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**Product Bulletin**

Product Name: Laser S
Product Code: 2341002
Revision Date: July 8, 2025

# Laser® S

**Laser S** is a Peroxide/Sulfuric Acid system that replaces bichromate, chromic acid, or Nitric-Sulfuric Acid pickles commonly used for pickling copper, brass and bronze alloys. It contains no greater than 34% by weight Hydrogen Peroxide.

As a pre-pickle, laser s is an effective process that quickly dissolves heavy oxides to produce a matte surface that is well suited for subsequent metal plating, soldering, or mechanical polishing.

## Features & Benefits

| | |
|---|---|
| Hydrogen peroxide<34% | Below reportable limit |
| Non-fuming | Safer work environment |
| Fast | Higher productivity |
| Non-chelated | Easier to waste treat, lower cost |
| Versatile | Effective on a wide range of copper alloys |
| Copper can be re-claimed | Process cost reduction |

Laser S Make-Up
Make up in the following order:

| Component | Concentration |
|---|---|
| Water | 79.5% by volume |
| Copper sulfate | 2.0 oz/Gal |
| Sulfuric Acid, 66□ Be' | 15% by volume |
| Laser S | 5.5% by volume |

Make-up Procedure

1. Fill tank three-quarters full of water.
2. Dissolve 2 oz/Gal copper sulfate pentahydrate if 300 series stainless steel equipment is being used.
3. Carefully add required amount of Sulfuric Acid 66□ Be', technical grade and mix well.
4. Allow bath to cool below 130□F.
5. Add required amount of laser S and mix well.
6. Bring up to final volume with water.

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## Operating Conditions

| | | Range | Optimum |
|---|---|---|---|
| 1. | Laser S | 3% – 7% | 5.5% (vol.) |
| 2. | Sulfuric Acid | 10% – 20% | 15% (vol.) |
| 3. | Temperature | 110□F – 125□F | 120□F |
| 4. | Immersion time | 1 – 4 minutes | |

Laser S is a concentrated peroxide solution that completely removes oxides, scales, and smuts from copper alloys and restores these metals to their original color. Inhibitors contained in this concentrate serve to minimize attack on the base metal and retard tarnish formation after processing.

Equipment
Stainless steel or plastic tanks that have provision for heating and cooling are recommended:

Stainless steel (type 304 or 316 pre-passivated)
PVC (type 1)
PVDC
Polyethylene
Polypropylene (molded or extruded)

## Titration Methods

Laser S Concentration
Chemicals Required

- Sulfuric Acid solution, 50% volume
- Ferroin indicator:
  Mix 1.3 grams 1,10-Phenanthroline with 0.7 grams ferrous sulfate heptahydrate and dissolve in 100 mL distilled water.
- Standard ceric solution 0.1N:
  Slowly add 30 mL concentrated Sulfuric Acid to 500 mL distilled water with constant stirring, then add 63.25 grams of ceric ammonium sulfate dihydrate and mix until dissolved; add distilled water to 1 liter in volumetric flask.

Procedure

1. Pipette 1 mL of bath into 500 mL Erlenmeyer flask and add approximately 300 mL of distilled water. Swirl to mix.
2. Add 5 mL Sulfuric Acid solution and mix.
3. Add 1 mL ferroin indicator.
4. Titrate with standard Ceric Solution from pale red to pale blue.
5. Record mL used.

Calculation

*Concentration = mL $Ce(SO_4)_2$ x 0.40*

Sulfuric Acid Concentration

1. Pipette 1 mL of bath solution into 250 mL Erlenmeyer flask.
2. Add 3 drops of Methyl Orange indicator.
3. Titrate with 1.0 N Sodium Hydroxide solution until a yellow-green color is observed.
4. Record mL used.

Calculation

*Concentration ($H_2SO_4$) = mL of 1.0N NaOH x 2.8*

Copper Concentration

Chemicals Required

- Pan indicator, makeup:
  Dissolve 0.1 gram of pan indicator (1-(2 pyridyl) -2 naphthol) in 100 mL of methyl alcohol.
- 0.0575 M EDTA disodium salt solution, make-up:
  Dissolve 21.40 grams of M EDTA disodium salt in 10 mL of concentrated ammonium hydroxide and 100 mL of distilled water, make up to 1 liter with distilled water.

