PRINTING ELECTRONICS REPORT
June 2007

From Ken Gilleo - Ken@ET-Trends.com
ET TRENDS

BUSINESS & MARKET NEWS

PE Market - Printable Electronics (PE), a relatively new field where printing techniques apply conductive patterns and devices, is gaining momentum. The technology is being applied to flexible e-paper displays, smart labels such as RFID tags, animated posters and active clothing. Industry analysts are encouraged by the quick adoption, as well as growing research into future applications. Predictions are that more than 15,000 specialized PE printing machines will ship between 2007 and 2013. The growing number of new plants designed to produce PE products such as displays, backplanes, RFID tags, sensors and photovoltaic cells, coupled with creasing R&D in this field will provide a significant boost for firms supplying related printing equipment according to NanoMarkets***. [This marketing firm tends to be overly optimistic, in my opinion].***

They found:

(1) As demand for PE grows, there will be a switch to high-volume traditional printing methods [***I disagree about "traditional methods" because reports suggest that nanoscale features will be required for the organic semiconductors requiring highly specialized printers. The semiconductors may need variable thickness and this suggests ink jet printing.]***

(2) There will be a market for smaller R&D machines for industrial laboratories and the growing number of educational establishments that include printable electronics courses in their curriculum; over 70% of the R&D machines will be ink jet printers.

(3) Screen printing, the traditionally process to print conductors, will lose market share; by 2013, screen printing will account for only 18%.

(4) The addition of new printers to the PE industry will boost its manufacturing capacity from minor to around 400-million m^2 by the end of 2013.

(5) The 2013 PE market is estimated at around $40-billion in products.
Source: http://www.nanomarkets.net/

Silver is Elementary but the Wrong One - ***Last month I pointed out that long-used silver conductive inks need to be replaced by something better for emerging Printed Electronics. There are many performance reasons, but increasing cost of silver is also high on the list of reasons for change. One of the proponents of the "silver forever" mentality is NanoMarkets, who predicted a huge silver ink market. Ironically, the precious metals market has used that report to promote buying into the silver market (and helping boost the price even further. The Seeking Alpha***

Newsletter stated, "Silver is being utilized more and more in nanotechnology applications. I find it disappointing that some many want to modify silver and no one is proposing alternatives. This would seem to give an innovator a wide-open playing field. According to a recent report from NanoMarkets, a California firm who claims to be a leading industry analyst, the market for silver conductive inks is expected to rise from the current $176-million per year to $1.2-billion over next 7 years. This is a seven-fold increase! They go on to give reasons for being bullish on silver. "When I first became interested in silver during the late 1950's, the U.S. government had a stockpile of 2.5-billion ounces of silver. The amazing fact is that all of this silver has long since been sold. Most of it is gone forever! The majority of uses for silver does not allow for recovery, since only small portions are being used in each application. Computers, cell phones, TV's, fridges, batteries, weapons, and now ink and RFID applications, each use a tiny amount. However, multiplied by large quantities, this ever increasing use is causing a constant drain on the remaining silver stocks." In my opinion, there is a large opportunity to replace silver in Polymer Thick Film (PTF) and emerging Printed Electronics (PE). Source: NanoMarkets.

New Alliance - Soligie Inc (MN) and Thin Film Electronics ASA (Norway) have concluded an agreement to co-develop processes for producing printed memory in commercial volumes. Soligie has been granted an option to acquire certain production and commercialization rights to Thin Film Electronics' memory technology under a patent and know-how license agreement. Both parties said their joint development would be based on Thin Film Electronics' intellectual property (IP) for soluble memory materials and Soligie's IP for printing functional materials. Their collaboration aims to enable a programmable memory feature into products such as smart labels, smart-packaging, game cards, smart cards, toys and RFID cards. Thin Film Electronics has demonstrated a printable material with unique memory characteristics and sees a market need for standalone products using printable, re-writeable memory on flexible substrates. Source: EE Times.

