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**UYEMURA
INTERNATIONAL
CORPORATION**

R&D
Altanova®

CLEARSignals

**A proven,
well-designed
ENEPIG capability
has been established in
the American northeast**

**It has strong technical credentials, and
significant experience with a high-profile,
high-demand customer.**

R&D Altanova (South Plainfield, NJ) designs and builds test interface boards for wafer sort and final test applications for the testing of integrated circuits.

Now in its 52nd year, the company provides in-house design and simulation (SI/PI), fabrication, and full component, mechanical assembly and test services to the semiconductor industry.



*Fully automated
ENIG/ENEPIG plating line uses
Uyemura's newest reduction-assisted
immersion gold process ("RAIG").*

R&D Altanova is best known for solutions that include fine pitch load board fabrication down to 0.2mm, probe card fabrication with coplanarity specifications as low as 12 µm per inch, multilayer organic substrates with pitches as small as 45 micron, boards with aspect ratios of 50:1, and embedded component solutions for PCBs and daughter cards. The company is also recognized as best in class for designing and delivering printed circuit boards for high frequency applications.

In 2019, R&D Altanova became the first East Coast PCB facility to install Uyemura's Reduction Assisted Immersion Gold (RAIG) ENEPIG process, and offer contract plating services.

The RAIG ENEPIG process developed by Uyemura is formed by the deposition of electroless nickel, followed by electroless palladium, with an autocatalytic immersion gold layer. RAIG ENEPIG's performance is unrivaled in solderability, shelf life and solder joint reliability. It is an exceptional final finish for soldering, gold wire bonding, aluminum wire bonding, and low contact pad resistance.

SEM studies and elemental analysis shows that palladium at the joint interface dramatically reduces

intermetallic propagation. This, along with its ability to produce a non-porous gold surface, has made ENEPIG the preferred final finish for packages requiring soldering and wire bonding with lead-free SAC type alloys.

ENEPIG has also proved an excellent solution for IC package PCB substrates. Unlike electrolytic processes, it carries no requirement for bussing lines, a factor which translates to maximum flexibility in circuit design, and compatibility with the highest board densities.

R&D Altanova operates under the leadership of CEO & President Seyed Paransun, a thought leader within the semiconductor and electronics industries with a strong vision about the company's role in the commercial arena, as well as the military sector, where ENEPIG has growing support.

"There is a lot of opportunity and demand for onshore turnkey services for design, fabrication and assembly using fine pitch substrates. This is particularly relevant due to the growing importance of being able to supply a full system in a package. R&D Altanova's ability to provide full turnkey and quick-turn substrates, along with ENEPIG "creates a strong value proposition for the marketplace."

**Quoted in
this article:**



*Don
Gudeczauskas*



*Seyed
Paransun*



*Rich
DePoto*



*Yubing
Wang*



*Vassilis
Danganis*

R&D Altanova serves a broad range of customers for ENEPIG. Its preeminent customer relationship is with Micron Technology. “Micron SIG (Systems Integration Group) designs and manufactures dedicated automated tester solutions,” explains Paransun. “R&D Altanova provides the PCBs that connect the automatic test equipment to the device under test.”

Originally, the ENEPIG process was outsourced, which proved problematic. “There were quality issues, as well as longer cycle times,” recalls Paransun. “ENEPIG is just one step of the process in a complex PCB manufacturing environment. As a turnkey house, we understand the exact requirements for pre-clean, ENEPIG, post-ENEPIG and inspection, so when the board is delivered to the customer, it’s ready for deployment.”

R&D Altanova has aggressively invested in new tools, materials, technology and capacity. In 2019, the company doubled annual spending to \$5 million in Cap Ex, including the ENEPIG line. “Commensurate to our investment in technology, we hired highly skilled individuals to support our ramp-up in technology and capacity. R&D Altanova is now ready to support our customers in 5G, AI, radar, autonomous vehicles and the IoT space,” says Paransun.

During the ENEPIG selection process, Micron also specified Uyemura as the chemical supplier. “Our team evaluated alternatives, but no other chemical supplier was qualified, in our view. There is great technical trust in the trifecta we built between Micron, R&D Altanova and Uyemura,” Paransun said.

R&D Altanova is actively marketing its ENEPIG processing capabilities within its traditional markets, and in evolving ones as well. The strongest interest,

according to Paransun, comes from current users of ENEPIG who expect world class quality and service, and users of hard gold.

“Usually,” he says, “boards get thick gold and hard gold. With too much gold, you can’t bond properly; not enough gold causes other issues. ENEPIG strikes a great compromise. I’m optimistic that momentum is building to make the ENEPIG process ubiquitous for a broad base of applications.”

Rich DePoto, Business Development Manager for Uyemura, suggests that other factors favoring ENEPIG are wire bondability and extended solderability. “Contract assemblers particularly appreciate that ENEPIG’s exceptional solderability allows it to handle the numerous steps including possible rework that are often involved.”

The ENEPIG line at R&D Altanova was designed by a team that included Uyemura Vice President Don Gudeczauskas, Senior Applications Engineer Al Gruenwald, and Rich DePoto, as well as Director of Process Engineering Dr. Yubing Wang and his team at R&D Altanova. Wang explains, “this is a fully automated hoist line with 2 nickel baths, and 2 gold baths, so we can process 2 loads simultaneously. The process cycle is 45-60 minutes; capacity is 3000 boards per week. Like all of our factories, the line is engineered to support 3 shifts and is located in a dedicated on-site building.

“Also,” he adds, “although the line has been fine-tuned to where we wanted it to be, we continually work on techniques to expand its process window and improve yield and throughput. For example,” he explains, “we have developed proprietary technologies that extend gold bath life beyond what is

High throughput hoist system provides full coverage of high aspect ratio holes, accommodates fine pitch geometry.



being achieved anywhere in the US— or Asia. That particular accomplishment was something we learned together with the Uyemura team.”