Procedure

1. Pipette 1 mL of working solution into 500 mL Erlenmeyer flask.
2. Add 2 mL of concentrated Ammonium Hydroxide.
3. Add 100 mL of distilled water and about 4 drops of pan indicator.
4. Titrate with 0.0575 M EDTA disodium salt solution until an end color changes from purple to green.
5. Record mL used.

Calcuation

*Copper (oz/Gal) = mL 0.0575 M EDTA x 0.48*

Copper Sulfate Recovery

At operating temperature of 105□F to 115□F and Sulfuric Acid concentration of 13 to17 fluid oz/Gal, as much as 10 oz/Gal of copper can be contained in the bath without salting out.

At room temperature the saturation point of the bath lies somewhere between 5 to 6 oz/Gal copper (20 -24 oz/Gal copper sulfate given the same operating concentrations above. Any concentrations above 6 oz/Gal will crystallize out of solution after 12 hours of shut down at room temperature.

Thus, if operating concentration is at 10 oz/Gal of copper, upon cooling 4 oz/Gal of copper or 16 oz/Gal copper sulfate crystals would be formed after 12 hours. If the bath in question was 100 gallons, this would represent 25 lbs. of copper sulfate pentahydrate crystals.

By using the control procedure for copper concentration daily, the operator can determine by established production figures at what time he will have to shut down before saturation develops and can plan his schedule for the 12 hours shutdown.

During shut down and after crystallization of the excess copper sulfate, the bath is decanted into an extra tank, necessary chemicals are added to bring chemistry back up to operating range and the bath again is put into full production.

The copper sulfate crystals are dumped out of first tank and collected and sold to the copper reclaim market.

If the production is such that shut down is impractical (3 shifts), then two operating tanks should be put in line. One is used as a backup while the other is shut down.

## Waste Disposal

Spent solutions contain Hydrogen Peroxide and Sulfuric Acid (although to varying degrees). They will contain dissolved metals - copper, zinc, lead, etc. They do not contain chelators.

Laser S solutions can be treated with other waste streams or they can be segregated, and batch treated independently. If a clarifier is used in the separation of solids and liquids, the batch method is preferred. Small gas bubbles produced by peroxide destruction can lift previously precipitated sludge and cause "floaters". If membrane filters, cartridge filters, sand filters, filter presses, etc., are used, then everything can be mixed.

Hydrogen Peroxide is generally unstable on the alkaline side. Since Laser S solutions are acidic, they require adjustment with caustic, caustic potash, lime, soda ash, etc. When the pH rises above 8.0, an effervescence will occur. This will vary with the concentration of peroxide. Certain dissolved metals like iron, lead, copper - will accelerate this.

This breakdown should be allowed to run to completion - as evidenced by the absence of gassing. If the dwell time is very short, sodium bisulfite can be used to expedite the process.

When the pH was raised, the various metals will precipitate in their hydroxide forms. If the LASER solution is mixed with chelate-containing wastes, some can remain in solution. Care should be taken to prevent this.

After metal precipitation and peroxide breakdown are complete, the waste stream can be handled in the normal fashion. The addition of coagulants and flocculants can proceed as normal.

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## Caution

DO NOT STORE USED LASER SOLUTIONS INJ SEALED DRUMS. DISCHARGE USED LASER SOLUTIONS TO WASTE TREATMENT SYSTEMS EQUIPPED TO HANDLE THEM.

Laser S is a Hydrogen Peroxide mixture and should be stored in original vented container in a dry location, out of sun and away from heat. Empty containers should be diluted with large quantities of water and discarded. A spill or leak should be quickly flushed away by flooding with water.

Avoid contamination from any source, including metals, dust and especially organic materials. Avoid contact with combustible materials. Do not get in eyes - wear goggles. Avoid contact with skin - wear neoprene, butyl rubber or vinyl gloves. Wash thoroughly after handling. Do not breathe mists or vapors; adequate ventilation should be provided.

In the event the laser solution drum begins to vent, immediately apply a cold-water spray to cool the drum. Do not physically handle the drum. Also, contact Hubbard-Hall Inc. for further assistance. In case of contact with skin immediately flush with water for at least 15 minutes while quickly removing contaminated clothing and shoes. For eyes immediately flush with water for at least 15 minutes and call a physician.

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