More Alliances - Xaar plc (Cambridge, England), an ink jet printhead manufacturer, and polymer memory developer Thin Film Electronics ASA (Oslo, Norway), signed an agreement to develop industrial ink jet methods and processes that can be used for producing printed memory applications in high volume. Xaar and TFE provided a demonstration of printed ferroelectric polymer memory with arrays of up to 100 bits constructed using a line width of 220-microns last year. TFE and Xaar achieved a read/write endurance of 100,000 cycles on the demonstrator. TFE has been spun off from Opticom ASA, who had been cooperating on research into hybrid silicon-and-polymer multilayer memories with Intel Corp. Intel's termination of polymer memory research was one stimulus to the restructuring of Opticom and TFE. Source: EE Times.

TECHNOLOGY

Printing for Semiconductors - Semprius recently received a $100,000 Small Business Innovation Grant for its semiconductor printing technology. The company's technology for printing high performance semiconductors on glass, plastic or other materials will be directed toward lower manufacturing costs for devices such as digital X-ray sensors, RF chips for mobile communications, and wearable electronics among others. The basic principle is to transfer semiconductor chiplets onto any type surface. They first form high-performance electronics on a host semiconductor wafer

using conventional wafer processing techniques. Then, wet etching is used for undercutting the devices to make them removable in an ultra-thin and flexible format. Finally, they transfer print the devices onto a plastic sheet using a silicone rubber transfer stamp. This provides the ability to manufacture flexible display backplanes to the demanding standards of the display industry will enable a broad opportunity in flexible electronics far beyond displays, including configurable X-ray sensors, RFID tags, and wearable electronics and sensors. ***[While described as "printed", this is more of a transfer method. The University of Wisconsin made an announcement a few months ago, about a semiconductor lift-off technique that sounds similar].*** Source: www.semprius.com

When Will Printed Electronics Work for RFID Tags? - Most agree that printed RFID, including chips, is still at the research stage with much more to be done before. Although the technology required for printing RFID tags is maturing, a good deal of research still remains to be done before printed tags can be offered commercially.

OrganicID is working on a low-cost technology to produce printable electronic RFID tags made with organic inks. They feel that the PE industry is making good progress on materials and processes. Printed antennas have been viable for decades and some companies have been able to demonstrate circuits created with printed polymers, but nothing is ready for commercial use.

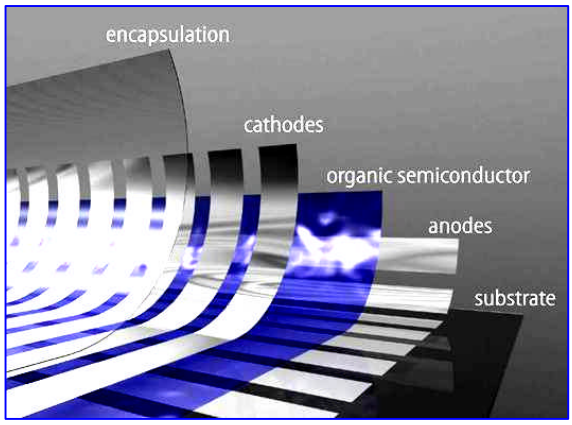
PolyIC is also developing printed RFID tags. ***[They promised samples 2-months ago, but I'm still waiting]***. PolyIC has created two organic 13.56 MHz RFID tags in a clean room: one with 32 bits of memory, the other with 64 bits and these were produced with polymers, not silicon. Some think that it is the printing technology that will make or break the industry. [***Perhaps, but the materials may be the real key***]. IDTechEx predicts that most of the 1.9-billion passive and active tags will be purchased in 2007 will use silicon ICs with printed antennas ***[That's almost a sure bet since that's what people have been doing]***. They go on to predict that 50% of the 670-billion tags purchased 10-yeras from now will be fully printed. But very simple printed RFID tags are already commercial.

