Presse / Press

January 15, 2009

Driving Force of Mass Logistics

Applications for RFID (Radio Frequency Identification) technology are manifold. To also make their use in disposable products worthwhile manufacturers are searching for ways to produce complex circuits with organic semiconductors thereby facilitating production processes for printed RFID transponders. Current trends and latest developments will be on display at **LOPE-C 2009** in Frankfurt, Germany from June 23-25, 2008.

For identifying everyday items – be it food products, pharmaceuticals or documents – RFID transponders feature numerous advantages compared to conventional barcodes. Information stored on RFID transponders can be electronically encrypted, read out without visual control or physical contact and processed by overriding information systems. With RFID any type of merchandise can be more quickly identified, more accurately located or better protected from product piracy than by conventional methods. RFID technology therefore offers added value for applications such as ticketing, trademark protection and mass logistics.

Due to the amount and complexity of processible data, mass logistics place the highest demands on RFID systems. Silicon-based RFID transponders are already being implemented on pallet level. In the fall of 2008 the logistics provider DHL began equipping all deliveries to the 89 Cash & Carry self-service markets of Metro AG in France with transponders. Information is read during loading processes and transmitted to the respective central market, where it is automatically compared with the original order.
In a next step it would be desirable to include tracking of individual packages such as yoghurt cups, bottles or cans in RFID systems. To enable this upgrade, production costs for transponders will have to decrease significantly.

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"That will not be possible on the basis of conventional silicon technology" says Wolfgang Mildner, Managing Director of PolyIC GmbH & Co. KG in Fuerth, Germany. "We expect to be printing organic RFID transponders in the future for only a few Euro Cents per piece."

Internet of Things

Organic transponders are made of a light and flexible substrate upon which so-called "polymers" are printed. Since these polymers are soluble in certain liquids and, depending upon their chemical composition, offer insulating, semiconducting or conducting properties, they are suitable for cost-effective production of electronic components such as RFID transponders, light-emitting diodes or photovoltaic cells through continuous printing processes (see background information).

The Organic Electronics Association (OE-A), a global industry association with more than 110 member companies representing the complete value chain of organic and printed electronics, has already prepared an applications and technology roadmap. This roadmap forecasts that RFID transponders for applications such as ticketing or trademark protection will be available by 2010 and for automated processing in closed logistic systems by 2015.

Transponders for the "Internet of Things", as RFID-supported mass logistics in open trade systems are also called, are to follow and should, for example, enable the identification of single yoghurt cups over the complete supply chain and ensure that the price can be transmitted to the cash register as soon as the merchandise is removed from the shelf. It will also be possible to navigate other integrated organic components such as sensors and displays, so that the package can signal an interruption of the cold chain or that the expiration date has been exceeded.

Successful Field Tests in Ticketing

Printed RFID transponders are far from ready for such applications. Their performance is restricted, as their simple circuitry is limited to a maximum storage capacity of four bits. They have, however, already successfully passed first field tests in the ticketing area.

For example, since 2007 Messe Frankfurt has distributed several thousands of printed transponders among their attendees in addition to their entrance tickets in order to monitor entry authorization without further visual control.

In the future the number of memory bits will have to increase substantially for more complex logistic applications. The organization for standardization “Global Standards One (GS1)” calls for a transponder capacity of at least 96 bits to enable reliable storage of electronic product codes, the core of secure RFID logistics in open trade systems.

To fulfil this requirement PolyIC, BASF, Evonik Industries, Elantas Beck and Siemens joined forces in October 2007 and initiated project “MaDriX” with a total budget of 15 million Euros. More than one half of this sum is funded by the German Federal Ministry of Education and Research. MaDriX’ main goal is the integration of new materials and printing processes to a next generation of printed electronics with increased functionality. Developers are currently working on adapting silicon-based CMOS (Complementary Metal Oxide Semiconductor) technology to organic semiconductors and complex printed circuitry. Due to only minor power loss in idle state, CMOS technology is the leading technology in the production of complex components such as micro processors or storage units.

Positive Results with n-Semiconductors

CMOS technology is based on two different types of semiconductors, so-called p or n-semiconductors. While organic p-semiconductors have been manufactured since the 1990s companies involved in MaDriX are searching for ways to produce organic n-semiconductors to fulfil the requirements of printed electronics. They have already been able to detect n-conducting properties in certain pigments.
The challenge now lies in processing these pigments so that they can be manufactured and then printed.

BASF was also able to report first positive results with n-conductive semiconductors. This type of molecules can be printed, but must first be further developed to suitable inks. The respective materials have been processed into printable inks and, under laboratory conditions, to efficient transistors. Peter Eckerle, Project Manager at BASF Future Business GmbH is convinced that the properties of these materials can be improved even more. “Results to date look very good”, he states. Within the next two to three years it should be possible to optimize these materials for use in industrial printing processes.”

Trends and Technologies on Display at LOPE-C

Further trends on “organic and printed electronics” will be on display at the LOPE-C, Large-area, Organic & Printed Electronics Convention to take place as a conference with an accompanying exhibition at the Congress Center of Messe Frankfurt. The OE-A (Organic Electronics Association) has invited experts from commerce and academia to this world premiere to discuss opportunities, products and developments in the field of organic and printed electronics.

For further information please visit:
www.lope-c.com

Should you have any further questions concerning “organic and printed electronics” or “LOPE-C”, please direct your editorial enquiries to:

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Background: Organic and Printed Electronics

Organic and printed electronics are opening a whole new spectrum of applications to complement conventional silicon technology as they enable the production of thin, light-weight and flexible electronic components.

They are based on a combination of:

- Techniques that enable large-area, high-volume coating and patterning
- Plastic molecules that are deposited on a light-weight, flexible substrate and, depending upon their chemical composition, have insulating, semi-conductive or conductive properties. Typically, these materials are organic, but inorganic materials can be used as well.

Plastics can be composed of large molecule chains (polymers) or “small” molecules. However, they differ in the way they are processed to produce electronic components. Small molecules are usually vaporized in a vacuum process. Polymers, on the other hand, are applied in a mass-printing process, as they are liquid-soluble and enable inexpensive, layer-by-layer production of electronic components.

Therefore, organic and printed electronics are, for example, suitable for the production of:

- Printed transistors that can be used as Radio Frequency Identification (RFID) tags in merchandise logistics
- Organic, light emitting diodes (OLED)
- Organic photovoltaic cells that absorb light and transform it into electric energy
- Flexible batteries to provide energy for mobile devices
- Printed sensors to measure environmental parameters such as pressure, temperature or humidity
- Organic memories for the storage of digital information
- Flexible displays for electronic books or SmartCards
- Printed, single-use measurement devices for medical diagnostics

and further innovative applications.

Pictures for Press Release:

In order to download the high-res versions of the pictures from the LOPE-C website, please click on the respective image or go to the press-area of http://www.lope-c.com

Picture 1:

With printed electronics it will be possible to apply the electronic product code (EPC) to almost all merchandise in a supermarket, which would enable the monitoring of each individual item throughout the complete supply chain.
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Picture 2:

Printed logic-circuitry for RFID transponders

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Picture 3:

"Pilot production of Poly-3-hexylthiophen (P3HT) by BASF for manufacturing of transistor circuits to be used in organic electronic applications. One possible application for P3HT in organic electronics is the production of reasonably-priced RFID (Radio Frequency Identification) tags and solar cells (organic photovoltaics). These will be manufactured in highly productive printing processes on the basis of electrically conductive and semi-conductive plastics, without the need for expensive silicon."
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Picture 4:

Pop concert ticket featuring an RFID transponder