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Product Preview

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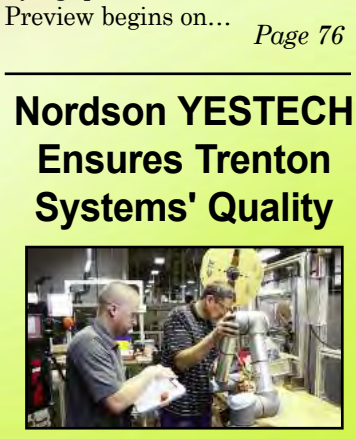
SPEA showcases full lineup of flying probe testers. Product Preview begins on… *Page 76*

Nordson YESTECH Ensures Trenton Systems' Quality



Made in USA — Nordson YESTECH AOI ensures product quality for made-in-USA EMS provider Trenton Systems. EMS section begins on… *Page 20*

This Month's Focus:
Assembly and Production

CyberOptics integrates reflection suppression into inspection machines; Nordson ASYMTEK uses nozzle tilt to improve coating coverage; Rehm develops new convection soldering system. Special Features begin on… *Page 62*

Comet Opens Cooperative Brainstorming Lab in Silicon Valley

By Michael Skinner, Associate Editor

San Jose, CA — Brainstorming has never gone out of style, but it takes on a new urgency as the centerpiece of Comet's new state-of-the-art laboratory in Silicon Valley. The Comet Group, which comprises Comet Plasma Control Technologies (PCT), YXLON and ebeam, has opened Comet Lab One, a collaborative space for brainstorming, research and development. Customers, such as the many tech titan OEMs in the area, as well as hundreds of smaller contract manufacturers and start-ups, will now have hands-on access to the Comet Group's RF and plasma technology, X-ray and computed tomography (CT) systems, and electron beam lab.

From left: René Lenggenhager, CEO of Comet; Sam Liccardo, mayor of San Jose; Ajit Manocha, president and CEO of SEMI; and Paul Smith, senior VP of Comet Technologies USA and general manager of Lab One; cut a ribbon to inaugurate the new facility.

The idea was formed in 2016 by Paul Smith, senior VP at Comet Technologies USA and general manager of Lab One, who sought to find a way to consolidate the company's branches and to leverage the technology of each. "Our new Lab One is a time-saver for local companies, because it provides inspection services extremely close to their location," says Smith. "It's a place where, together, we turn jointly-developed ideas into

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Better Rechargeable Batteries Coming Soon?

Troy/Ithaca, NY — Lithium electrodes coated with indium could be the basis for more powerful, longer-lasting, rechargeable batteries. The coating hinders undesirable side-reactions between the electrode and electrolyte, provides a more uniform deposition of lithium when charging, and augments storage in the lithium anode through alloying reactions between lithium and indium, as reported by American scientists in the journal *Angewandte Chemie*. Their success stems from the diffusion of lithium ions along the interfacial layer.

Today's lithium-ion batteries usually have graphite anodes that store lithium when the batteries are charged. An interesting alternative is presented by batteries with metallic anodes, such as lithium metal, which promise significantly higher storage capacity. However, a significant hurdle barring their successful implementation has been the uneven deposition of the metal during the charging process, which leads to the formation of dendrites.

After longer uses of the battery, these dendrites can grow so extensive that they short-circuit the battery. There are also undesirable side-reactions between the reactive metal electrodes and the electrolyte, which significantly reduce the lifetime of the batteries. The formation of a stable, passivating layer that prevents

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Air-Sensitive Semiconductors Under Study for Nanoelectronics

Tomsk, Russia — A research group of scientists from Tomsk Polytechnic University, Germany and Venezuela have proven the viability of a two-dimensional semiconductor gallium selenide (GaSe) in air. This discovery will allow the manufacturing of superconducting nanoelectronics based on GaSe, which, reportedly, has not been achieved until now. The study was published in *Semiconductor Science and Technology*.

One of the promising areas of materials science is the study of two-dimensional (2D) materials, i.e. thin films consisting of one or several atomic layers. 2D materials, due to their electrical superconductivity and strength, could be a basis for today's nanoelectronics. Optic applications in nanoelectronics require advanced materials capable of "generating" great electron fluxes upon light irradiation. GaSe is one of the 2D semiconductors that can cope with this problem most efficiently.

