Electropolish WA

Electropolish WA is an acidic solution, used at full strength, with current (anodically) for polishing, machining, sizing, burr removal, and as a means of smoothing and leveling any one of the following metals:

Steel (low and high carbon)
Stainless steel alloys (200, 300 and 400 series)

Overview

- Universal solution for the above metals
- Solution composition is stable and will not crystalize out upon cooling
- Solution is designed for high-speed operation
- Since the WA solution is full sludging, (ie. nearly all the metallic salts formed as a product of electropolishing will settle to the bottom of the tank) the metallic salts will not interfere with the solution's performance and will greatly increase the life of the solution
- Low temperatures or short immersion times will produce finishes on the satin side
- Bright finishes are achieved by increasing time, temperature, and/or current density
- Gas streaks from high current densities (evolution of oxygen) are easily avoided with an anode rod agitator or stirrers in solution which are above the metallic sludge buildup

Features & Benefits

High quality raw materials	Product consistency and performance
Rigorous quality assurance	Product consistency and performance

Operating Conditions

Concentration	Full strength (Use as received)
Operating temperature range	140 - 220°F (60 - 104°C) Note: Operating temperature will be dependent upon alloys processed. (see below)
Anode current density	100 - 700 Amps/ft^2 (10 - 70 Amps/dm^2)
Cathode current density	50 - 100 Amps/ft^2 (5 - 10 Amps/dm^2)
Voltage	7 - 15
Agitation	Anode rod 5 - 10 ft/min (1.5 - 3.0 m/min) or use mild agitation (use

	chemical coil)
Time	Dependent upon metal and finish required
Ventilation	150 - 250 CFM/ft^2 of solution surface area (approximately 80,000 cm^3/sec)

Equipment

Tank	Chemical lead or lead-tin lined steel tank
Heating/Cooling coils	Chemical lead, lead-tin, quartz, or tantalum Note: Allow a minimum of 12in (30cm) between tank bottom and coil bottom. Remove sludge accumulation from tank bottom to avoid contact of the coil or heating elements.
Cathodes	Chemical lead, lead-tin, copper or carbon
Racks	Titanium, copper or phosphorous bronze tips with copper spline. Uncoated copper spline racks are suitable. Racks may be plastisol coated. Firm conductive rack contacts are necessary for good results. DO NOT LOOSE CONTACTS.
Pump	Chemical lead or lead-tin lined

The operating temperatures and voltages will be dependent upon alloy processed. In some cases, it may be possible to operate the Electropolish WA bath at temperatures as low as 140°F (60°C) or even as low as 130°F (54°C).

The operating voltage for each given job and alloy must be determined by trial and error. It is for this reason a voltage range is given rather than a specific voltage.

Metal	Voltage	Temperature		Anode Current Density	
		°F	°C	Amps/ft^2	Amps/dm^2
Stainless Steel (200)	8 – 15	180 – 220	82 – 104	108 – 700	11 – 70
Stainless Steel (300)	8 – 15	180 – 200	80 – 104	108 – 700	11 – 70
Stainless Steel (400)	8 – 15	180 – 210	82 – 99	144 – 700	14 – 70
Low Carbon Steel	9 – 12	160 – 180	71 – 82	144 – 700	14 – 70

High Carbon Steel	9 – 12	160 – 180	71 – 82	108 – 700	11 – 70

Solution Break-In Period and Operation

Use the solution as received. However, a new solution will keep a heavy amount of metallic salts in solution until the full sludging property of the bath takes effect. These metallic salts will remain in solution and will "break in" the bath and increase throwing power. After the "break n period," these metallic salts will settle out as sludge and plate out as a non-adherent deposit on the cathodes. When this occurs, cathodes should be cleaned frequently. Also, after the "break in" period, voltage should be increased slightly for maximum results.

Note: At cathode current densities below 75 amp/square foot, iron is reduced at the cathodes and drops out as a sludge. This is desirable because it keeps the iron content down. However, when sludging is objectionable, operate at a cathode current density of more than 80 amp/square foot. Iron may be controlled by periodically decanting and adding fresh solution.

Solution loss due to drag-out or sludge removal is to be replenished by adding Electropolish WA concentrate.