Menippos (Germany) makes a game, called HurraFussball that includes trading cards with printed RF tag encoded with a 16-bit ID number. Menippos purchased the technology from Printed Systems (Chemnitz, Germany). The tags have just 16 bits of read-only memory giving 65,536 codes. Printed Systems sells the tags together with low-cost readers. ***[This still fits the definition of RFID]***. Printed thin-film transistor circuits appears to be one of the most promising technologies for low-cost RFID tags, especially if the projected target of less than 3-cents per tag is met. Estimates are that PE could move in and ramp up RFID sometime around 2011 or 2012. Others aren't sure if PE can delivery anything but the simplest tags. Printed TFTs (Thin Film Transistors) are just starting out and will initially be suited only for very simple, low-memory devices with short range. Technical challenges include poor mobility of a printed transistor's electrons, print resolution, yield, method for encapsulation, frequency stability, lifetime, memory capacity, read range, read speed, tag size and other parameters. That said, a large number of groups are working on organic electronics and it may take only 3 to 4-years to get a commercial product. Source: RFID Journal.

Library Print on Demand Books? - The New York City Library now offers instant-books from the very first (non-beta) Espresso Book Machine; found in the Science, Industry and Business Library section. For the time being, most of the books available are the ones in the public domain.

The books include over 200,000 titles from the Open Content Alliance database where visitors to the library can print off books free of charge [Not sure if there is a material's cost charge.] The instantly printed book which is indistinguishable from the factory-made title. Espresso On Demand Books hardware manufacturer seems to be getting orders for the machine; New Orleans Public Library, the University of Alberta, the Northshire Bookstore in Manchester, Vermont, and the Open Content Alliance in San Francisco each already in line to get one this year ***[OK, this isn't really printed electronics, but who knows what's ahead, maybe printed electronics for interactivity, or at least and RFID chip].***

Printed Electronics (PE) Photodetector - NANOIDENT Technologies AG has manufactured an 18-cm x 12-cm photodetector array on a flexible polyethylene film substrate. The array is the largest PE semiconductor photodetector array ever manufactured. The technology deposits thin layers of conducting and semiconducting "inks" on a PET substrate using state-of-the-art printing techniques. As a result, the company can create unique mechanical, electro-optical, and structural properties in arrays up to 50-cm x 50-cm. Semiconductor Platform 2.0 is the core technology for all NANOIDENT vertical market platforms. It comprises four core intellectual property (IP) elements: liquid conductive and semiconductor materials IP, design and simulation IP, production processes and quality assurance IP, and functional component IP. Beside photodetectors, the platform can be used to design and mass-produce other semiconductor-based functional components, including light-emitting diodes, transistors, resistors, capacitors, and interconnects. Printed semiconductor devices based on Semiconductor 2.0 Platform can be highly customized and sold directly to global OEM partners. Source: Electronic Design.



MATERIALS

Materials for Printed Memory - Solvay SA (Brussels, Belgium) has agreed to work with Thin Film Electronics ASA (Oslo, Norway) to develop materials for the production of Printed Electronic (PE) devices. Solvay Solexis (a subsidiary) is a provider of specialty polymer products and has set to work on a joint development program to optimize ferroelectric polymer materials to enhance the manufacturability and performance of TFE's memory technology. The focus is on developing appropriate ink formulations for printed electronics. Solvay Solexis can acquire certain production and commercialization rights to memory technology as part of the deal. TFE hopes to manufacture electronic circuits in a wide variety of shapes and on a variety of thin, flexible substrates, using traditional printing facilities at high volumes. This would enable electronic functionality in a range of new products and applications including medical, educational and consumer goods. Products could include animated advertising on printed pages and speech-enabled food packaging. Solvay has the know-how and the resources for optimizing and enhancing ferroelectric polymers for memory implementations, both the printed and the hybrid silicon-based according to TFE. Source: EE Times. ***[While the long-range projections for PE may be uncertain, this emerging area seems to offer opportunities for electronic materials developers and printing equipment makers.]***