"Some research teams abroad tried to create electronic devices based on GaSe. However, despite extensive theoretical studies of this material, which were published in major scientific journals, the stability of the material in real devices remained unclear," says professor Raul Rodriguez, of Tomsk Polytechnic's department of lasers and lighting engineering.

The research team revealed the

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Designing Sophisticated Microfabrication Labs

By Del Williams

More complex, sophisticated cleanrooms have become a virtual necessity for a wide range of cutting-edge physical science, material science, and biomedical disciplines in order to deal with the increasingly difficult demands of research.

Due to the financial investment required for these facilities, both university and private R&D laboratories are designed and built to accommodate the needs of a wide range of researchers. This presents a challenge. Few administrators have the experience to select and set up lab equipment with the versatility required to serve such a diverse group of users over decades of continually-changing research.

A growing number of lab administrators are optimizing their microfabrication equipment, both for current and future needs, by getting their vendors involved early in the process. This enables expert planning, as well as the selection of standard equipment options that can improve safety, usability, and efficiency, while cutting cost.

"Often, university lab administrators have never built their own cleanrooms. They hire an architectural firm to do the design, but are still a little lost on how to lay out the equipment for all the different potential uses," says Louise Bertagnolli, president of JST Manufacturing.

JST designs and implements wet processing equipment for R&D cleanrooms and labs.

Lab Development

JST is a nationwide manufacturer of manual and automated wet processing equipment. The company's mechanical, electrical, and chemical engineers have many years of experience in the silicon and compound semiconductor, MEMS, photovoltaics, LEDs, flat panel display, and sensor industries.

Whether for compound semiconductors, nanotechnology, MEMS, biophotonics, biomedical electronics, or creating solar power alternatives to traditional silicon wafer construction, much of the advanced research done in labs today requires microfabrication operations. This typically includes wet processing equipment for metal lift-off, stripping, etching, plating/coating, cleaning, and de-bonding.

Dennis M. Schweiger, senior director of infrastructure at the University of Michigan's Lurie Nanofabrication Facility (LNF), feels that the right combination of user requirements and assistance from the equipment fabricator can make a significant difference in the design, layout, and operation of a wet processing station.

The LNF is a world-class facility in all areas of semiconductor device and circuit fabrication, integrated microsystems and MEMS technologies, nanotechnology, nanoelectronics, nanophotonics, and nanobiotechnology. The LNF is an open-use facility with hundreds of users from various UM departments, as well as many other universities and businesses.

Schweiger says, "Since we essentially rent lab space and equipment to our users, it is important

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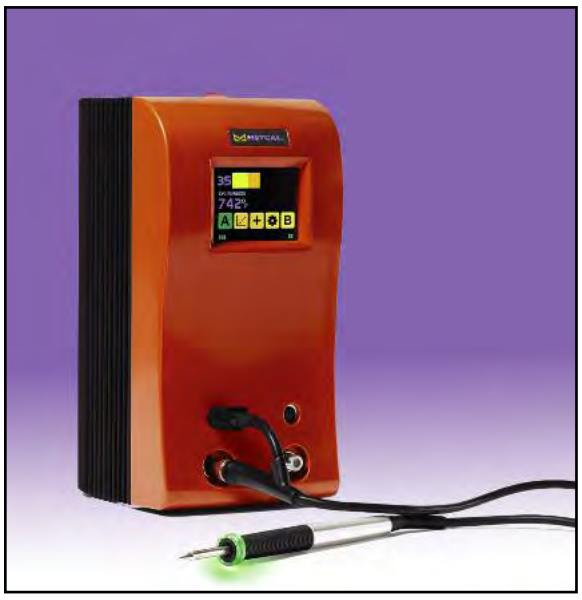
Metcal Offers Wide Selection of Soldering Tools

Cypress, CA — Metcal is now offering a range of soldering tools, along with its new connection validation (CV) selective soldering system. CV is the company's latest hand soldering innovation. Built on Metcal's SmartHeat™ technology, CV evaluates the quality of the solder joint by calculating the intermetallic compound formation and providing closed-loop feedback to the user, mitigating risk in the process.



Connection validation hand soldering system.

Metcal has released its CV monitoring software, which is designed to improve solder process traceability. It creates a performance baseline to quickly analyze soldering performance, identify changes in solder conditions, and allow changes to be made.

