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Benefits Derived from Reducing Hazards To Environmental Safety

Only recently has research into environmentally friendly alternatives in PWB processing been proven to be practical in all areas of concern. The PWB industry's primary goal is the elimination of cyanide, formaldehyde, lead, and chelating agents detrimental to waste treatment.

Some of these alternatives have been in use for more than 20 years, but the recent success of direct metallization and palladium as a substitute for gold has made this objective imminent. Developments have occurred in the following areas:

Copper metallization
- Chelating agents compatible with waste treatment
- Elimination of cyanide from electroless copper solutions
- Formaldehyde-free electroless copper
- Direct metallization processes

Etch resists
- Tin electrodeposits
- Dry film resists
- Nickel/gold
- Nickel/palladium
- Organic solderability preservers (OSPs)
- Tin electrodeposits
- Lead-free hot-solder coatings

Manufacturing Advantages

Benefit:	**By elimination of:**
Lower waste treatment cost	Gold cyanide Lead Chelating agents Electroless copper
Streamlined operation	Electroless copper HASL
Minimized board warpage	HASL

Current Roadblocks

Although technology now exists for a safer and more environmentally friendly PWB fabrication process, as well as one with quality improvement potential, the immediacy of universal approbation is questionable. Many PWB fabricators are reluctant to make the investment in a new technology where approval is not guaranteed. OEM or contract manufacturer customers have control over the materials and processes that can be employed in manufacturing their PWBs.

The PWB fabricator is aware of the benefits derived from eliminating processes containing perceived toxic chemicals. The OEM or contract manufacturer must be educated on assembly, cost and design advantages to be gained.

I recently chaired two technical sessions that included papers on HASL/direct metallization alternatives (references follow). The majority of post-presentation questions generated agreement that approval must depend on creating an awareness for specification of the proper process for a specific application. The target population at these sessions (*i.e.*, engineers/designers of assembled PCBs) expressed intense interest in ascertaining the advantages and limitations of each procedure.

There are several processes for both alternatives to HASL and direct metallization, and each has certain advantages for different situations. It is extremely important that the best process be chosen for each particular application.

Successful creation of a safer and environmentally friendly PWB manufacturing process requires ongoing education of the PWB user. Reports of problems must be minimized in order to post a track record of reliability. ***P&SF***

References

Boyle, Michael, "Reliability Enhancements Resulting from Direct Plate Metallization," *Proc., NEPCON West*, Feb. 1996, p. 930.

Walsh, Michael, "Learning to trust Palladium Tin Direct Metallization," *ibid*, p. 934.

Milard, George and Hugh Roberts, "Electroless Palladium Coatings for Bonding Fine Pitch Devices," *ibid*, p. 1333.

Charbonneau, Richard A., "An Evaluation of Anti-oxidant Coatings as an Alternative to HASL," *ibid*, p. 1342.

Gutierrez, Sam and Kent F. Langston, "Evaluating OSPs Used in Card Assembly," *ibid*, p. 1347.