Eliminate Cyanide silver strike tank and plate directly to copper, copper alloy and nickel with alkaline non cyanide silver

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Silver electroplating: applications

- Decorative: silverwares
- Electronics: switches, connectors

Silver Electroplating: Chemistry

- Cyanide silver Electroplating
- Non-Cyanide Silver Electroplating

Design non-cyanide silver plating chemistry

- Complex: environmental friendly chemicals, Ag ion easily to be precipitated out
- Stable bath chemistry
- Plate on nickel, as well as other copper alloys
- Excellent adhesion
- Uniform White deposit with no yellow hues

Breakthrough technology of non cyanide silver electroplating

- Plate directly on nickel, as well as copper alloys
- Stable solution chemistry
- Bright silver for electronic, industrial and decorative applications
- Cost effective: plate silver entirely from dissolving silver anodes
- Exceptional covering and throwing power
- Fine-grained, smooth, dense silver deposit with low porosity
- Brilliant white deposit and better anti-tarnishing properties than other non-cyanide silver processes
- Easy maintenance and room temperature plating

Plating Specifications

- Silver metal: 9.5-17 g/l
- pH: 9.5-10.5
- Temperature: 16-24 °C
- Cathode current density: 3-10 ASF
- Anode current density: 2-10 ASF

Plating Specifications (continuous)

- Silver anode: slab or popcorn anodes in polypropylene basket
- Filtration: continuous filtration with 1 micron filter
- Agitation: air agitation on the cathodes

Bath Make-Up

Liquid silver concentrate	30% by volume
Maintenance electrolyte	30% by volume
Brightener	1% by volume
Rest of DI water	39% by volume

Functions of solution components

- Liquid silver concentrate: provide initial silver ions
- Maintenance electrolytes: complex silver ions, dissolve silver anode, and ensure great adhesion between silver and metal substrates
- Brightener: refine silver grain and control crystal orientation

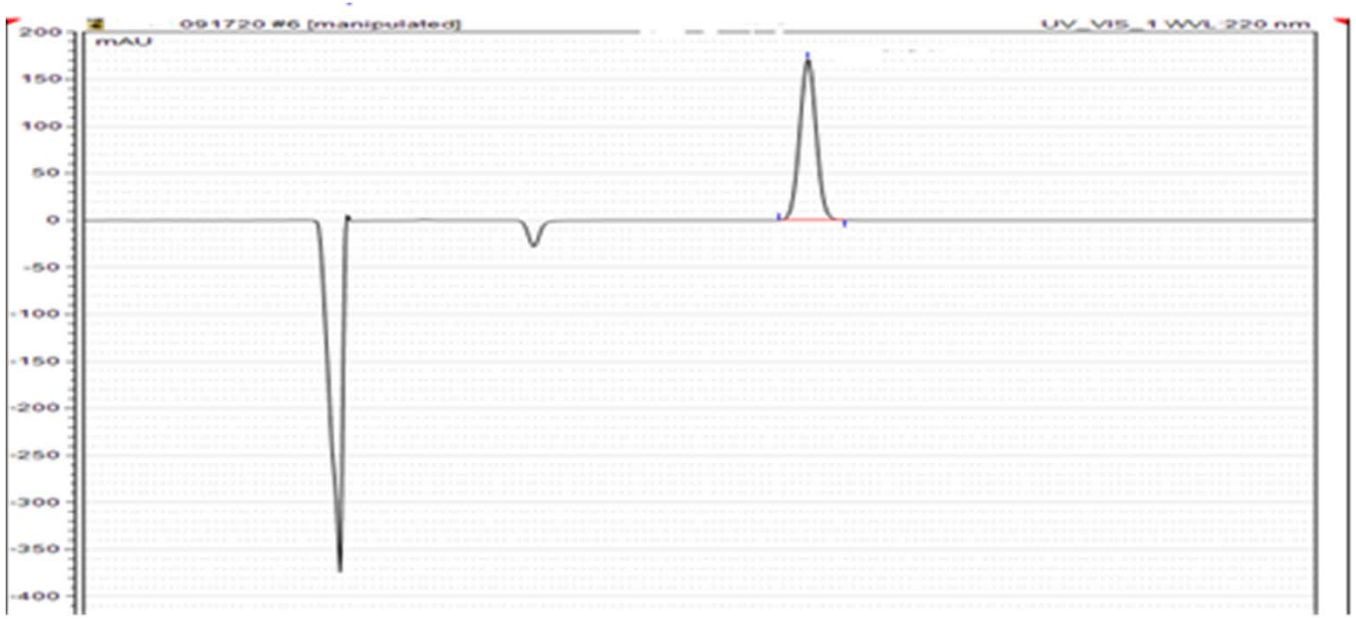
Maintenance of plating bath

- Silver metal: titration, entirely replenished by dissolving silver anode
- Maintenance electrolyte: Hull cell test for adhesion, HPLC analysis, consumed based on ampere hours
- Brightener: hull cell test and ICP analysis, consumed based on ampere hours

