textile & Printing Dyeing**: Sequestering agent for dyeing and finishing process, chelate metal ions in water and dyes, improve dyeing uniformity and color fastness.
- **Metal Surface Treatment**: Rust remover and passivator for metal surface, remove metal oxide scale, form a protective film, improve metal surface finish.
- **Other Fields**: Water quality stabilizer for oilfield water injection, chelating agent for pulp and paper industry, scale inhibitor for desalination system.

5. Usage Methods

Recommended Dosage (Adjust according to water quality and application scenario)

- **Industrial Circulating Water**: 2 ~ 20 ppm (single use); 1 ~ 5 ppm (compound with other water treatment agents)
- **Boiler Water Treatment**: 5 ~ 30 ppm (depending on boiler pressure and water hardness)
- **Reverse Osmosis System**: 1 ~ 5 ppm (dilute with pure water before adding)
- **Electroplating Industry**: 0.5 ~ 5 g/L (electroplating bath formulation)
- **Cosmetic Industry**: 0.05 ~ 0.5% (total formulation weight)
- **Textile Dyeing**: 0.1 ~ 1 g/L (dyeing bath)

Key Application Tips

1. **Direct/ Diluted Addition**: Can be added directly to the water system, or diluted with water (1:5 ~ 1:10) for uniform addition; add continuously with a metering pump for industrial water treatment.
2. **pH Adjustment**: The product is acidic; adjust the system pH to 6.0 ~ 8.5 with alkali (NaOH, Na_2CO_3) for water treatment to achieve the best scale and corrosion inhibition effect.
3. **Compound Use**: Can be compounded with polyacrylamide, polycarboxylate, zinc salt and other agents to improve the overall water treatment effect.
4. **Addition Point**: Add at the water inlet of the circulating system to ensure uniform mixing with water; avoid direct addition to high-temperature boiling water.6. Packaging & Storage

Packaging Specifications

- 500 mL/1 L HDPE plastic bottle (laboratory/R&D small-batch use)
- 25 L food-grade HDPE plastic drum (cosmetic/electroplating small-scale use)
- 200 L industrial HDPE plastic drum (water treatment/industrial bulk use)
- 1000 L IBC ton barrel (large-scale water treatment project use)
- Custom packaging available according to customer requirements.

7. Safety & Protection

1. The product is a strong acid, has corrosive effect on skin, eyes and mucous membranes; avoid direct contact with skin, eyes and inhalation of mist during operation.
2. **Recommended PPE**: Acid-resistant nitrile rubber gloves, chemical safety goggles, acid-resistant lab coat, face shield (for large-scale handling); wear a gas mask if mist is generated.
3. **Accident Treatment**:

- Skin Contact: Immediately rinse the affected area with plenty of running water for 15 ~ 20 minutes; apply neutral anti-corrosive ointment if necessary, consult a physician if severe burns occur.
- Eye Contact: Pry open the eyelids and rinse with plenty of clean running water for 20 minutes; consult an ophthalmologist **immediately** (do not rub eyes).