Military customers who are historically reluctant to change are clearly moving in ENEPIG’s direction – “and quickly,” according to DePoto. “We talk with military OEM suppliers weekly on applications where they would like to use this technology. This process is a powerful business driver for expanding ENEPIG’s universe.

“Everyone would love to run ENEPIG, and many are trying to figure out how they can take advantage of its capabilities,” says DePoto. *(Note: Uyemura ENEPIG can be integrated into an existing surface finish line with limited tank additions. The alternative ENEPAG approach requires thin immersion followed by electroless gold, thereby requiring 2 active gold tanks.)*

“Electroless palladium can be a tricky process to run and putting gold on palladium is trickier still. The process in small volumes can be expensive to run, efficiently. I predict that industry will benefit from outsourced ENEPIG for quite a while.

“This is an ‘elite’ process,” he adds, “with chemical specification, process and equipment and capable lab support critical for process reliability. Similar to a racehorse, it also performs best when it runs frequently.

“When it was introduced, we expected ENEPIG to quickly gain widespread acceptance,” says DePoto. “Instead, our ENIG ended up covering more ground and meeting customer needs beyond our expectations. Now,

ENEPIG demand is increasing. Few shops are set up for the planning, testing and production level that ENEPIG requires. And bringing on that capability for lower volumes is often simply not practical.”

At R&D Altanova, ENEPIG operates under a process engineering team headed by Yubing Wang. “We develop the process flow, test every variable to assure process robustness, then run pilots. When we’re comfortable with the process and are sure it’s solid, we move to low level manufacturing, document the process, and release it to manufacturing. The manufacturing team then runs it, while we continue researching ways to make it more robust, and compatible with ever-finer geometries.”

According to Vassilis Danginis, VP of Quality, the company is ISO9001 certified and has been audited by numerous tier 1 consumer and military customers with exceptional outcomes.

Uyemura’s ENEPIG technology is state-of-the-art, and no other company is running as high a level of ENEPIG as R&D Altanova. This is largely due to the reduction-assisted immersion gold (“RAIG”) that is the defining, exclusive component of Uyemura ENEPIG.

Dedicated, fully contained process line eliminates the risk of cross contamination.



TWX-40 RAIG was developed by Uyemura's Central Research Labs

for applications that require an immersion gold deposit thickness significantly greater than the minimum values required of ENIG / ENEPIG specifications.

RAIG allows the deposition of 4-6 μm gold directly on electroless nickel or electroless palladium. This hybrid or "mixed reaction" bath employs both immersion and autocatalytic (electroless) modes of gold deposition. The autocatalytic aspect means that the gold layer is deposited directly without displacing the underlying base metal.

The RAIG bath is highly stable, with a wide operating window. Distribution is exceptionally uniform and independent of pad size, PCB surface geometry, and residual capacitance potential. Low coefficient of variation in gold thickness uniformity contributes to optimum process control and an absence of concern regarding nickel or palladium corrosion.

RAIG, through its reduction-assisted reaction, assures compliance with IPC4552. It provides fine geometry edge resolution and long-term deposit layer reliability.



ENEPIG analytics, chemistry and auto dosing are managed by R&D Altanova's own lab.

RAIG is a proven alternative to previous attempts to achieve heavier gold deposits, i.e. extended dwell times, or depositing autocatalytic gold over immersion gold, both of which degrade the nickel and palladium under-layers.

As IPC specs change with 4556 and beyond, R&D Altanova is substantially ahead of the curve for corrosion and thickness control of gold. "This line was created for where the industry is going in the next 5 years," says Paransun. "We are more prepared on ENEPIG than anyone, committed to being the best, and ready to demonstrate what it can do."

“ ENEPIG (with RAIG) produces a gold surface that is ultimately free of porosity – a major reason why Micron consistently delivers pogo pin reliability at the highest level. ”

Daniel Cram, Mechanical Engineering Manager,
Micron Technology

ENEPIG from R&D Altanova

- ▶ Reduction-assisted gold process produces a uniform corrosion-free gold deposit
- ▶ Process delivers extreme tight pitch/spacing capability
- ▶ Excellent through-hole plating capability, full coverage up to 25:1 aspect ratio

R&D Altanova Leadership



Seyed Paransun CEO and President

- 36 years in the semiconductor/PCB industry
- B.S. Electrical Engineering, M.S. Electrical Engineering, MBA
- Patented Pin Scale Systems Flexible Test Solution for Highly Complex Devices

What is the single most important trait in a good vendor partner?

“ Consistent quality, the ability to help customers ‘future-proof’ their products, and service. ”



Vassilis Danganis Vice President, Quality

- 36 years in the semiconductor/PCB industry
- Responsibilities: Direct R&D Altanova Global QA activities, establish best-in-class quality goals for the PCB industry
- M.S. Materials Engineering & Electrochemistry
- Published works: Photoelectrocatalysis of Phthalocyanine and Its Metal Derivatives, and Failure Analysis Techniques for VLSI Circuits

What is the single most important trait in a good vendor partner?

“ Effective communication and full accountability regarding quality issues. ”



Yubing Wang Director of Process Engineering

- 15+ years in the semiconductor/PCB industry
- Ph.D. in Chemistry
- 5 patents
- Over 20 published technical articles

What is the single most important trait in a good vendor partner?

“ The ability to reliably build-in quality, and anticipate what customers will need in the future. ”



Richard Morbit Customer Service Representative

- 32 years in the customer service profession
- Responsibilities: serve as Altanova customers' primary contact for R&D programs; job status management, fabrication outsourcing, liaison with assembly houses.

What is the single most important trait in a good vendor partner?

“ Dependability ”