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STORM'S PROPRIETARY SILVER SOLUTION

Introduction

BACKGROUND

- Electroplated silver is used in an increasingly diverse range of applications and industrial segments for both decorative and functional finishes.
- Replacing the traditional cyanide electrolyte was one of the key objectives of this product development.
- Additionally, this new product should deliver:
 - Excellent solderability
 - Good adhesion over Copper and Nickel (with strike plate)
 - Low contact resistance
 - Bright to Semi-Bright, white appearance
 - Wide operating window
 - High efficiency

STORM'S PROPRIETARY SILVER SOLUTION MAKE-UP

	CD < 2 ASD	CD > 2 ASD
Chemicals Required	Volume	Volume
Storm's Proprietary Silver Solution Make-up Solution	400 mL/L	400 mL/L
Storm's Proprietary Silver Solution Concentrate	250 mL/L (20 g/L Ag)	500 mL/L (40 g/L Ag)
Storm's Proprietary Silver Solution Brightener	10 mL/L	10 mL/L
Storm's Proprietary Silver Solution HS Additive	---	40 mL/L
D.I. Water	To make one litre	To make one litre

STORM'S PROPRIETARY SILVER SOLUTION OPERATING PARAMETERS

Parameter	Range
Silver Concentration	20 g/L (0.5 – 2 ASD) 40 g/L (2 – 10 ASD)
Free complexing agent	75 g/L
Brightener	8 – 16 mL/L
HS Additive for high speed applications	40 - 50 mL/L
pH	9 – 10
Temperature	50 – 60°C
Cathode Efficiency	100%
Plating Rate	3µm/min at 5 ASD
Anodes	Silver
Anode: Cathode Ratio	. 3:1

CHARACTERISTICS

Storm's Proprietary Silver Solution Electrolyte

1. Cyanide-free electrolyte, pH 9-10
2. Chemically stable solution vs. bath age
3. CD range: 0.5 – 10 ASD (up to 15 ASD for jet or wire plating)
4. Cathode efficiency ca. 100%
5. Suitable for soluble anodes at this stage
6. Excellent adhesion over copper and copper alloys
7. Plating over nickel requires a strike layer
8. Does not contain metallic additive

Storm's Proprietary Silver Solution Deposit

1. Deposit composition: ca. 100% silver
2. White, bright silver deposit over a broad CD range (0.5 – 15 ASD)
3. Matte deposit possible (optional)
4. Suitable for electrical/electronic and decorative applications
5. Excellent contact resistance
6. Excellent solderability
7. Harder than cyanide silver deposits, especially after annealing at 155°C
8. No tarnishing when applying Anti-Tarnish agents recommended by Storm Power Components

PLATING SEQUENCE OVER COPPER AND COPPER ALLOYS

Step	Process	Notes
1	Cleaning (standard)	
	Rinse	
2	Storm's Proprietary Silver Solution	
	Hot Rinse (60-80°C)	Required directly after plating
3	Anti-Tarnish	Optional
	Rinse	

PLATING SEQUENCE OVER NICKEL UNDERCOAT

Step	Process	Notes
1	Cleaning (standard)	
	Rinse	
2	Nickel Plating	
	Rinse	
3	Storm's Proprietary Silver Solution Silver Strike	
4	Storm's Proprietary Silver Solution Bright Silver	
	Hot Rinse (60-80°C)	Required directly after plating
5	Anti-Tarnish	Optional
	Rinse	

STORM'S PROPRIETARY SILVER SOLUTION SILVER STRIKE

Chemicals Required	Parameters
Storm's Proprietary Silver Solution – Make-Up Solution	300 mL/L
Ag using Storm's Proprietary Silver Solution Silver Concentrate	0.3 – 0.5 g/L Ag
Temperature	Room Temperature
pH	9.5
Current Density	0.5 – 3 ASD
Time	10 sec – 2 min
Anode	Stainless Steel
Agitation	Mild

Notes:

- 1) It is recommended to optimize the parameters depending on plating techniques and conditions
- 2) Bath maintenance – use Storm's Proprietary Silver Solution Strike Replenisher