Maintenance of plating bath (continuous)

- pH: 9.5-10.5; lower pH with nitric acid, raise pH with 50% KOH
- Filtration: continuous filtration with 1 micron filter
- Agitation: air agitation on the cathodes

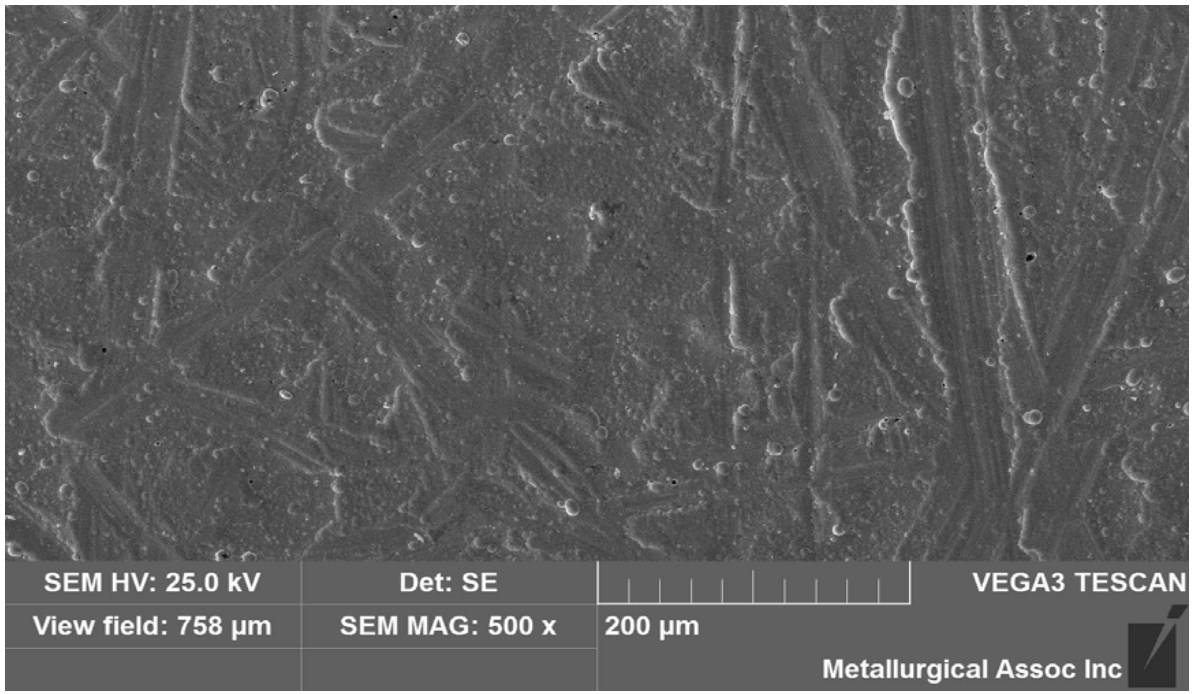
HPLC analysis of maintenance electrolyte



Plating speed of non cyanide silver

Cathode Current density (ASF)	2	5	10	15	20
Plating Rate micro-inches/min	6.4	15.4	26.2	33.3	40.3

SEM picture of silver deposit



SEM picture of silver deposit over nickel (cross-section analysis)

Properties of silver deposit

- Purities: over 99.9%
- Hardness: 150-200 KHN50 with a Knoop diamond indenter at a load of 50 grams
- Electrical resistance: 3.0-3.5 microhm-cm
- The wear resistance: better than cyanide silver deposit; the wear test performed by Taber Abrader is to abrade the silver deposit with the load of 250 grams.

Conclusion

- The silver deposit has a brilliant white color and shows a better anti-tarnishing properties than other non-cyanide silver processes.
- The new chemistry is very cost effective and it plates entirely out of silver anodes.
- The bath is extremely stable. The solution pH is buffered and remains stable during plating and when idle.
- It can plate non cyanide silver directly on nickel surfaces (meeting all three types of ASTM B-700) as well as plate directly on silver, brass, bronze and copper and does not require a separate silver strike on these substrates.
- The plating bath is an alkaline, cyanide free plating solution, which can plate bright silver for electronic, industrial and decorative uses.

Thanks