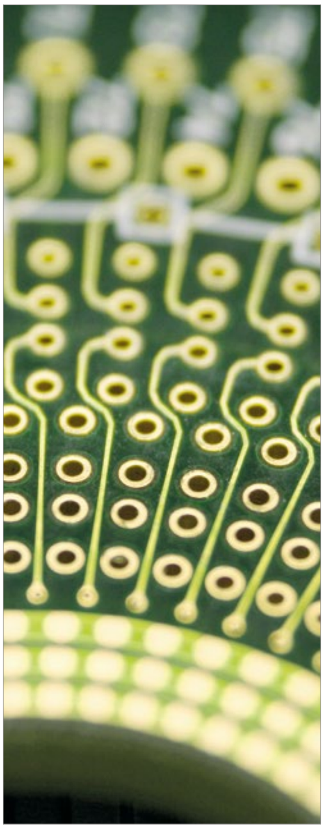
Au Pd Ni

Version: 24 March 2025

umicore

ENEPIG PROCESS

ELECTROLESS NICKEL ELECTROLESS PALLADIUM AND IMMERSION GOLD PLATING



Electroless Palladium, Electroless Nickel and Semi-Autocatalytic Gold Plating

Umicore's ENEPIG process provides an universal finish to the PCB industry with excellent wire-bonding performance and the highest degree of solder joint reliability (SJR) with lead-free SAC 305 alloy. The palladium slows the diffusion of tin into the nickel resulting in a minimum thickening of the nickeljtin IMC (= intermetallic compound), even following thermal stress of 1000 hours at 150 °c.

The possible use of unique semi-autocatalytic gold electrolyte Gobright® TWX-40 also enables to deposit even thicker gold layers with very uniform thickness distribution depending on customer requirements. The combination of electroless processes (nickel and palladium) and the final gold plating with this special type of electrolyte ensures a corrosion-free final finish system for high-end applications and mixed assembly processes on same surface.

Moreover ENEPIG films are less expensive in comparison to electrolytic or electroless bondable gold like ENAG (= Electroless nickel + Autocatalytic gold) and additionally comply with latest RoHs and WEEE regulations.

ENEPIG as Final Finish

ENEPIG plating on PCB

Advantages

- Universal finish for soldering and wire-bonding applications
- Highly robust solder joints with SAC solder
- Excellent contact surface
- Electroless process
- Less expensive than electrolytical gold finishes
- Dense and homogenous gold protection layer from 0.03 - 0.3 µm

Applications

- IC package PCB substrate
- Multi-functional assembly
- PCB for harsh environment

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ELECTROLESS NICKEL ELECTROLESS PALLADIUM AND IMMERSION GOLD PLATING

TECHNICAL SPECIFICATIONS ELECTROLESS NICKEL PLATING

Electrolyte characteristics Nimuden® NPR-8-2	
Electrolyte type	Autocatalytic process
pH value and temperature	4.6 at 84 ° c
Deposition rate	12 µm / h

Coating characteristics	
Coating composition	Nickel-Phosphorus
Recommended thickness	4.0 - 7.0 µm

TECHNICAL SPECIFICATIONS ELECTROLESS PALLADIUM PLATING

Electrolyte characteristics XTP (MW)	
Electrolyte type	Autocatalytic process
Metal content	0.6 (0.45 - 0.75) g/l Pd
pH value	7.2 (7.0-7.5)
Operating temperature	50 °C
Deposition rate	0.1 µm / 10 min

Coating characteristics	
Coating composition	Palladium-Phosphorus
Recommended thickness	0.1 - 0.3 µm

TECHNICAL SPECIFICATIONS (SEMI AUTOCATALYTIC) GOLD PLATING

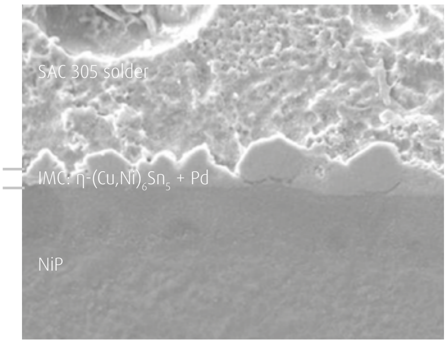
Electrolyte characteristics Gobright® TWX-40	
Electrolyte type	Semi autocatalytic
Metal content	1.2 (1.0 - 1.4) g/l Au
pH value	7.1 (6.9 - 7.4)
Operating temperature	78 (76 - 84) °C
Deposition rate	0.12 µm/15 min at 78 °C

Coating characteristics	
Coating composition	Fine gold
Purity	99.9 wt %
Recommended thickness	0.03 - 0.1 µm

ENEPIG PROCESS

ELECTROLESS NICKEL ELECTROLESS PALLADIUM AND IMMERSION GOLD PLATING

Cross-Section Observation by SEM of ENEPIG Solder Joint



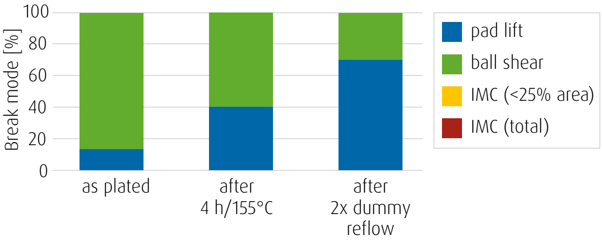
Thin and uniform IMC.

After 500 hours baking at 150 °C.

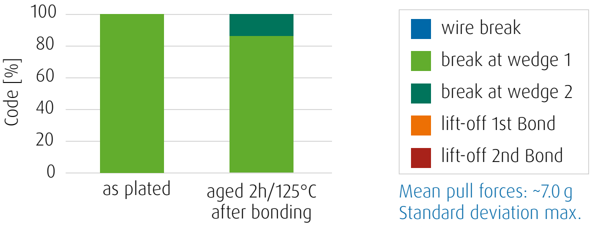
10 kV
5,000 x

BGA Solder Ball Shear Results

(ball size 0.76 mm, SAC solder, 4.8 µm NiP, 0.15 µm Pd, 0.06 µm Au)

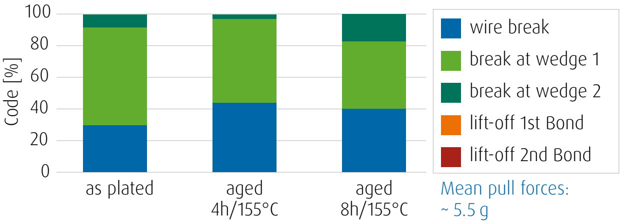


Aluminium Wire Pull Test Results, AlSi1 25 µm



Mean pull forces: ~7.0 g
Standard deviation max. 15 %
No lift-offs

Gold Wire Pull Test Results, Heraeus HD2 25 µm



Mean pull forces: ~ 5.5 g
Standard deviation max. 15 %
No lift-offs

YOUR CONTACT

Do you have a specific question or would you like a no-obligation quote calculation?
Our specialist will be happy to help you with any technical questions you might have.

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