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Flexible displays tap markets, volume production imminent

By Tom Cheyney, Small Times Senior Contributing Editor

June 28, 2007 -- Although the commercialization of products enabled by flexible electronics (e.g., smart cards, shelf labels, and mobile displays) continues to gain momentum, the market won't reach the multibillion-dollar mark for several years. That's the word from speakers at IntertechPira's Flexible Displays and Electronics 2007 conference held June 19-21 in Oakland, Calif.

Presentations at the event detailed the challenges of -- and breakthroughs achieved in -- transitioning from development-scale work to volume production of flexible front- and backplanes made with printing- or microelectronics-type techniques on foil, plastic, and other substrates.

IDTechEx's Dan Lawrence sees a $2-billion-plus printed electronics sector by 2010, with organic LEDs making up the biggest piece of the pie. Display Search's Barry Young forecast that the flexible-display market will reach $1 billion by 2012, with point-of-purchase and labeling applications garnering more than half of sales, although he cautioned that in terms of area (square meters manufactured), the flexible segment "is likely to remain under 1%" of the total display market for 10 years.

Several companies have started volume production of flexible electronics components for "smart" credit cards. Emily Selene de Rotstein, VP of marketing for Dow Chemicals' spinout Aveso, said her company has started shipping its Primero line of functional ink-printed "flexible display modules for hot-laminated, ISO-compliant card applications" to its inlay-manufacturing partner Smartrac, for eventual integration into secure display cards.

Robert Sprague, SiPix's VP of engineering, noted that within the past year, his company has shipped about 500,000 of its ISO-certified "display cards." The electrophoretic module, made with SiPix's Microcup process for creating embossing molds, can be laminated to many different kinds of backplanes. He said that more than 2 million units will ship this year, with prototypes in the works for reconfigurable mobile-phone keypads and other applications.

One flexible segment with billion-dollar-plus potential -- electronic-paper displays or e-books -- is nearing commercialization. Plastic Logic's Stuart Evans told attendees that the cornerstone ceremony for the company's Dresden production fab took place May 23. The vice chairman said the cleanroom should be completed by the end of 2007, and the equipment -- an eclectic toolset comprising semiconductor, LCD, and printing gear -- has been ordered and will be installed in the first half of 2008. By late 2008, the first "product-quality" flexible e-paper display modules will roll off the line, with volume production by early 2009.

Polymer Vision and Innos, its display-manufacturing partner, revealed an even more aggressive production and commercialization roadmap. First units of Polymer's Readius rollable-display device will be delivered to initial customer Telecom Italia by year's end, according to Polymer Vision's CTO, Edzer Huitema.

Alec Reader, Innos's director of business development, credits the use of "proven standard silicon processing techniques" at the company's new Southampton, UK, fab for the rapid, relatively low-risk approach to getting Polymer Vision's product to market first. He said that they are "already producing rollable displays," which are laminated on a rigid 150-mm silicon substrate or "carrier" and delaminated at the end of the process.

Although he declined to state specific volumes, Reader said that installed capacity will be "in the hundreds of thousands of wafers per year" within six months. Yield improvement is a key focus area: "As we're taking the yields up, we're bringing up the capacity at the same time." Huitema expects "yield loss to be very comparable to AMLCD lines," noting that "we don't have a yield loss problem at delamination."

On the development front, Shawn O'Rourke, director of operations at the Flexible Display Center (FDC) at Arizona State University, announced the shipment of "active-matrix-display demonstrator modules (based on FDC's proprietary low-temperature amorphous-silicon TFT [thin-film transistor] process) for our first product-level technology demonstrator -- the ultrarugged soldier's digital assistant." Among other accomplishments over the past year, he cited a better-than-twofold improvement in device mobility.

FDC's Gen-II 370 x 470-mm glass-based TFT pilot toolset has been installed, according to O'Rourke, with ongoing evaluations of the bond/debond technologies on the new line. "Our intent is to qualify the TFT processing tools (some of which are unique or new to FDC) by the end of 2007 and to begin qualifying a Gen-II process in 2008."