Laser® EX 50 Plus

Laser EX 50 Plus 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 containing iron, manganese, and /or nickel.

As a pre-pickle, Laser EX 50 Plus 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.

Laser EX 50 Plus 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.

Features & Benefits

Non-fuming	Safer to work with
Low water treatment impact	Lower total process cost
High stability	Tolerates high copper loading; longer life; lower cost of use

Operating Conditions

Laser EX 50 Plus make-up
Solution make-up in the following order

Component	Concentration
Water	79.5%
Copper Sulfate	2.0 oz/Gal
Sulfuric Acid, 66°Be’	15% by volume
Laser EX 50 Plus	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 to below 130°F.
5. Add required amount of Laser EX 50 Plus and mix well.
6. Bring up the final volume with water.

	Range	Optimum
Laser EX 50 Plus	3% – 7%	5.5% by volume
Sulfuric Acid	10% – 20%	15% by volume
Temperature	110°F – 125°F	120°F
Immersion Time	1 – 4 minutes	

Equipment

Tanks	PVC, Polypropylene, Polyethylene, 304 or 316 stainless steel
Heaters	Quartz, Teflon or 316 stainless steel
Cooling Coils	304 or 316 stainless steel
Ventilation	Required
Fixtures, Racks, & Baskets	Polypropylene, PVC, nylon, or stainless steel

Titration Method

Laser EX 50 Plus – Potassium Permanganate Method

1. Pipette a 2 mL sample into a 100 mL volumetric flask and dilute to the mark with DI water.
2. Pipette a 10 mL sample of the diluted solution into a 250 mL Erlenmeyer flask and add 75 mL of DI water.
3. Add 5 mL of concentrated sulfuric acid.
4. Titrate with 0.1 N Potassium Permanganate solution until a pink color remains for 10 to 20 seconds.
5. Record mL used.

Calculation

$$Concentration = 0.1N\ KMnO_4 \times 1.5$$

Laser EX 50 Plus - Ceric Sulfate Method

Chemicals required

1. Sulfuric acid solution - 50% by volume.
2. Ferroin Indicator
   Mix 1.3 grams of 1,10 - Phenanthroline with 0.7 grams of ferrous sulfate heptahydrate and dissolve in 100 mL DI water.
3. Standard Ceric Sulfate Solution - 0.1N.
   Slowly add 30 mL conc. sulfuric acid to 500 mL DI water with constant stirring, then add 63.25 grams of ceric ammonium sulfate dihydrate and mix until dissolved. Add DI water to 1 liter in a volumetric flask.

Procedure

1. Pipette a 2 mL sample into a 100 mL volumetric flask and dilute to the mark with distilled water.

2. Pipette a 10 mL sample of the diluted solution into a 250 mL Erlenmeyer flask and add 75 mL of DI water.
3. Add 5 mL of sulfuric acid solution and mix.
4. Add 1 mL Ferroin Indicator.
5. Titrate with 0.1 N Ceric Sulfate solution until the color changes from pale red to pale blue.
6. Record mL used.

Calculation

$$Concentration = mL\ 0.1N\ Ce(SO_4)_2 \times 1.5$$

Sulfuric Acid Concentration

1. Pipette 5 mL sample into a 250 mL Erlenmeyer flask.
2. Add 75 mL of DI water.
3. Add 5 drops of Methyl Orange indicator.
4. Titrate with 0.1 N Sodium Hydroxide to a yellow endpoint.
5. Record mL used.

Calculation

$$Concentration\ (H_2SO_4) = 0.1N\ NaOH \times 0.05$$

Copper Concentration

Chemicals required

1. Pan indicator, makeup:

Dissolve 0.1 gram of pan indicator (1-(2-pyridylazo)-1-napthol) in 100 mL of methanol.

2. 0.0575 M EDTA disodium salt solution, makeup:
   Dissolve 21.4 grams of DETA disodium salt in 10 mL of concentrated Ammonium Hydroxide and 100 mL of distilled water, dilute up to 1 liter with distilled water.

Procedure

1. Pipette 1.0 mL of Laser EX 50 PLUS solution into a 500 mL Erlenmeyer flask.
2. Add 2 mL of concentrated Ammonium Hydroxide (28% by weight). The solution will gas vigorously. The color should be a blue violet.
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 endpoint color changes from blue violet to green.
5. Record mL used.

Calculations

$$Copper\ (oz/Gal) = mL\ 0.0575\ M\ EDTA \times 0.48$$
$$Copper\ (g/L) = mL\ 0.0575\ M\ EDTA \times 3.6$$

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. Spent solutions should never be stored in non-vented tanks or containers. The spent solution should

also be kept acidic until such time as any remaining peroxide can be released in a controlled manner.

Laser 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.

Caution

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

Our People. Your Problem Solvers.

For more information on this process,
please call us at 203.756.5521 or email: techservice@hubbardhall.com

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