RAIG: Reduction-Assisted Immersion Gold for ENIG, ENEPIG

Thicker Gold, Corrosion-Free, 4552 Compliant

Uyemura's TWX-40 "RAIG" process was developed for OEMs and board shops that require an immersion gold deposit significantly greater than the minimum values required by the ENIG or ENEPIG specifications. Shops can now deposit 4-6 µin gold, directly on electroless nickel or electroless palladium, in a single step. This highly stable hybrid bath employs both immersion and autocatalytic (electroless) modes of gold deposition. The autocatalytic aspect means that the gold layer is deposited directly on the underlying metal without displacement of the underlying base metal, which is typical of standard immersion gold processes.

TWX-40, through its reduction assisted immersion mixed reaction, best assures compliance with IPC

4552 as well as long term deposit layer reliability. TWX-40 is a proven alternative to previous attempts to achieve heavier gold deposits i.e. extending dwell times, or depositing autocatalytic gold over immersion gold, both of which can compromise nickel and palladium under-layers.

TWX-40 RAIG has a wide operating window. Distribution is exceptionally uniform, most notably at higher thicknesses - a major plus where circuit density is a priority. Deposit uniformity is independent of pad sizes and PCB surface geometry, or residual capacitance potential. Low coefficient of variation in gold thickness uniformity also contributes to optimum process control.

Other advantages:

- Fully preserves nickel integrity
- Consistent gold plating rates throughout the life of the bath.
- Bath exhibits excellent stability and fine geometry edge resolution.
- ▶ Nickel phos content can be kept mid-range.
- Maximum latitude regarding %P.



RAIG 3.12 µins gold. No Corrosion per IPC 4552, preferred Level 0 Product Rating



RAIG (25 minutes dwell time) 5.48 µins gold. No Corrosion per IPC 4552, preferred Level 0 Product Rating

Read more in an article titled *"TWX-40 Reduction-assisted Gold Bath Meets Demand for Thicker Gold on ENEPIG"* available online in the Uyemura Library: bit.do/RAIG



RAIG^{**}

A High-Performing Gold Alternative for ENIG and ENEPIG

Combination Immersion and Autocatalytic Reaction

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Displacement reaction first occurs on nickel surface.

RAIG on **ENIG**



Autocatalytic reaction starts after displacement gold partially covers nickel surface.



Continuous gold film grows by autocatalytic reaction.



Designers today often specify gold thicknesses that are higher than what has been considered standard. This test was done to determine whether extended dwell time in the gold bath would produce nickel corrosion, and whether higher gold thickness was achievable.

The dwell time in the RAIG bath was 25 minutes, achieving a gold thickness of 5.48 µin. There was zero corrosion – Level "0".



Phos Palladium / Reduction-Assisted Immersion Gold

No Corrosion at 2.0 µin gold; 7.6 µin phos palladium





No Corrosion at 6.4 µin gold; 7.6 µin phos palladium

Comparison of Nickel Displacement and Concentration for Different Immersion Gold Processes

Nickel concentration in the immersion gold solutions over bath life: a comparison of three gold plating processes used with ENIG

Standard Displacement Immersion Gold
High Efficiency Immersion Gold

Reduction-Assisted Gold