Robotic soldering is becoming more commonplace as manufacturers look to reduce risk and increase productivity.

Metcal's new CV selective soldering system addresses these needs by combining its CV technology and a new smart interface. CV reduces unnecessary dwell time by signaling to the system to move to the next solder joint in the program after a good joint is formed. The system can be easily programmed through its smart interface.

Metcal's HCT2 series of digital hot air pencils have always included an array of nozzle sizes for precision control. The new HCT2-200's improved thermal performance allows the user to target a larger variety of components. New features include a 200W ceramic heater and dual-stage air pump, a replaceable handpiece, and optional bent nozzles for easy access and for use under a microscope.

Metcal's high thermal demand (HDT) solution, which comprises a new hand-piece and a selection of thermally-efficient cartridges, has been developed for use with the company's MX line of power supplies.

HTD transforms a Metcal MX series soldering station into a powerhouse for applications with high thermal loads, such as dense boards, without damaging sensitive components.

The company also offers a solder tip cleaner, which removes oxidation and extends the life of soldering tips. The easy-to-use cleaner senses the tip when inserted into the unit and activates automatically, saving the operator time.

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Designing Sophisticated Microfabrication Labs

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that we provide them with benches that suit their purposes well, from those who are processing wafers to those who may be doing very advanced research or testing on non-wafer components."

According to Bertagnolli, who has guided numerous R&D lab administrators through the equipment design and selection process, the main concern is about setting up the cleanroom and procedures to serve the needs of users. The process is not always well defined and there are many unknowns.

"When designing and laying out cleanroom equipment, it is important to talk with a vendor or consultant with the experience to help you achieve your evolving research goals," says Bertagnolli. "It is also essential that they help ensure it is correctly set up, that the proper safety, operation, and maintenance procedures are in place, and that lab managers are properly trained to carry these out."

Bertagnolli says that maintaining safety and flexible function for wet processing equipment often requires selecting the most appropriate options from a number of technologies. This may involve various chemistries, temperature controls, chemical baths/dips, ergonomic designs, as well as cleaning, filtration, ventilation, safety, and disposal technologies.

Customized and Modular

To facilitate the economical design and building of a wet processing equipment solution, many users insist on a standardized approach with customizable features that will best handle their application parameters.

For example, JST uses standard products and standard methodologies to design and manufacture equipment. The equipment is modular by design for easy reconfiguration, should process or product requirements change.

Another powerful feature: each unit is designed with software that is capable of performing all tool functions, including those that are not required. With this, end users can create their own process, or recipes, with all sub-routines at their disposal.

"We like to give customers added flexibility by programming their equipment to do everything that it is capable of doing," explains Bertagnolli. "This enables them to dial in applications, such as chemical concentrations. They can also turn various features on or off, depending on the process requirements."

Specifying the design parameters for many manual benches may not be as involved as those for automated systems. However, soliciting the opinion of equipment manufacturers regarding equipment design can be very beneficial.

"Certain processes, such as etching and cleaning, lab managers will want to be flexible enough to accommodate a wide range of users and projects," says Bertagnolli. "We are often asked for tank construction materials that can withstand a number of concentrated acids, so part of design flexibility is ensuring that you use the most compatible materials for the most acids."

"Another aspect to consider is properly separating, neutralizing, and disposing of all the chemistries involved after use, whether in drains or tanks for treatment or pick up," she adds.

According to Bertagnolli, having the vendor visit the user's facility can contribute to equipment design versatility that can accommodate changes in lab use over the long term.

Optimizing LNF's Lab

Schweiger explains that the original equipment design for the new lab areas wet processing benches was very specific, and was determined by LNF staff.

"We had looked at it in terms of process flow, from start to finish, not really taking into account the variety of process samples that our user community might be working with, how we'd accommodate non-standard sample sizes, or what the impact might be in total cost of ownership with respect to chemical usage," he says.

Schweiger adds that some of the new benches had their decks reconfigured once the tools were installed. Several of the earlier benches, some of which were purchased over 20 years ago, were also modified to allow more flexibility to meet the process needs of the user community.

"In retrospect, our initial plan for the deck space, and processing capability of the benches, wasn't adaptable or flexible enough, and we worked with JST to implement modifications so that the bench decks were simpler, and could provide more working space," Schweiger concluded.

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