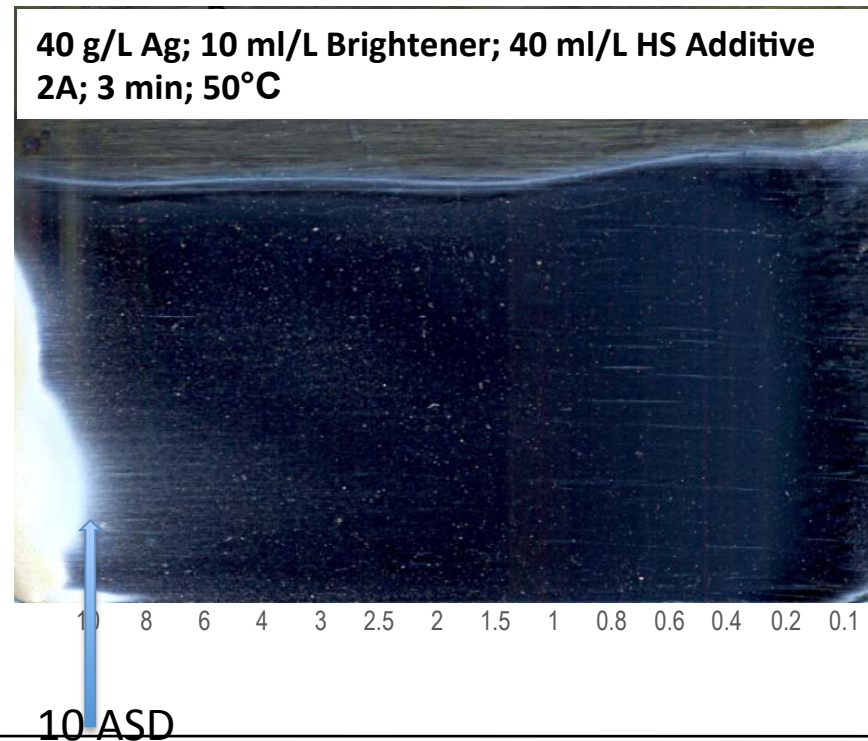


STORM'S PROPRIETARY SILVER SOLUTION
BRIGHT SILVER

Performance

APPLICABLE CURRENT DENSITY

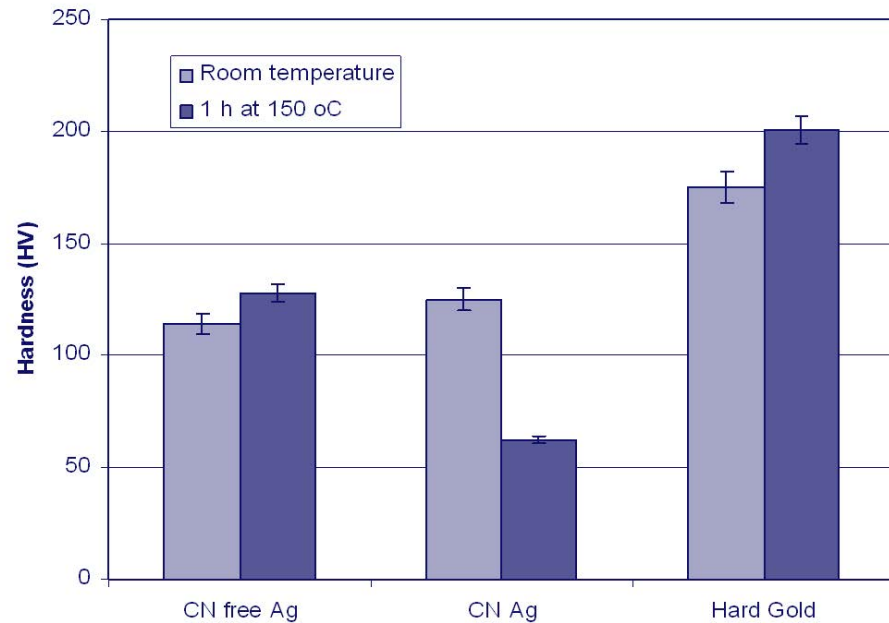
- 1 At 20g/L Silver 0.5 → 2 ASD
- 2 At 40g/L Silver 2 → 10 ASD (limited only by agitation)



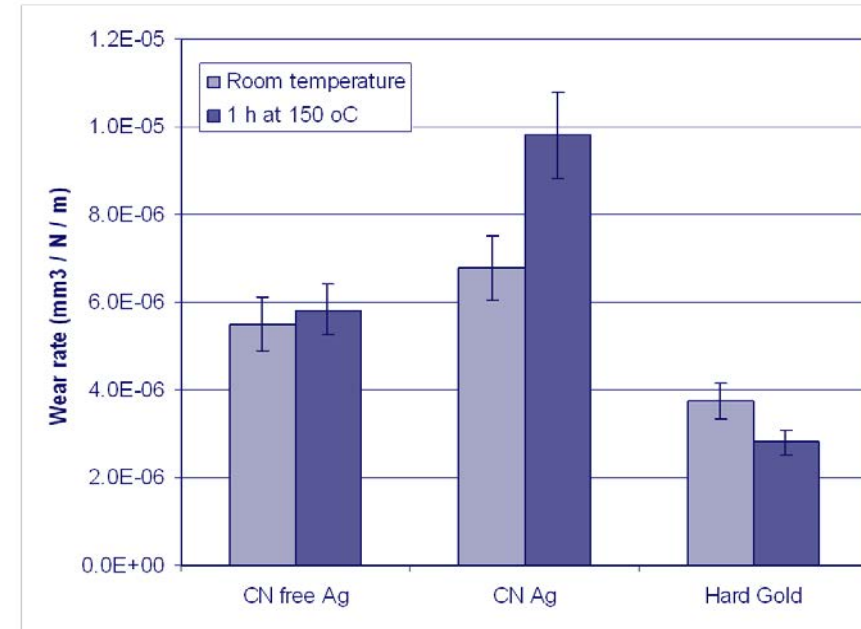
DEPOSIT APPEARANCE

Application	Metallization	Sample
Connector	Copper Alloy + Nickel + Storm's Proprietary Silver Solution	
POP	Copper + Nickel + Storm's Proprietary Silver Solution	
POP	Copper + Nickel + Storm's Proprietary Silver Solution	
Wafer	Copper + Storm's Proprietary Silver Solution	

HARDNESS AND WEAR RATE



Nano-Hardness



Wear Rate (Silver vs. Steel)

- Storm's Proprietary Silver Solution : Silver Deposits show higher hardness than deposits from a cyanide electrolyte, after annealing
- Storm's Proprietary Silver Solution: Silver deposits show lower wear rate compared to deposits from cyanide electrolyte, especially after annealing