Status: Currently Official on 14-Feb-2025
Official Date: Official as of 01-Dec-2014
Document Type: USP Monographs
DocId: GUID-FE7406A6-F50D-4A2B-AA57-E6EF2E2FDCA0_1_en-US
DOI: https://doi.org/10.31003/USPNF_M20700_01_01
DOI Ref: o38z3

Cupric Sulfate

$CuSO_4 \cdot 5H_2O$ 249.69
$CuSO_4$ 159.61
Sulfuric acid, copper(2+) salt (1:1), pentahydrate;
Copper(2+) sulfate (1:1) pentahydrate CAS RN®: 7758-99-8; UNII: LRX7AJ16DT.
Anhydrous CAS RN®: 7758-98-7; UNII: KUW2Q3U1VV.

DEFINITION

Cupric Sulfate is anhydrous or contains five molecules of water of hydration. It contains NLT 98.5% and NMT 100.5% of cupric sulfate ($CuSO_4$), calculated on the dried basis.

IDENTIFICATION

- **A. Identification Tests—General, *Sulfate* ⟨191⟩:** A 100-mg/mL solution meets the requirements.
- **B. Identification Tests—General, *Copper* ⟨191⟩:** A 100-mg/mL solution meets the requirements.

ASSAY

- **Procedure**

Sample solution: Place 650 mg of Cupric Sulfate in a weighed container fitted with a ground-glass stopper. Dry, allow to cool in a desiccator, and weigh again to obtain the weight of the sample. Dissolve in 50 mL of water. Add 4 mL of 6 N acetic acid and 3 g of potassium iodide.

Titrimetric system

Mode: Direct titration

Titrant: 0.1 N sodium thiosulfate VS

Endpoint detection: Visual

Analysis: Titrate the liberated iodine in the *Sample solution* with the *Titrant*, adding about 2 g of potassium thiocyanate and 3 mL of starch TS as the endpoint is approached. Perform a blank determination, and make any necessary correction. Each mL of 0.1 N sodium thiosulfate is equivalent to 15.96 mg of cupric sulfate ($CuSO_4$).

Acceptance criteria: 98.5%–100.5% on the dried basis

IMPURITIES

- **Limit of Sodium**

Sample stock solution: 0.2 g/mL of cupric sulfate in water, prepared as follows. Transfer 40.0 g of Cupric Sulfate to a 200-mL volumetric flask, add water, and swirl to dissolve. Add 5 mL of nitric acid, and dilute with water to volume.

Sample solutions: To three 25-mL volumetric flasks add a volume of *Sample stock solution* equivalent to the *Sample Weight* given in *Table 1*. To two of the flasks add the amounts of reference analyte ion specified in *Table 1*. Add 2 mL of potassium chloride solution (1 in 20) to each flask, and dilute with water to volume.

Analysis: Using atomic absorption spectrophotometry (see *Atomic Absorption Spectroscopy* ⟨852⟩), analyze the *Sample solutions* by the method of standard addition analysis given in *Table 1*.

Table 1

Limit Test	Wave length (nm)	Sample Weight (g)	Reference Ion Added (mg)	Flame Type	Background Correction
Sodium	589.0	0.05	0.005/ 0.01	Air–acetylene	No
Potassium	766.5	0.4	0.02/ 0.04	Air–acetylene	No
Calcium	422.7	0.8	0.02/ 0.04	Nitrous oxide–acetylene	No
Iron	248.3	4.0	0.12/ 0.24	Air–acetylene	Yes
Nickel	232.0	4.0	0.10/ 0.20	Air–acetylene	No

Acceptance criteria: NMT 0.02%

- **Limit of Potassium**

Sample stock solution: Prepare as directed in the test for *Limit of Sodium*.

Sample solutions: To three 25-mL volumetric flasks add a volume of *Sample stock solution* equivalent to the *Sample Weight* given in *Table 1*. To two of the flasks add the amounts of reference analyte ion specified in *Table 1*, and dilute with water to volume.

Analysis: Using atomic absorption spectrophotometry (see *Atomic Absorption Spectroscopy ⟨852⟩*), analyze the *Sample solutions* by the method of standard addition analysis given in *Table 1*.

Acceptance criteria: NMT 0.01%

- **Limit of Calcium**

Sample stock solution: Prepare as directed in the test for *Limit of Sodium*.

Sample solutions: To three 25-mL volumetric flasks add a volume of *Sample stock solution* equivalent to the *Sample Weight* given in *Table 1*. To two of the flasks add the amounts of reference analyte ion specified in *Table 1*, and dilute with water to volume.

Analysis: Using atomic absorption spectrophotometry (see *Atomic Absorption Spectroscopy ⟨852⟩*), analyze the *Sample solutions* by the method of standard addition analysis given in *Table 1*.

Acceptance criteria: NMT 0.005%

- **Limit of Iron**

Sample stock solution: Prepare as directed in the test for *Limit of Sodium*.

Sample solutions: To three 25-mL volumetric flasks add a volume of *Sample stock solution* equivalent to the *Sample Weight* given in *Table 1*. To two of the flasks add the amounts of reference analyte ion specified in *Table 1*, and dilute with water to volume.

Analysis: Using atomic absorption spectrophotometry (see *Atomic Absorption Spectroscopy ⟨852⟩*), analyze the *Sample solutions* by the method of standard addition analysis given in *Table 1*.

Acceptance criteria: NMT 0.003%

- **Limit of Nickel**

Sample stock solution: Prepare as directed in the test for *Limit of Sodium*.

Sample solutions: To three 25-mL volumetric flasks add a volume of *Sample stock solution* equivalent to the *Sample Weight* given in *Table 1*. To two of the flasks add the amounts of reference analyte ion specified in *Table 1*, and dilute with water to volume.

Analysis: Using atomic absorption spectrophotometry (see *Atomic Absorption Spectroscopy ⟨852⟩*), analyze the *Sample solutions* by the method of standard addition analysis given in *Table 1*.

Acceptance criteria: NMT 0.005%

SPECIFIC TESTS

- **Loss on Drying ⟨731⟩**

Analysis: Dry it at 250° to constant weight.

Acceptance criteria: 33.0%–36.5% for the pentahydrate form; NMT 1.0% for the anhydrous form

ADDITIONAL REQUIREMENTS

• **Packaging and Storage:** Preserve in tight containers. Store at controlled room temperature.

• **Labeling:** Label the product to indicate whether it is anhydrous or it is the pentahydrate.

Auxiliary Information - Please check for your question in the FAQs before contacting USP.

Topic/Question	Contact	Expert Committee
CUPRIC SULFATE	Documentary Standards Support	SM12020 Small Molecules 1

Chromatographic Database Information: Chromatographic Database

Most Recently Appeared In:
Pharmacopeial Forum: Volume No. PF 39(4)

Current DocID: GUID-FE7406A6-F50D-4A2B-AA57-E6EF2E2FDCA0_1_en-US

DOI: https://doi.org/10.31003/USPNF_M20700_01_01

DOI ref: o38z3