Voltage is bot critical; from four to twelve volts D.C. giving excellent results. In some cases, good finishes have been obtained at even lower voltages, however, this is not advisable. Higher voltages are not recommended since amperage increases proportionally and may cause burn marks on the object being polished, as well as, the possibility of gas streaks due to the increased evolution of oxygen at higher current densities. Gas streaks may be eliminated by providing agitation to the solution or the work rod.

Notes on Operating Techniques

As in any electro-chemical operation, best results can be obtained only with proper cleaning. Vapor degreasing, solvent cleaning, soak tank and electrolytic cleaning all work well. While electropolishing will remove scale, in most cases, it is best to remove scale by pickling first.

If stainless steel has been heat treated, it may contain a surface oxide. This oxide must be dissolved prior to electropolishing. Failure to remove the temper oxide will result in a poor electropolished surface and white stains.

The oxide of this type can only be removed in an acid solution made up of Descale D and Nitric Acid. See H-H product bulletin on Descale D.

Electropolishing Operation

Parts are racked or hung on hooks to insure good electrical contact. The works is made positive (anodic). The pieces to be electropolished are arranged in such a manner to allow the greatest area to be exposed parallel to the cathodes. The cathode to anode area ratio should be at least two to one respectively. Greater cathode to anode ratios is usually an improvement. In case of cathodes designed for finishing insides of objects, the above does not hold true. It is not advisable to use lead tank lining as a cathode.

Rack spines are best constructed of copper, due to its high conductivity per area. Rack tips can be made of copper, brass or phosphorous bronze. Naturally the exposed portion of the tips are subject to attack and gradually diminish in dimension. The useful life may be increased by dipping in solder periodically to build up size. Also, tips can be plated for build-up if facilities are available. All portions of the rack not contacting the part to be polished should be insulated with rack coating or masking materials designed for the electroplating trade.

Cathodes may be made of carbon, copper or lead. The latter being preferred. In the case of deep recesses in drawn, spun, or machined pieces, care must be taken in racking, so gas is not trapped. No polishing will occur in a gas pocket. Also, in cases mentioned above it may be necessary to build conforming cathodes where throwing is insufficient from regular tank cathodes. This following similar practices encountered in plating.
Spray currents may seriously damage lead-lined tanks unless certain precautions are taken. The work must not be closer to the end or bottom of the tank than distance from the work to the cathode. This may be eliminated by inserting glass panels along tank walls or tank sides and bottom.

1. First Water Rinse
   Parts are rinsed by immersion or spray to remove the solution from the surface. This may be operated at room temperature. If faster rinsing is desired, it is necessary to use hot water. A good rinsing at this stage will extend the life of the following rinse. Either running water or periodic emptying of this tank is important.

2. Second Water Rinse
   If the work is to be plated, a cold-water rinse or spray is necessary to remove final traces of the electropolishing solution.
   Otherwise, this rinse is best used hot to dry the wry the work rapidly as an aid in preventing water spotting, as well as rinsing off traces of acid from the previous cycle. This rinse should also be changed frequently. Several compounds may be added to aid the appearance and as wetting agents, sequestering agents and chelating agents. Since each to determine by experimentation or by writing us as to which would be best for your needs.

Control Method

The Electropolish WA solution may be controlled by checking the specific gravity with a hydrometer.

Equipment
1. 500 mL graduated cylinder
2. Standard hydrometer with a range from 1.600 to 1.800

Pour 400 mL of the Electropolish WA solution into the 500 mL graduate.

Note: The solution should be at 180°F (82°C) when taking the specific gravity reading. The specific gravity will increase as the iron content in the bath increases.

Another factor in controlling the Electropolish WA is the water buildup. Water may enter the bath from three sources: drag-in from the subsequent water rinse, excessive water additions, and from the atmosphere.

The water may be driven off by holding the bath at 220 - 225°F (104 - 107°C).

Waste Disposal

Discharge to a disposal system. To be completely informed on the latest regulations for your area, please contact the local authorities.

Caution

Electropolish WA is a strong inorganic acid mixture and should be handled with the same precaution as a concentrated mineral acid. Avoid skin and eye contact. Flush exposed areas immediately with clean cold water. Wear protective clothing and eye goggles when working with the solution. In case of skin burns contact a doctor. For eye contact flush with cold water and immediately contact a doctor.

Our people. Your problem solvers.

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