

Technical Data Sheet (TDS)

1. Product Overview

- Product Name: Copper Sulfate (Pentahydrate)
- English Name: Copper Sulfate Pentahydrate; Cupric Sulfate; Blue Vitriol
- CAS Number:7758-98-7
- Formula:CuSO₄·5H₂O (Anhydrous: CuSO₄, CAS 7758-98-7)
- Molecular Weight:249.69 g/mol (pentahydrate); 159.61 g/mol (anhydrous)
- Product Characteristics: Bright blue crystalline powder/crystals, odorless, bitter and astringent taste, hygroscopic. Inorganic copper salt with strong water solubility, acidic aqueous solution, non-flammable, corrosive to iron/steel, toxic to aquatic organisms. Dehydrates to white anhydrous copper sulfate at > 100°C, decomposes at high temperature to produce toxic copper oxide fumes. Suitable for electroplating, agriculture, water treatment, chemical synthesis and laboratory analysis.

2. Technical Specifications

Item	Specification (Industrial Grade Pentahydrate)
Appearance	Bright blue crystalline powder/crystals
Purity (CuSO ₄ ·5H ₂ O Content)	≥ 99.0%
Water Insoluble Matter	≤ 0.02%
Chloride (as Cl ⁻)	≤ 0.02%
Iron (Fe)	≤ 0.01%
Zinc (Zn)	≤ 0.01%
Lead (Pb)	≤ 0.5 ppm
Arsenic (As)	≤ 0.1 ppm
pH Value (5% aqueous solution, 25°C)	3.5-4.5
Solubility (25°C)	20.7 g/100 mL water
Dehydration Temperature	> 100°C (loses crystal water)
Melting Point	110°C (dehydrates); 650°C (decomposes, anhydrous)
Density (20°C)	2.284 g/cm ³ (pentahydrate)

3. Product Advantages

1. High Purity & Low Impurity: Strict control of heavy metals, chloride and iron/zinc impurities, stable copper ion content.
2. High Crystallinity: Bright blue crystals, low water insoluble matter, rapid dissolution, high utilization rate.
3. Stable Performance: No decomposition under normal storage conditions, constant copper ion activity, suitable for long-term use.
4. Good Reactivity: Rapid complexation with ammonia water, sodium hydroxide and other reagents, high reaction conversion rate.
5. Standard Concentration: Meet national industrial standards, consistent product quality, no batch difference.

4. Application Fields

- Electroplating Industry: Main copper source for copper electroplating, electroforming and electroless copper plating (the largest application field).



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- Agricultural Use: Fungicide for crop downy mildew, blight and powdery mildew (Bordeaux mixture raw material with lime); trace element fertilizer for copper deficiency crops.
- Water Treatment: Algicide for industrial circulating water and swimming pools (inhibits algae growth); heavy metal removal agent for wastewater.
- Chemical Synthesis: Precursor for copper oxide, copper hydroxide and copper complex production; catalyst for organic synthesis.
- Laboratory Research: Analytical reagent (copper ion standard solution), water quality testing (anhydrous for water content detection), and chemical experiment raw material.
- Pigment Industry: Production of blue pigment (ultramarine) and ceramic colorant.

5. Usage Methods

- Electroplating: Dilute to 5-15% concentration, adjust pH to 3.0-4.0 with sulfuric acid, use insoluble anode (titanium/platinum).
- Agricultural Use: Dilute to 0.1-0.5% concentration for foliar spraying; mix with lime to prepare 1:1 Bordeaux mixture (0.5-1.0% concentration) for spraying.
- Water Treatment: Dosage 0.5-2.0 mg/L (algicide); add slowly and stir evenly, avoid excessive use (toxic to aquatic life).
- Laboratory Use: Prepare standard copper ion solution (0.01-0.1 mol/L) by accurate weighing and dissolution.
- Optimal Conditions: Operate in well-ventilated areas; use plastic/glass/stainless steel equipment (avoid iron/steel contact to prevent corrosion); avoid mixing with alkaline substances.

6. Packaging & Storage

- Packaging: 1kg/5kg HDPE sealed bags, 25kg woven bags with plastic inner lining, 50kg HDPE drums (UN-approved, marked with toxic and corrosive signs).
- Storage: Cool, dry, well-ventilated warehouse ($\leq 30^{\circ}\text{C}$); sealed packaging, prevent moisture absorption and deliquescence; separate from food, feed, alkaline substances and iron/steel products.
- Shelf Life: 24 months (unopened, under specified storage conditions).
- Transportation: Hazardous goods (toxic to aquatic life, corrosive); transport in accordance with hazardous goods transportation regulations, avoid mixing with food/feed and iron/steel products.

7. Safety & Protection

- Toxic to aquatic organisms, corrosive to iron/steel, mild irritation to human skin/eyes: Wear nitrile rubber gloves, chemical safety goggles, anti-corrosion clothing and dust mask during operation.
- Avoid skin/mucous membrane contact and dust inhalation; avoid direct discharge into water bodies (toxic to fish/shrimp).
- No open flame required for operation; keep first aid equipment (water, neutralizer) on site.

8. Quality Assurance

- Manufactured under ISO 9001 quality management system, in line with GB/T 4372-2018 industrial copper sulfate standard.
- Each batch is equipped with a detailed COA, with copper ion content and impurity indicators traceable.
- Provide technical support for electroplating process optimization, agricultural dosage and water treatment application.