Just roll with it: Selected short takes from the flexible electronics, PV realm

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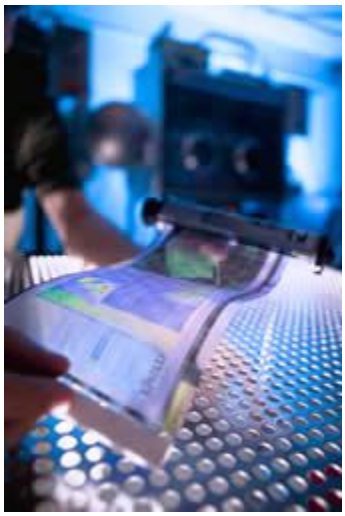
The copy flow has slowed here this week, due to a combination of laptop software problems (thanks, Microsoft Vista!) and a deadline for a print feature in the first edition of *Photovoltaics International* (if you haven't signed up for a free subscription at pv-tech.org, please do!). Since my schedule this week has been anything but rigid, here are a few short takes from the realm of flexible, printed, and organic electronics and photovoltaics.

After the US Display Consortium changed its name to the FlexTech Alliance in early July, the organization has been busy working on next year's main technical symposium event and finalizing some project contracts. The eighth edition of the Flexible Electronics and Display conference and exhibition will return to the Pointe Hilton Squaw Peak Resort in Phoenix on Februrary 2-5, but for the show to be successful it needs a raft of quality presentations.

The deadline for abstracts for the Flex conference has been extended to August 25. Potential presenters working on materials and process development and volume manufacturing equipment solutions in the areas of flexible/printed/organic RFID, sensor, display, PV, and OLED technologies have a choice of three conference tracks: business, markets, and applied development; fundamental research; and student research posters. The alliance recently appointed an advisory council to help decide which papers are worthy and how the conference program will be developed.

On the FlexTech contracts front, funds were recently awarded to Lehigh University (and its industrial partner the Hamilton Precision Metals unit of Ametek) to investigate and characterize various non-stainless-steel foils in order to gauge the alternative materials' suitability for flexible roll-to-roll manufacturing. The trade group also just closed a one-year deal with Raytheon to modify some of E-Ink's core electrophoretic technology (better known as e-paper) and create ultra-low-power, lightweight, rugged battlefield display prototypes for the US Army.



USDC and now the alliance has had a close relationship with the Army Research Lab since the consortium was created. The group's largest and arguably most important military-industrial collaboration, the Flexible Display Center at Arizona State University, announced a breakthough last week. The many cycles of learning digested by Gregg Raupp's team at the center's pilot line during their development of amorphous-silicon thin-film transistors built on plastic substrates have evidently paid off.

FDC's proprietary low-defect, high-temperature (for polymer anyway) process uses a unique temporary bonding/debonding sequence (stick the plastic on a carrier substrate using a custom adhesive, then peel if off at the end) and standard display-manufacturing techniques. Using the process, QVGA transistor arrays can be integrated using electrophoretic imaging layer film from, you guessed it, E-Ink, with specially planarized PEN coating material from DuPont Teijin Films. The resulting displays are only 375 microns thick, durable, and almost distortion free, with pretty crisp grey-scale image quality.

One of FlexTech's member companies, Plastic Logic, apparently doesn't need the alliance's help with any cash. The flexible display pioneer--which began in Cambridge, UK (and still conducts its R&D there), is ramping its new factory in Dresden, Germany, and recently

opened a Mountain View, CA, exec HQ for its sales, marketing, and product engineering and supply chain (with a slew of new VP hires)--said earlier this week that it has raised another $50 million in equity funds. This pushes the total investment monies secured by the company over the $200 million mark, a fair size chunk of VC change for a non-cleantech concern these days.

"We are approaching very significant milestones in the creation of the plastic electronics industry with the opening of our Dresden plant [scheduled for Sept. 17] and the pending launch of our first commercial consumer electronics product," said CEO Richard Archuleta in the press release announcing the funding round. "This new investment will enable expanded business operations in support of our first commercial product early next year while we continue to develop our IP to deliver on our broader long-term vision."

One firm leveraging its flat-panel/semiconductor know-how and starting to make a name for itself supplying turnkey and custom equipment to the flexible electronics and photovoltaics space is Austin-based NexTechFAS, the operating company resulting from the pairing of NexTech Solutions and FAS Holdings. I met with president/CEO Tony Di Napoli (who I've known since his Asyst days) at Semicon/Intersolar last month, and he told me the "emerging market play is a real good fit for the company."

Several current and soon-to-be clients (including Plastic Logic) are or will be using the company's automation, deposition, and optical inspection systems--often in combination. A coating line with inspection capability has recently shipped to the plastic electronics firm's Dresden fab, while an organic PV and printed electronics materials supplier has an integrated NexTechFAS system. Di Napoli's firm and Abbie Gregg have been collaborating closely, developing technologies and engineering solutions in the areas of OPV and touch-screen flexible displays.

The tool vendor has a CIGS (copper-indium-gallium-[di]selenide]) thin-film PV start-up customer in Texas (hmmm, who could that be?), as well as an Italian amorphous-silicon TFPV player ramping a Gen 8.5 line and incorporating a deposition tool "which will probably help them eliminate the conductive coating step," he said.

"Since the end of last year, we've seen PV interest spike," the company exec explained. "We just shipped our first PV tools." He attributes part of the growing interest to the launch of NexTechFAS's PVScan automated solar-panel optical defect-inspection system, calling the system "a real accelerator of our plan."

The tool's ability to detect and identify a broad spectrum of PV panel defect types and perform film thickness, resistivity, and other measurements, as well as its multitudinous review and automation options, have caught the attention of module manufacturers eager for improved inspection, metrology, and process control capabilities at a reasonable price point.

The company has a second solar-centric tool also raising some user eyebrows, the PVAdvantage extrusion, or spin-less, deposition tool. It can accurately deposit inorganic or organic solution-based materials (down to thicknesses of 20 nm for dry film, 1-micron for wet ones, with better than +/-3% uniformity) on a range of substrates--glass, plastic, or foil. The ability to handle both rigid and flexible materials comes from NexTechFAS's experience customizing and modifying its gear to fit the customer's needs, according to Di Napoli.

If two recent research reports' rather lofty forecasts are to be believed, tool and materials suppliers like NexTechFAS and E-Ink will be part of an emerging supply-chain infrastructure serving combined multibillion-dollar markets in a few years. NanoMarkets has just published its latest printed electronics materials database as well as its thin-film PV market outlook, in which the firm says it expects high double-digit growth for the foreseeable near- and longer-term future. On the PE materials side, global sales should exceed $11 billion by 2015 and the overall TFPV sector will top $22 billion by then, according to the reports.

While those prognosticative numbers should be taken with a healthy dollop of sodium-chloride crystals, there's no denying that the two nascent--and overlapping--sectors have large-area upside potential.

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